Environmental Report

National programme
for the management of spent fuel and radioactive waste

Ministero dello Sviluppo Economico

MINISTERO DELL'AMBIENTE E DELLA TUTELA DEL TERRITORIO E DEL MARE

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Thanks go to the *Directorate General for the Safeguarding of the Territory and Water*, the *Directorate General for the Protection of Nature and the Sea* and the *Directorate General for the Climate and Energy* of the Ministry for the Environment and Land and Sea Protection, the *Institute for Environmental Protection and Research (Istituto Superiore per la Protezione e la Ricerca Ambientale - ISPRA)* and *Sogin SpA* for having offered specialist support and technical data useful in preparing this Environmental Report.

1 General information on the National Programme and description of the preliminary phase of the SEA

1.1 Purpose and contents of the National Programme

The National Programme (hereinafter the “NP”), as envisaged by Articles 7 and 8 of Italian Legislative Decree no. 45/2011, constitutes the national reference framework for the safe management of all types of spent fuel and radioactive waste subject to national jurisdiction, throughout all the phases of the life cycle of said waste, from production to definitive arrangement (disposal).

As summarised in figure 1.1-1 and described below, the life cycle of radioactive waste can be divided up into three main phases: production, management and disposal.

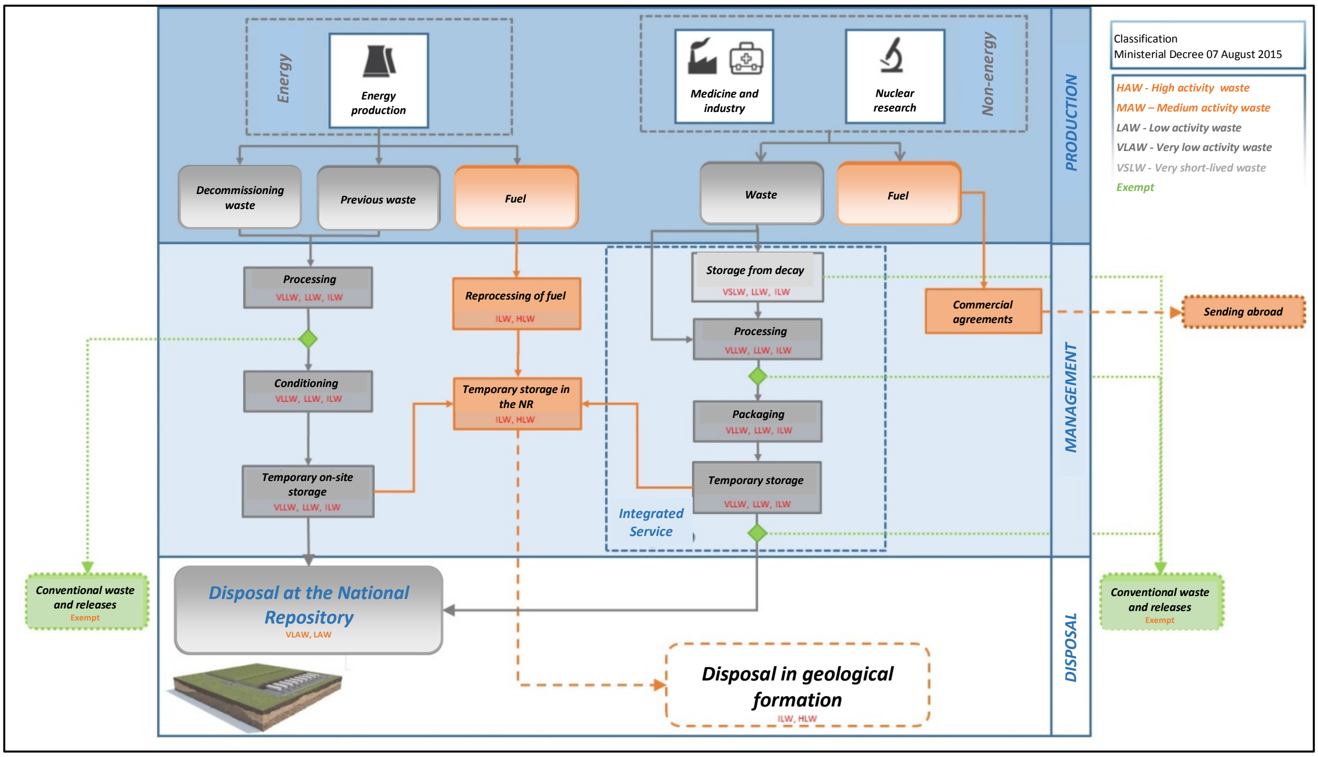

Figure 1.1-1: Life cycle of radioactive waste and spent fuel

Production

On a national level, the production of radioactive waste can be divided up into two macro categories.

<u>Energy segment</u>

This segment includes radioactive waste produced during use of nuclear energy cycle plants (electro-nuclear plants and nuclear fuel cycle plants, temporary storage of spent fuel, referred to “previous waste”), waste that is and will be produced during the keeping safe of these plants and that to be produced from their decommissioning.

<u>Non-energy segment</u>

This includes the collection, processing, packaging and temporary storage of radioactive waste, both existing and future production, produced by the medical-health, industrial and nuclear research sectors.

The life cycle of this waste is managed by the Integrated Service (hereinafter the “IS”), coordinated by ENEA, which guides, coordinates, supervises and plans said activities, establishing the type of waste that can be conferred and how it can be packaged and transported, using authorised operators. Some types of materials with irrelevant residual radioactivity (medical) are treated through disposal by exemption (like non-radioactive waste). Other types of waste, once treated and packaged, are stored in a depot whilst awaiting availability of the National Repository of low and medium radioactive waste (hereinafter the “NR”).

To date, apart from reactor RB3 (Nuclear Engineering Laboratory of Montecuccolino of Bologna University, for which decommissioning activities, authorised in 2010, are currently being completed), none of the plants have had deactivation authorisation issued.

Management

As a rule, radioactive waste is classified into different categories depending on their radioactive content. In Italy, radioactive waste has historically been classified according to ENEA-DISP Technical Guide no. 26, which envisaged three specific categories: categories I, II and III, in increasing order of radioactivity.

The Decree issued on 07 August 2015 by the Ministry of the Environment and the Protection of Land and Sea (“MEPLS”) and the Ministry of Economic Development (“MED”) established a new classification of radioactive waste. In line with international standards[1], this classification is based on five categories: Very Short Lived Waste (VSLW), Very Low Activity Waste (VLAW), Low Activity Waste (LAW), Medium Activity Waste (MAW) and High Activity Waste (HAW).

The classification aims to define subsequent waste management phases, guiding, where necessary, the choice of the most suitable types of treatment, packaging, storage and disposal.

As regards the terminology used in this Report, in connection with the management of radioactive waste in the National Repository, the term high activity waste also includes part of the intermediate level waste, in accordance with the above Decree of 07 August 2015.

Disposal

Italian Legislative Decree no. 31 of 15 February 2010 as subsequently amended and supplemented (hereinafter also referred to as “Italian Legislative Decree no. 31/2010”) lays down the procedures to be followed to localise and realise the National Repository (the “NR”) and the benefits enjoyed by the territories hosting it.

In accordance with Italian Legislative Decree no. 31/2010, the NR, included in a Technology Park including a Study and Experimentation Centre, will be used for final disposal of low and medium activity waste deriving from the above activities, as well as to offer temporary, long-term safe storage of high activity waste and irradiated fuel from the previous management of nuclear plants.

[1] On an international level, the classification of radioactive waste is dictated by the IAEA. It has evolved over the years and its latest version (IAEA - General Safety Guide No.GSG-1, Classification of Radioactive Waste, Vienna 2009) outlines the categories on the basis of the specific disposal solution to apply to the waste.

Italian Legislative Decree no. 31/2010 defines details of the procedure for the localisation of the NR, establishing the terms, institutional steps, technical documentation to be produced, through to the single authorisation for construction and operation. It also establishes that SOGIN S.p.A. must define a proposed National Map of Potentially Suitable Areas (CNAPI) to host the site where the NR is to be developed, considering the criteria laid down by the IAEA[2] and the ISIN[3]. The proposed CNAPI is just a first step in a complex procedure, structured into several phases, of site selection: this selection will, in fact, need to be made within areas found to be suitable, through a participated process based on the self-application by local entities, as well as specific technical surveys entailing an in-depth analysis of the locations.

The NP constitutes the national reference framework for the safe management of all types of spent fuel and radioactive waste subject to national jurisdiction, throughout all the phases of the life cycle of said waste, from production to definitive arrangement (disposal). This document is revised every three years for any updates required in connection with scientific and technical progress made, as well as recommendations, good practices and lessons learned from international *inter pares* audits.

The contents of the NP are given in Art. 8 of Italian Legislative Decree no. 45/2014 and are as follows:

- general objectives of the national policy for the management of spent fuel and radioactive waste;
- most significant steps and clear time limits for the implementation of these steps in light of the primary objectives of the national programme;
- inventory of all spent fuel and radioactive waste and estimates of future quantities, including those coming from deactivated plants, in which the location and quantity of radioactive waste and spent fuel must be indicated, in compliance with the radioactive waste classification;
- projects or plans and technical solutions for the management of spent fuel and radioactive waste from generation through to disposal, including the National Repository;
- projects and/or plans for the post-closure phase of the life of a disposal plant (NR), including the period for which suitable controls are maintained and the means to use to retain knowledge of the plant in the long-term;
- research, development and demonstration activities necessary in order to implement solutions for the management of spent fuel and radioactive waste;
- responsibilities for the implementation of the National Programme and key performance indicators to monitor the progress made on implementation;
- assessment of the costs of the national programme and premises as well as hypotheses behind this assessment, which must include a time profile;
- the financing regime or regimes in force;
- policy or procedure on transparency pursuant to Article 58-*quater* of Italian Legislative Decree no. 230 of 17 March 1995;
- any agreements stipulated with a Member State or third country on the management of spent fuel and radioactive waste, including the use of disposal plants.

[2] The specific IAEA Guidelines for the siting of a surface depot of radioactive waste are included in document SSG-29 "*Near Surface Disposal Facilities for Radioactive Waste*".

[3] The functions of the ISIN (Ispettorato nazionale per sicurezza nucleare e la radioprotezione - Italian National Inspectorate for Nuclear Safety and Radioprotection) have been temporarily assigned to the Centro Nazionale per la Sicurezza Nucleare e la Radioprotezione (Italian National Nuclear Safety and Radioprotection Centre) (formerly the Dipartimento Nucleare, Rischio Tecnologico e Industriale (Nuclear, Technological and Industrial Risk Department) of the ISPRA.

In line with the regulatory indications given in Italian Legislative Decree no. 45/2014, the NP strategies do not regard the management of conventional waste and materials (which are not radioactive), produced during the decommissioning or following natural deterioration.

1.2 Reference regulations for the National Programme

Council DIRECTIVE 2011/70/EURATOM of 19 July 2011, establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste (hereinafter the “Directive 2011/70/EURATOM”), assigns the European Union Member States the obligation to prepare a National Programme for the implementation of the policy for the management of spent fuel and radioactive waste, asking that they specify, in the individual National Programmes, the methods, terms and resources used to manage all types of waste, from generation through to disposal, and citing as international practice, the surface disposal of low and intermediate level waste or the geological disposal of high level waste.

In compliance with the obligations deriving from its membership of the European Community, Italy has incorporated Directive 2011/70/EURATOM, amending **Italian Legislative Decree no. 45 of 04 March 2014** “Implementation of Directive 2011/70/EURATOM, establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste”, which updates and supplements some important provisions on the management and storage of radioactive waste and incorporates the European Community indications on the establishment of the Independent regulatory authority (ISIN) and the preparation of the National Programme for the management of spent fuel and radioactive waste.

Due to its nature and the contents envisaged, the NP comes under the scope of application of **European Parliament and Council DIRECTIVE 2001/42/EC** on the assessment of the effects of certain plans and programmes on the environment, incorporated on a national level by **Italian Legislative Decree no. 152/2006 as subsequently amended and supplemented**, setting out “Environmental standards” and also termed the “Environment Act”. This Decree defines the Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) procedures.

As it contains the national policy for the management of spent fuel and radioactive waste, the NP is required to comply with the international, European and Italian regulatory framework set out below.

International regulations

- Convention on Nuclear Safety stipulated in Vienna on 20 September 1994 and ratified by Italian Law no. 10 of 19 January 1998
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, stipulated in Vienna on 05 September 1997 and ratified by Italian Law no. 282 of 16 December 2005

Additional commitments in this matter stem from Italy's membership of the IAEA – International Atomic Energy Agency. This international organisation in fact issues technical standards[4] and technical reports on nuclear safety and radiology protection - in the form of guides - to be applied to nuclear installations and the management of radioactive waste and spent fuel. These technical reports and standards are recognised and adopted on an international level.

European legislation

- European Council Directive 2009/71/Euratom, establishing a Community framework for the nuclear safety of nuclear installations, incorporated into Italian legislation by Italian Legislative Decree no. 185 of 19 October 2011, subsequently amended by European Council Directive 2014/87/Euratom of 08 July 2014, to be incorporated by 15 August 2017
- European Council Directive 2011/70/EURATOM, establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste
- European council Directive 2013/59/EURATOM of 05 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom.

Italian legislation

- Italian Law no. 1860 of 31 December 1962 "Peaceful use of nuclear energy"
- Italian Legislative Decree no. 230 of 17 March 1995 as subsequently amended and supplemented setting out the "Implementation of Directives 89/618 Euratom, 90/641 Euratom, 96/29 Euratom, 2006/117 Euratom on ionising radiations, 2009/71 Euratom on the nuclear safety of nuclear plants and 2011/70 Euratom on the safe management of spent fuel and radioactive waste deriving from civil activities"
- Italian Law no. 368, converting into law, with amendments, Decree-Law no. 314 of 14 November 2003, setting out "Urgent measures for the collection, disposal and storage, in complete safety, of radioactive waste"
- Decree by the President of the Council of Ministers ("DPCM") of 10 February 2006, setting out "Guidelines for the emergency planning of transport of radioactive and fissile materials, in implementation of Art. 125 of Italian Legislative Decree no. 230 of 17 March 1995 as subsequently amended and supplemented"
- Italian Legislative Decree no. 152 of 03 April 2006 setting out "Environmental standards", which also defines the Strategic Environmental Assessment and Environmental Impact Assessment procedures
- Italian Legislative Decree no. 52 of 06 February 2007 setting out the "Implementation of Directive 2003/122/EC Euratom on the control of high-activity sealed radioactive sources and orphan sources"
- Italian Legislative Decree no. 23 of 20 February 2009 setting out the "Implementation of Directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel"

[4] The IAEA safety standards provide a solid framework of fundamental standards ("Safety Fundamentals"), requirements and recommendations ("Safety Requirements") by which to guarantee safety and protect people and the environment from the harmful effects of ionising radiation, supplying specific guidelines (the "Safety Guidelines"); they apply throughout the whole life of structures and activities - both existing and new - used for peaceful purposes. The safety standards are valid deriving from the Statute of the IAEA, which allows the Agency to "establish or adopt, in consultation and, where appropriate, in collaboration with the competent organs of the United Nations and with the specialized agencies concerned, standards of safety for protection of health and minimization of danger to life and property (including such standards for labour conditions), and to provide for the application of these standards".

- Italian Law no. 99 of 23 July 2009 as subsequently amended and supplemented setting out "Provisions for the development and globalisation of companies, and on energy matters" and, in particular, Article 29 whereby the Nuclear Safety Agency was established, thereafter abrogated by Italian Legislative Decree no. 45 of 04 March 2014
- Italian Legislative Decree no. 31 of 15 February 2010 as subsequently amended and supplemented setting out the "Regulation of irradiated fuel and radioactive waste storage systems and economic benefits". The Decree contains provisions on the location of sites to host the NR
- Italian Law no. 75 of 26 May 2011, which amended the provisions of Italian Law no. 99 of 23 July 2009 and Italian Legislative Decree no. 31 of 15 February 2010
- Italian Law no. 27 of 24 March 2012 setting out "Urgent provisions for competition, the development of infrastructures and competitiveness", which, in order to speed up decommissioning of nuclear sites, envisaged a single authorisation procedure that would also take due consideration of the position of the local authorities involved
- Italian Legislative Decree no. 45 of 04 March 2014 setting out the "Implementation of Directive 2011/70/EURATOM, establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste"
- The Decree issued on 07 August 2015 by the Ministry of the Environment and the Protection of Land and Sea and the Ministry of Economic Development setting out the "Classification of radioactive waste in accordance with Art. 5 of Italian Legislative Decree no. 45 of 04 March 2014", where the new classification of radioactive waste is established, replacing that of the previous ENEA-DISP Technical Guideline no. 26.

Technical guides

The Technical Guides, issued in accordance with Art. 153 of Italian Legislative Decree no. 230/1995 as subsequently amended and supplemented, are documents whereby the Italian control authority issues standards of good technique that define the procedures for the technical-operative implementation of the provisions of law on matters of nuclear safety and radioprotection, also establishing the criteria and methods with which it intends to carry out its controls.

There are essentially two reference technical guides for the management of radioactive waste:

- 1987 ENEA DISP Technical Guide no. 26 "Radioactive waste management";
- 2014 ISPRA Technical Guide no. 29 "Criteria for finding the location for a surface disposal facility for low and medium activity waste".

1.3 Strategic Environmental Assessment

By Italian Legislative Decree no. 152/2006, incorporating European Parliament and Council Directive 2001/42/EC of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment, Italy undertook to adopt the Strategic Environmental Assessment (hereinafter referred to as the "SEA"), for preventive environmental protection and integration.

The SEA:

i) consists of a process of assessing the environmental impacts of plans and programmes intended to provide a reference framework of the activities carried out in the territory;

ii) analyses a series of problems (not just environmental, but also social, economic, territorial, etc.) through a procedure that is not separate from the plan or programme training process, but rather linked by a continuous interaction and revision of choices;

iii) is not a mere analysis of the plan choices and possible alternatives that may be able to be proposed, but rather extends the assessment time through to application of the plan, envisaging the monitoring of the effects of the choices made, through the use and study of specific indicators;

iv) regards the plans and programmes that can have significant impacts on the environment and cultural heritage and must be activated right from the very first phases of the decision-making process, when proposals are collected from the players competent in environmental matters and the debate starts, in order to achieve, by comparing the alternatives, confirmation of the strategic choices made on the plan structure. The strategic assessment process will accompany the whole of the plan formulation, debate and adoption/approval process and will also extend to include the implementation and management phases, with the provision and development of the monitoring programme.

International regulations

The international treaties and conventions of greatest interest for environmental assessments are listed below:

- Århus Convention: 1998 "Convention On Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters", ratified by Italy with Italian Law no. 108 of 16 March 2001;
- Espoo Convention: 1991 "Convention on Environmental Impact Assessment in a Transboundary Context", ratified by Italy with Italian Law no. 640 of 03 November 1994;
- Kiev Protocol: 2003 Draft Protocol on Strategic Environmental Assessment, ratified by Italy with Italian Law no. 79 of 03 May 2016.

European legislation

SEA was introduced by European Parliament and Council Directive 2001/42/EC of 27 June 2001, aiming "*to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development, by ensuring that, [...], an environmental assessment is carried out of certain plans and programmes which are likely to have significant effects on the environment*". The Directive clearly stresses the need to supplement the SEA during planning, declaring that the integration must "[...] *be carried out during the preparation of a plan* [...]" (Art. 4, paragraph 1) and must be extended to the whole planning cycle, including control of the significant environmental impacts as a consequence of the plan implementation (Art. 10).

Italian legislation

Nationally, European Parliament and Council Directive 2001/42/EC of 27 June 2001 was formally implemented with Italian Legislative Decree no. 152 of 03 April 2006 "Environmental standards" (hereinafter also referred to as the "Environment Act").

The contents of the second part of the Environment Act, regarding the "Procedures for Strategic Environmental Assessment in Environmental Impact Assessment (EIA) and for the Integrated Environmental Authorisation (IEA) were supplemented and amended by the subsequent Italian Legislative Decree no. 4 of 16 January 2008 "Additional measures correcting and supplementing Italian Legislative Decree no. 152 of 03 April 2006 setting out environmental standards" and, finally, by Italian Legislative Decree no. 128 of 29 June 2010 "Amendments and supplements to Italian Legislative Decree no. 152 of 03 April 2006 setting out environmental standards, in accordance with Art. 12 of Italian Law no. 69 of 18 June 2009".

The SEA, verification of applicability of EIA and EIA procedures have been altered in some respects, with a view to simplifying the information disclosed to the public, by Italian Decree Law no. 91 of 24 June 2014, as converted by Italian Law no. 116 of 11 August 2014.

Finally, Italian Legislative Decree no. 195 of 19 August 2005 “on public access to environmental information” is of particular interest to the SEA procedure to which the NP is subject. The Decree introduces rules aiming to guarantee the right to access environmental information held by the public authorities and establishes the terms, essential conditions and methods for its exercise.

Existing reference documents in terms of methodology, prepared to guide the SEA process, include, in particular:

- the 2003 European Commission Guidance on the application of Directive 2001/42/EC “Implementation of Directive 2001/42/EC on the Assessment of the Effects of Certain Plans and Programmes on the Environment”;
- ISPRA Guidelines 124/2015 “Practical guidance to assess and prepare SEA documents”.

1.3.1 Subjects involved in the SEA procedure of the NP

- The Proceeding Authority (PA) consists of the Ministry of the Environment and the Protection of Land and Sea (- Directorate General for Waste and Pollution - and the Ministry of Economic Development - Directorate General for the Electric Market, Renewables, Energy Efficiency and Nuclear;
- The Competent Authority (CA) is the Ministry of the Environment and the Protection of Land and Sea - Environmental Assessments Directorate (EAD) by agreement with the Ministry of Culture and Cultural Heritage and Tourism (MCCHT) and with the Ministry for Foreign Affairs and International Cooperation (MFAIC), which issues the grounded SEA opinion (Art. 7, paragraph 5 of Italian Legislative Decree no. 152/2006). The technical-scientific support for this duty is offered by the Environmental impact assessment technical commission - EIA and SEA (Art. 8 of Italian Legislative Decree no. 152/2006), in turn supported during the investigation stage, if required, by the Institute for Environmental Protection and Research.

The participation in the SEA process is also extended to include other important players:

- environmental authorities (EAs): the public administrations and public entities that, for their specific environmental competences or responsibilities, may be involved by environmental impacts deriving from the implementation of the NP;
- entities territorially involved: other Entities that it is considered may be involved actively and in drafting the Environmental Report, in order to inform and share knowledge on the context being studied;
- public: one or more natural persons or legal entities, according to current legislation, and their associations, organisations or groups, who meet the conditions set out in the Århus Convention or Directives 2003/4/EC and 2003/35/EC); i.e. Citizens and Associations.

1.3.2 Strategic Environmental Assessment procedure

The SEA process includes, according to the provisions pursuant to Articles 12 to 18 of the Environment Act, the phases shown in Figure 1.3-1.

Art. 6 of the Environment Act lists all the plans and programmes that can be subjected to SEA. More specifically, letter a), paragraph 2 of Art. 6 refers to plans and programmes “that are prepared to assess and manage ambient air quality, for the agricultural, forestry, fishing, energy, industrial, transport, waste and water management, telecommunications, tourism, territorial planning or soil use sectors, and which define the reference framework for the approval, authorisation, area of localisation or in any case development of the projects listed in annexes II, III and IV of this Decree”. The arguments discussed and objectives mean that the NP must be subjected to SEA.

The SEA procedure on the NP was launched by the PA on 18 March 2016 with the transmission of the Preliminary Report (PR).

On 22 April 2016, the PA sent the “Communication of the start of consultation in accordance with Art. 13, paragraph 1 of Italian Legislative Decree no. 152 of 2006 as subsequently amended and supplemented”, to the EAs and the EAD supplied indications on the method and timing of consultation (30 days from the date of receipt of the communication).

The assessment procedure by the EIA/SEA Technical Commission was completed on 21 May 2016, producing the Scoping Opinion sent on 27 May 2016, containing all observations received and the key points contained in this Environmental Report (ER).

Verification of applicability - Art. 12

The CA decides, according to the Programme impact, whether or not it should be subjected to SEA

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Scoping phase - Art. 13

Preliminary phase for the set-up and definition of the contents of the Environmental Report, during which observations are collected from the EAs on the Programme

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Preparation of the Environmental Report - Art. 13

through which the significant impacts that the implementation of the Programme may have are identified, described and assessed, and any reasonable alternatives that could be adopted

↓

Consultation - Art. 14

Submission of observations by the EAs within 60 days of publication of the proposed programme and the Environmental Report

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Assessment of the ER and results of the consultation - Art. 15

The CA assesses all the documentation submitted, as well as the observations, objections and suggestions, and expresses its grounded opinion within 90 days

↓

Decision - Art. 16

The Programme and the Environmental Report, together with the grounded opinion and the documentation acquired under the scope of the consultation, are sent to the PA

↓

Information on the decision - Art. 17

Publication of the final decision, the grounded opinion of the CA, the summary description (explaining how the environmental considerations have been integrated into the Programme and the measures adopted) and the measures adopted as regards monitoring

↓

Monitoring - Art. 18

Monitoring ensures control of the significant impacts on the environment deriving from the implementation of the approved programme

Figure 1.3-1: SEA process phases

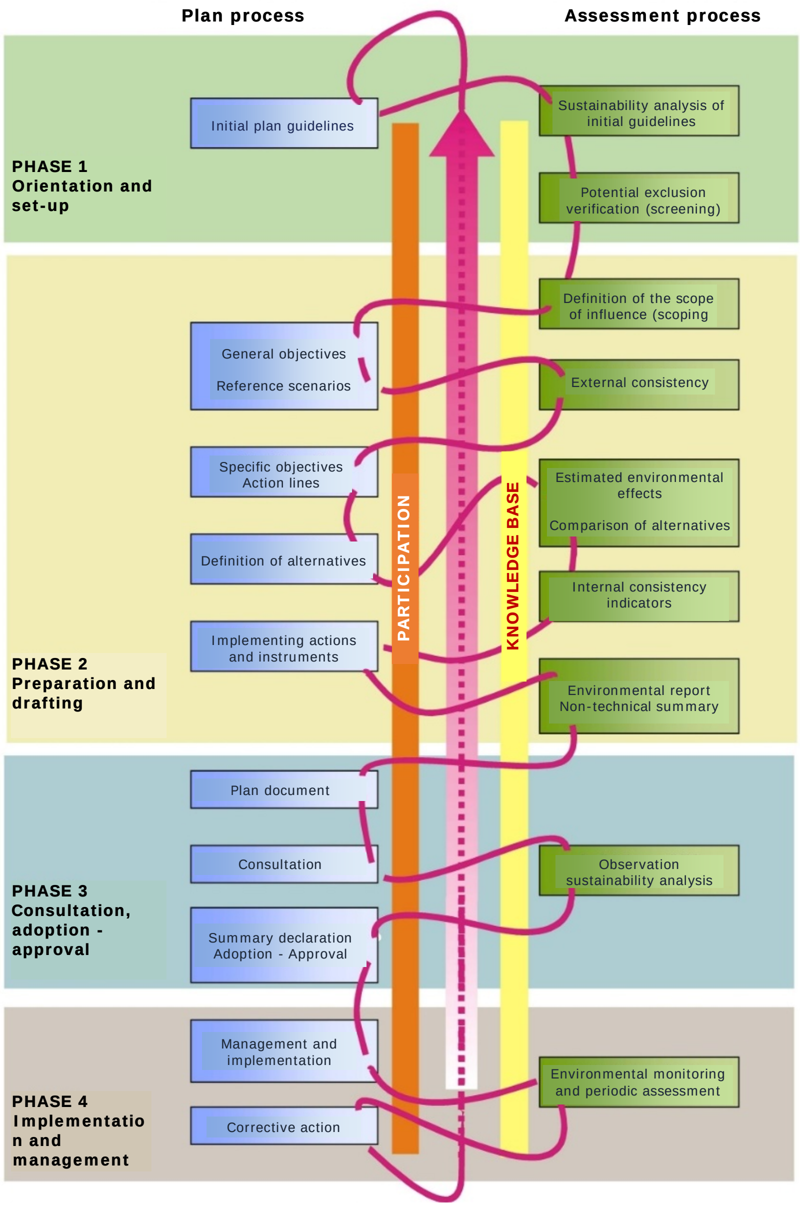
1.4 Description of the procedure for preparing the NP and the methods of integration between the planning and the environmental analysis

The process for preparing the National Programme is completely regulated by Art. 7 of Italian Legislative Decree no. 45/2014. This provision in particular establishes that:

- The NP shall be defined by Decree of the President of the Council of Ministers, on the proposal of the MED and the MEPLS, having consulted with the Minister of Health, the Unified Conference and the competent regulatory authority (paragraph 1)
- Once every 3 years, the NP is subjected to assessment by the MED and the MEPLS, having consulted with the competent regulatory authority. Following this assessment, where conditions are met, the NP must be updated by new Decree, in accordance with the procedure pursuant to paragraph 1 (paragraph 2)
- Having consulted with the competent regulatory authority, the MED and MEPLS send the European Commission the NP within 30 days of its approval and inform the Commission of any subsequent change (paragraph 3)
- The MEPLS and the MED ensure the necessary opportunities for effective public participation in the decision-making processes, concerning the management of spent nuclear fuel and radioactive waste, by means of the publication on its institutional websites of the structure of the NP. They also make sure that the public can express their observations in this regard and that these are duly considered in the drafting of the final text of the NP (paragraph 4).

The process of preparing the NP described, takes place parallel to the start-up of the SEA procedure, the aim of which will be to supplement and make the planning process of the NP coherent, directing it towards sustainability through the following phases (Figure 1.4-1):

- **Orientation and set-up**: preliminary analysis of the NP



1.4-1: Methodological structure of the SEA; Enplan project; 2004 Guidelines

- **Preparation and drafting**: definition of the area of influence of the NP (scoping); structuring of the general objectives; construction of the reference scenario; external coherence of the general objectives of the NP; identification of the alternatives to the NP; internal consistency of the relations between the objectives and action lines of the NP through the system of indicators representing them; estimation of the environmental effects of the alternatives to the NP; preparation of the environmental report
- **Consultation, adoption and approval**: the Competent Authority accompanies the adoption/approval process and collaborates in the assessment of the environmental impacts of the observations made
- **Implementation and management**: is also guaranteed through the identification of specific indicators, the verification of the effects on the environment in connection with pre-set objectives; the information necessary to assess the effects on the environment of the action implemented by the NP is supplied; the possibility is offered to promptly identify the corrective measures that may be necessary

The SEA procedure is essentially characterised by three elements:

1. Presence of activities that tend to be developed continuously throughout the procedure for the construction and approval of the NP: knowledge base and participation, the latter intended in the broadest sense to also include institutions, subjects with competences and/or specific knowledge as well as the public and its organisations.
2. Phase of implementation of the NP as an integral part of the planning process, in this sense accompanied by monitoring and the assessment of results.
3. Circular nature of the planning process, introduced through the monitoring of results and the possibility/need to revise the NP if said results should differ from the sustainability objectives that motivated the approval of the NP.

1.5 Time frame of the activities envisaged by the NP

1.5.1 Radioactive waste from the energy sector

Radioactive waste from the energy sector are those produced by the nuclear energy cycle plants (electronuclear plants and nuclear fuel cycle plants, temporary storage of spent fuel) during the operating phase, during their keeping safe and those that will be produced by the decommissioning of the installations themselves.

For nuclear plants assigned it, SOGIN S.p.A. has planned the dates on which the so-called “brown fields” will be achieved. This objective, which precedes that of the “green fields” (which in turn consists of the release of the site free from radiological restrictions), is achieved when in a nuclear site, all decommissioning operations have been concluded and all radioactive waste is conditioned and stored safely within specific temporary depots, ready for transfer to the NR.

Completion of the decommissioning of all Italian nuclear plants is connected with the development of the NR.

The temporary depots at each site, in fact - despite respecting the safety requirements laid down for the immediate term - cannot be considered as a final location for radioactive waste. Only a structure like the NR can, in fact, guarantee the disposal of low and intermediate level waste and the safe, long-term storage of high activity waste and irradiated fuel from the previous management of nuclear plants. Consequently, when the NR is available, a programme will be launched of gradual conferral of waste to said structure and, therefore, it will be possible to decommission the temporary depots and return the sites to the status of “green fields”, i.e. the condition free from radiological restrictions as above, which may enable the return of the spaces to the community for re-use.

1.5.2 Radioactive waste from the non-energy sector

The radioactive waste generated by medical, industrial and research applications are currently managed by operators authorised whilst awaiting their transfer to the National Repository.

As regards the research reactors, the national fuel policy on fuel is to return the spent fuel to the country of origin. The last significant delivery abroad of spent fuel took place in July 1999, when 140 fuel elements of TRIGA RC-1 were delivered to the United States of America Energy Department under the scope of the US policy for the repatriation of US-produced spent fuel.

Of Italian research reactors, the only ones holding spent fuel on the site are the TRIGA Mark II, located in the L.E.N.A. (Laboratory of Applied Nuclear Energy) of Pavia University and the TRIGA RC-1, located in the ENEA Casaccia Research Centre.

The Saluggia EUREX and Trisaia (MT) ITRIC plants of the former ENEA, the Plutonium and OPEC plants at the Casaccia Centre (Rome), the Avogadro Depot of Saluggia (VC) of the Deposito Avogadro S.p.A. and the installations of the Ispra (VA) Research Centre of the European Commission, which are no longer operative, will be subject to the respective decommissioning programmes.

For the Italian research reactor, regular revision, every 5 years, is envisaged, but mainly seeks to monitor them with analyses carried out on a case-by-case basis.

1.5.3 Spent fuel

Current strategic guidelines on the management of spent fuel, issued by the Ministry (Decree by the Ministry of Production of 02 December 2004 an Directive by the Ministry of Production 28 March 2006), envisage the sending abroad for reprocessing of spent fuel, the transfer to third parties of uranium and plutonium and the return to Italy of radioactive waste (Directive by the Ministry of Economic Development of 10 August 2009 and the Inter-Governmental Agreement between Italy and France of Lucca of November 2006), duly conditioned and packaged, in a length of time that is coherent with the availability of the National Repository.

The spent fuel that has not been assigned for reprocessing will be packaged into specific screening containers (casks) for transport and storage and will be subsequently transported to the NR in line with the planning to be specifically agreed with said NR.

1.5.4 Siting, construction and operation of the National Repository

The siting procedure of the NR through to issue of the Single Authorisation ("AU") is defined in Italian Legislative Decree no. 31/2010 as subsequently amended and supplemented, which also specifies the terms envisaged for most of the procedural steps.

Figure 1.5-1 summarises the siting and development process of the NR in accordance with Italian Legislative Decree no. 31/2010 as subsequently amended and supplemented, in the event of receiving a "letter of intent" from the Regional and local entities to investigate further with a view to potentially hosting the infrastructure.

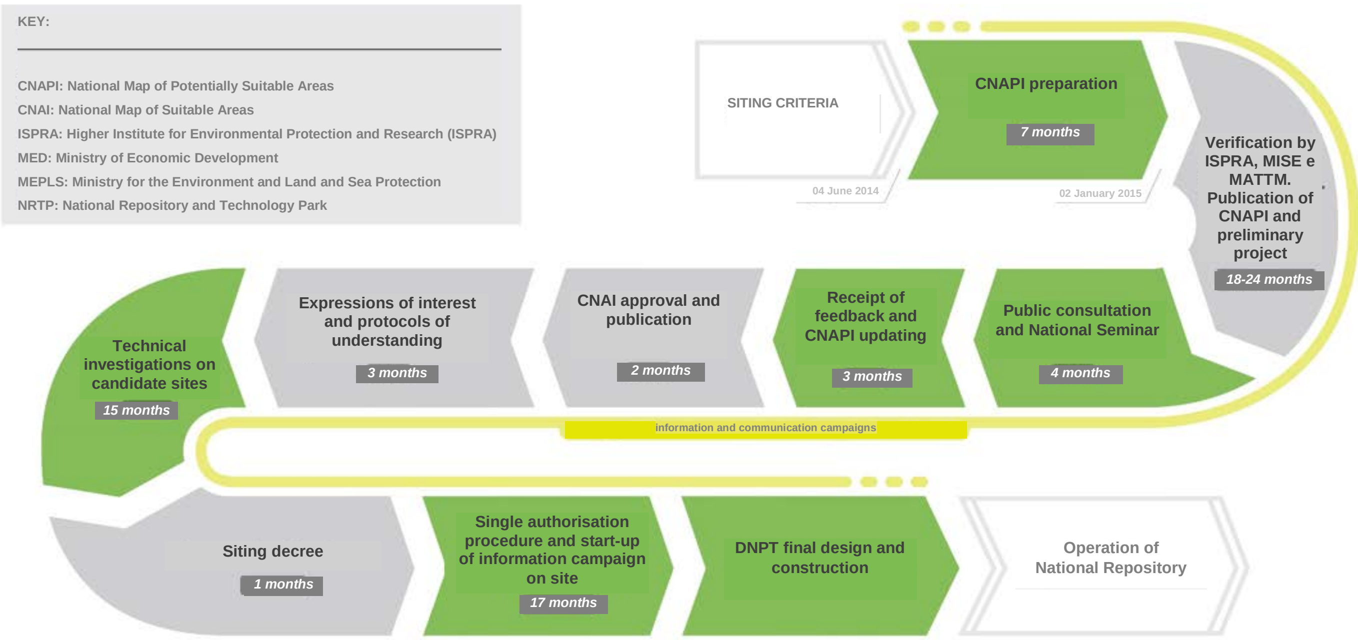


Figure 1.5-1: Siting and development process of the National Repository deriving from legal terms in the hypothesis of receiving at least once letter of intent

The ISPRA Technical Guide no. 29, prepared on the basis of technical standards and recommendations issued by national and international organisations and, in particular, by the IAEA, details the siting process, dividing it up into three main phases, which, if compared with the procedure defined by Italian Legislative Decree no. 31/2010 as subsequently amended and supplemented, can be summarised as follows:

- Phase 1 - under the scope of which, starting from a set of data that is immediately available and has been collected from national territory, the siting criteria are applied, thereby identifying a set of “potentially suitable” areas (“CNAPI”);
- Phase 2 - under the scope of which sites are chosen from within the “potentially suitable” areas in which an understanding has been reached with the local entities concerned, wherein to carry out more in-depth studies;
- Phase 3 - aiming to technically characterise one or more sites in detail. More specifically, the term “detailed technical characterisation” is used to refer to a set of investigations and studies aimed at determining the way the chosen site or sites will respond in the long-term; according to the technical characterisation, a site may be chosen where the NR can be developed and, consequently, the technical documentation can be prepared to be attached to the application for the issue of authorisation to develop the structure of the NR itself, in accordance with the methods set out by current legislation.

Figure 1.5-2 summarises and compares the phases for the siting of the area intended to host the NR envisaged by national and international guidelines, by ISPRA Technical Guideline no. 29, and by Italian legislation.

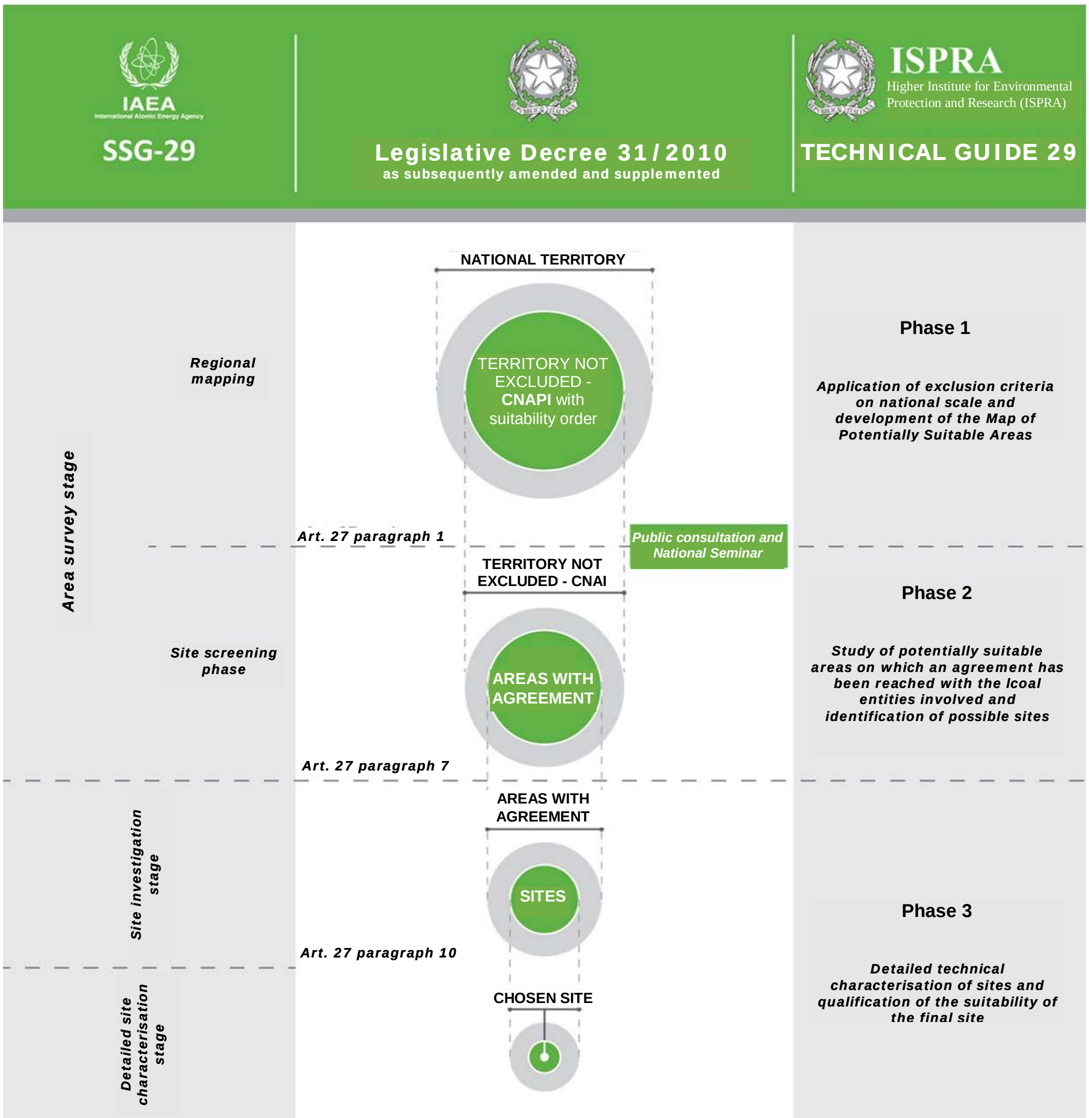


Figure 1.5-2: Siting procedures adopted internationally (IAEA SSG-29) and nationally, compared

At present, Italy is at the end of Phase 1 (Fig. 1.5-2), waiting for the competent Ministries (MED and MEPLS) to complete their respective investigations and give clearance to the publication of the CNAPI, thereby starting the public consultation and subsequent and consequent phases (Fig. 1.5.1).

1.6 Financial resources involved in the implementation of the NP

Annex 1 shows the financial resources involved in the implementation of the National Programme.

1.7 Summary of the participation process to be applied to the NP

In compliance with the Århus Convention incorporated with Italian Law no. 108/2001, which guarantees the right of participation of citizens in public environmental choices, also standardised by the provisions of Art. 7, paragraph 4 of Italian Legislative Decree no. 45/2014, the NP considers al observations submitted within the limits of the law, as established by the reference legislation.

Under the scope of the SEA procedure, the environmental authorities (EAs) took part in the decision-making processes relating to the procedure in question by submitting their observations on the NP to the competent administrations (in this respect, see the table below, which provides a summary of the observations received).

1.8 Summary of the observations received, list of EAs involved and description of how the observations are integrated into the NP

Observation submitted by		Acquisition protocol	Considerations on the observations received
1	MCCHT - Regional secretariat of the Ministry and of cultural and tourism activities for Tuscany	DVA-9853 12-04-2016	The observation contains no indications to be incorporated into the preparation of the Environmental Report
2	MEPLS - Directorate General for Sustainable Development, Environmental Damages and Relations with the European Union and International Organisations	DVA-11198 26-04-2016	The observation contains no indications to be incorporated into the preparation of the Environmental Report
3	Umbria Regional Council	RIN-6312 29-04-2016	The observation contains no indications to be incorporated into the preparation of the Environmental Report
4	River Adige Basin Authority	RIN-6495 03-05-2016	The observation contains no indications to be incorporated into the preparation of the Environmental Report
5	Regional Park – Entity of Migliarino San Rossore Massaciuccoli	RIN-6592 04-05-2016	The observation contains no indications to be incorporated into the preparation of the Environmental Report
6	Reno Basin Authority	RIN-6976 10-05-2016	The observation does not highlight any important elements apart from just some indications on the context indicators (on the matters of "WATER" and "SOIL USE") described in the PR. To this end, please note that following further investigations and assessments carried out in chapter 7 of the RE, the selection of context indicators (for a complete description of which, reference is made to chapters 7 and 10) has been updated, considering the environmental components involved, directly and indirectly and the potential environmental effects determined by the actions of the NP.
7	River Po Basin Authority	RIN-7118 11-05-2016	• As regards the inclusion of the *detailed assessment of the potential effects deriving from anthropic causes or natural phenomenon impacting the plants and sites*, it is important to justify the fact of not including said assessment in the ER, arguing that the activities relevant to nuclear safety and radioprotection are carried out, for decommissioned plants, according to decommissioning projects that consider the very best international standards in this respect and in the management of radioactive waste, and, in particular, the criteria laid down by the Western European Nuclear Regulators Associations (WENRA) , to be submitted for approval of the ISIN before activities are carried out. The radiological impact of the operations on the

Observation submitted by		Acquisition protocol	Considerations on the observations received
			population will respect, with the provisions established in the decrees authorising their decommissioning, the criteria of non radiological relevance during normal conduct and, in the event of an incident, will respect, with margins, the aim of radioprotection established as corresponding to the limit of the annual dose for the population (1 mSv). • As regards the need to assess the *resilience of the general objectives of the national policy developed through the programme examined in connection with the effects of climate change*, it should be recalled that the National Programme, in accordance with Art. 7, paragraph 2 of Italian Legislative Decree no. 45/2014, is updated regularly, having consulted with the ISIN, once every 3 years. At this time, the possibility may be duly assessed of adjusting the NP action lines to fit with scientific and technical progress and the recommendations, good practice and teachings taken from the international verifications *inter pares*, made available.
8	Tuscany ARPA (Regional Environmental Protection Agency)	RIN-7650 18-05-2016	• As regards the observation on the Pisa CISAM (Joint Force Centre for Military Application Studies), it should be recalled that 2011/70/Euratom applies to all phases of the management of radioactive waste, from generation to disposal, when the radioactive waste results from civilian activities (Art. 2, paragraph 1). Moreover, the NP does not envisage the possibility of storing "civilian" radioactive waste in the depot currently present at the Centre managed by the Defence Administration. Therefore, the ER and the NP do not consider any CISAM plant for the management or storage of radioactive waste. • As regards the requests for clarification relative to the state of proceedings on the siting of the National Repository, reference is made to paragraphs 1.5.4 and 5.3. • The NP and the national policy will be set out in a single document, whilst for the time frame identified for the implementation of the activities envisaged by the NP, reference is made to paragraph 1.5. • Use of the sources pursuant to Italian Legislative Decree no. 52 of 06 February 2007, is classified into two categories: A (clearance by the MED) and B (clearance by the Regional Council for medical purposes or the Prefect for other purposes). The holder is required to stipulate a written agreement with the Integrated Service Manager (ENEA) or with the National Operator (Sogin SpA), which covers the long-term storage and disposal at a final depot, or alternatively is required to stipulate a written agreement for the return to the

Observation submitted by		Acquisition protocol	Considerations on the observations received
			manufacturer of the source no longer use. • The observation asks that the context indicators be integrated "*with data sources relative to all geographic areas involved by the objectives and actions of the National Programme, not merely those relative to the places where there are already temporary radioactive waste depots and plants"*. As specified under chapter 5 "Scoping of the area of potential influence of the NP", the environmental effects that can be assessed, from a conventional and radiological viewpoint, relate to a circumscribed area around the current processing and storage sites relating to the energy and non-energy sector. There is therefore no need to follow-up on the indication given in the observation. • As regards the environmental sustainability objectives, it is specified that the radiological impact of the actions of the NP will respect, with the provisions established in the decrees authorising their decommissioning, the criteria of non radiological relevance during normal conduct and, in the event of an incident, will respect, with margins, the aim of radioprotection established as corresponding to the limit of the annual dose for the population (1 mSv).
9	River Tevere Basin Authority	RIN-7660 19-05-2016	• As regards point 1) of the observation, it is clarified that, outside the National Repository, for which reference is made to paragraph 5.3, the NP does not envisage the development of any radioactive waste or spent storage or processing plants outside existing ones, for both the energy and non-energy sector. • For a verification of external coherence with the basin planning, reference is made to chapter 3.23. • The indications given under points 5, 6 and 7 have been incorporated into the ER
10	Lombardy ARPA	RIN-7717 19-05-2016	The observation contains no indications to be incorporated into the preparation of the Environmental Report
11	Autonomous Region of Friuli Venezia Giulia	RIN-7727 19-05-2016	• In relation to that requested by the Landscape and Biodiversity Service, it is highlighted that the NP does not envisage the development of any radioactive waste or spent storage or processing plants outside existing ones. For the clarifications requested regarding the routes undertaken for the transfer of spent fuel abroad, reference is made to chapter 5.2. Finally, please note that the ER has analysed the entire safe management cycle of radioactive waste, also analysing any non site-specific impacts of the NR, the only national structure dedicated to the disposal of low and medium activity waste. • As regards that requested by the Geological Service concerning nuclear transport that may involve the

Observation submitted by		Acquisition protocol	Considerations on the observations received
			regional territory, please note that said transport envisages the issue of preventive authorisation by the MED (Art. 5, Chapter III, Italian Law no. 1860/62; Art. 21 Italian Legislative Decree 230/95; MED Circular no. 244 of 26 May 1997; MED Directorate Decree of 12 October 2011; MED Ministerial Decree of 03 March 1978), which are considered as sufficiently cautious, also in terms of the potential environmental impact. On this point, reference is made to paragraph 5.2
12	Metropolitan City of Naples	RIN-7751 20-05-2016	The observation contains no indications to be incorporated into the preparation of the Environmental Report
13	Provincial Authority of Cuneo	RIN-7771 20-05-2016	As regards the verification of compatibility with the planning and regulatory framework of the Region of Piedmont, reference is made to paragraph 3.2.3
14	ISPRA-Environment	RIN-7794 23-05-2016	The requests for change and/or investigation contained in the observation were accepted by the ER, apart from the following: <u>General observations:</u> 4. the reference environmental matters, considered relevant for the implementation of the NP, are not included in those indicated (see chapter 5). 5. construction of the reference scenario (see chapter 8) 7. definition of specific environmental objectives of the NP 8. limited to the definition of preliminary estimates of traffic brought about by the actions of the NP (see paragraph 5.2)
15	Autonomous Province of Trento	RIN-7773 23-05-2016	• As regards the "*comparison of possible alternative sites of the NR*", please note that this will not be assessed in the ER, as to date the CNAPI has not been published, which is the first step in the complex process of siting the NR, duly defined by Italian Legislative Decree no. 31/2010. The analysis of possible alternative and the repercussions in terms of the health of the population, will be carried out during the EIA (in accordance with Italian Legislative Decree no. 31/2010 and Italian Legislative Decree no. 152/2006 as subsequently amended and supplemented). Moreover, as prescribed by TG 29, the operation of the NR, in normal conditions, will guarantee respect of criteria of non radiological relevance established in national legislation, thereby excluding any repercussions on the health of the population. • As regards the impact of the transport of radioactive materials, reference is made to chapter 5.2, whilst that linked to the future conferral of conditioned waste to the NR may be fully investigated only during EIA, as to date there is no knowledge of the definitive siting of the disposal infrastructure.

Observation submitted by		Acquisition protocol	Considerations on the observations received
16	Basilicata Region Basin Authority	RIN-7776 23-05-2016	For a definition of the area of potential influence of the strategies and actions identified by the NP, reference is made to chapter 5, whilst for a timely definition of the monitoring indicators, to chapter 7
17	Basin Authority - Pilot basin of the River Serchio	RIN-7782 23-05-2016	For a definition of the area of potential influence of the strategies and actions identified by the NP, reference is made to chapter 5 As regards the requests for clarification relative to the state of proceedings on the siting of the National Repository, reference is made to paragraphs 1.5.4 and 5.3.
18	Marche Region Basin Authority	RIN-7761 23-05-2016	The observation contains no indications to be incorporated into the preparation of the Environmental Report
19	Autonomous Region of Valle d'Aosta	RIN-7855 23-05-2016	The observation contains no indications to be incorporated into the preparation of the Environmental Report
20	Provincial Authority of Ragusa	RIN-7846 23-05-2016	The observation contains no indications to be incorporated into the preparation of the Environmental Report
21	Valle d'Aosta ARPA	RIN-7807 23-05-2016	The observation contains no indications to be incorporated into the preparation of the Environmental Report
22	Apulia Region Basin Authority	RIN-7919 24-05-2016	The observation contains no indications to be incorporated into the preparation of the Environmental Report
23	Umbria ARPA	RIN-7969 24-05-2016	As regards the timing for the implementation of the actions of the NP (time for the return of fuel; placing in the final depot of materials currently deposited at the sites indicated in the PR), reference is made to chapter 1.5 As regards the management strategies for disposal in a geological formation of high level waste, reference is made to chapter 3.3.4
24	Apulia ARPA	DVA-13444 19-05-2016	As regards the greater detail requested in relation to the seismic risk and the description of the demographic profile of the resident population under the scope of potential influence, reference is made to chapter 6 (for each individual plant analysed) For a description of the health of populations, with specific reference to tumour incidences and the effects on health correlated to the activities implemented in Italian nuclear sites, the study by the Istituto Superiore di Sanità (Italian Institute of Health) has been analysed, entitled *"Stato di salute della popolazione residente nei Comuni già sedi di impianti nucleari: Analisi della mortalità, stima dei casi attesi e rassegna degli altri studi epidemiologici"* (State of health of the resident population in the municipalities already home to nuclear plants: analysis of mortality, estimate of cases forecast

Observation submitted by		Acquisition protocol	Considerations on the observations received
			and report of other epidemiological studies) (see paragraphs 5.1.1 and 7.4)
25	National Association of Italian Municipalities (ANCI)	DVA-13841 23-05-2016	• As regards the timing for the implementation of the actions of the NP, reference is made to chapter 1.5 • For a discussion of the criteria used for siting, reference is made to ISPRA Technical Guide no. 29, analysed in the ER under paragraphs 3.4 and 5.3 • The characteristics of present and future storage depots in the nuclear sites identified by the NP (action line A.5) are essentially different to those of a disposal plant. For this reason, the indications in GT 29 do not apply for provisional storage structures (see paragraph 4.3). • For the management of radioactive waste produced by reprocessing activities and the potential environmental disturbances caused by the operation of the CSA, reference is made to chapters 1.5.3 – 1.5.4 – 4.4.5 – 4.5.7 • As regards the proposal to include indications on the coordination with the emergency plans, so as to ensure correct information to the populations concerned about the potential risks, this aspect is not concerned by the NP. • Finally, as regards the public participation mechanisms, reference is made to chapters 1.7 and 10.4
26	Saluggia City Council through the ANCI	DVA-13742 20-05-2016	• The consultation phase on the PR was carried out in compliance with the provisions pursuant to Art. 13, paragraph 1 of Italian Legislative Decree no. 152/06 as subsequently amended and supplemented. • The adjustment of the temporary site depots to higher nuclear safety standards is prescribed by the Deactivation Decrees issued by the MED and assessed, in environmental terms, by different environmental assessment procedures carried out by the MEPLS. The expansion of storage capacity, where envisaged, was considered an essential condition by which to launch disposal activities, as it is functional to the safe management of radioactive waste produced by decommissioning. Finally, please note that the activities in question is fully coherent with the indications of the NP (see paragraph 5.3 of the NP). • The observations pursuant to point 3 have been incorporated in the ER.
27	Romagna Regional Basins Authority	RIN-7977 25-05-2016	The observation contains no indications to be incorporated into the preparation of the Environmental Report
28	Basin Authority of the Rivers Isonzo, Tagliamento, Livenza, Piave and Brenta-Bacchiglione	RIN-7982 25-05-2016	The study conducted by the ER excluded from the scope of influence potentially affected by the environmental fallout of the NP, the territory of competence of the Basins Authority of the Rivers Isonzo, Tagliamento, Livenza, Piave and Brenta-Bacchiglione

Observation submitted by		Acquisition protocol	Considerations on the observations received
29	Piedmont ARPA	RIN-8018 25-05-2016	The requests for change and/or investigation contained in the observation were accepted by the ER, apart from the following: - study of alternative plan scenarios, as the strategies of the NP are encoded by sources of legislation and government guidelines that do not envisage possible exceptions. - construction of the reference scenario (see chapter 8) - the definition of a context indicator linked to mobility, as the matter of transport is not included in the assessment conducted by the ER (see paragraph 5.2) - objective no. 9 “Research and development” will be pursued through intangible actions that, as such, have no direct effect on the state of the Environment. Consequently, no context indicator has been identified. - The ER has excluded any significant repercussions of the actions of the NP on the Biodiversity present in the area of potential influence of each site. However, a verification of relations between the actions of the NP and the Natura 2000 sites has in any case been deemed necessary
30	Metropolitan City of Turin	RIN-7972 25-05-2016	As regards the “movement of waste” and the request for clarifications with regards to the National Repository, reference is made to the indications given in paragraphs 5.2 and 5.3. Instead, as regards the observations relative to the provincial planning, it is specified that the scope of potential influence of the actions of the NP defined in the ER do not involve the territory of the Province of Turin
31	Marche Regional Council	DVA-13930 23-05-2016	The requests for change and/or investigation contained in the observation were accepted by the ER, apart from the following: - the assessment of the potential impacts connected with the transport of radioactive waste, as the matter is not covered by the assessment carried out by the ER (see paragraph 5.2) - specific monitoring provisions for Public Health (see paragraph 5.1.1) Finally, for the management of hospital radioactive waste, it is specified that this is and will be in compliance with Articles 4 and 5 of Italian Law no. 1860 of 1962, Article 21 and Articles 27 to 31 of Italian Legislative Decree no. 230 of 17 March 1995. This waste must be conferred to a subject in possession of the authorisation

Observation submitted by		Acquisition protocol	Considerations on the observations received
			to collect and deposit it, in accordance with Articles 30, 31, 32 and 33 of said Italian Legislative Decree no. 230/95. Use of the sources pursuant to Italian Legislative Decree no. 52 of 06 February 2007, is classified into two categories: A (clearance by the MED) and B (clearance by the Regional Council for medical purposes or the Prefect for other purposes). The holder is required to stipulate a written agreement with the Integrated Service Manager (ENEA) or with the National Operator (Sogin SpA), which covers the long-term storage and disposal at a final depot, or alternatively is required to stipulate a written agreement for the return to the manufacturer of the source no longer use.
32	Abruzzo ARTA (Regional Environmental Protection Agency)	RIN-8062 25-05-2016	The requests for change and/or investigation contained in the observation were accepted by the ER
33	Apulia Regional Council	DVA-0014325 26-05-2016	As regards the impact of the transport of radioactive materials, reference is made to chapter 5.2, whilst for the definition of strategic alternatives to the development of the National Repository, it is specified that the unique nature of this infrastructure is sanctioned by Italian Legislative Decree no. 31/10 and no type alternatives are envisaged for the disposal of radioactive waste. As regards the criterion of proximity, it is specified that at present, the NP does not envisage the development of any new storage infrastructures, outside the industrial scopes managed by Sogin. Finally, the ER has excluded any significant repercussions of the actions of the NP on the Biodiversity present in the area of potential influence of each site. However, a verification of relations between the actions of the NP and the Natura 2000 sites has in any case been deemed necessary
34	Friuli Venezia Giulia ARPA	RIN-8263 27-05-2016	Below is the state of incorporation of the indications given in the document: Objectives and actions: the observations have been noted by the ER Environmental effects: on the basis of the level of technical investigation to date contained in the NP, the ER has not highlighted any need for action to mitigate the impacts generated by the implementation of the action lines analysed. Alternatives: the ER has not been able to submit the "*results of the proposal of suitable areas (CNAPI) and of the comparison drawn with the criteria pursuant to ISPRA Technical Guide no. 29*", insofar as to date, the competent Ministries have not yet issued clearance for publication of the CNAPI. Monitoring: the observations have been noted by the ER

Observation submitted by		Acquisition protocol	Considerations on the observations received
35	Veneto Regional Council	RIN-8348 30-05-2016	The requests for change and/or investigation contained in the observation were accepted by the ER
36	Piedmont Regional Council	RIN-8393 30-05-2016	The requests for change and/or investigation contained in the observation were accepted by the ER. More specifically: - as regards the potential impacts on agricultural, zootechnical, fish farming, quality of water resources and flora and fauna ecosystems, reference is made to the paragraphs from 7.1 to 7.4; - the ER has excluded any significant repercussions of the actions of the NP on the Biodiversity present in the area of potential influence of each site. However, a verification of relations between the actions of the NP and the Natura 2000 sites has in any case been deemed necessary Finally, we would recall the responses already provided to Piedmont ARPA and refer to the considerations
37	Provincial Authority of Ancona	RIN-8464 31-05-2016	The requests for investigation relative to the Monitoring Plan contained in the observation were accepted by the ER.
38	Umbria Regional Council	RIN-8465 31-05-2016	The action strategies today included in the NP do not affect the territory of the Region of Umbria. Thus the regional databases cited in the observation have not been considered by the ER analyses (see chapter 6)
39	Tuscany Regional Council	RIN-8568 01-06-2016	Below is the state of incorporation of the indications given in the document: no. 1: the indication has been incorporated into the ER no. 2: points b) and g) have been incorporated into the ER (see 1.5 and 10), whilst for points c), reference is made to the NP no. 3: reference is made to the NP no. 4: nuclear transport that may involve the regional territory, please note that said transport envisages the issue of preventive authorisation by the MED (Art. 5, Chapter III, Italian Law no. 1860/62; Art. 21 Italian Legislative Decree 230/95; MED Circular no. 244 of 26 May 1997; MED Directorate Decree of 12 October 2011; MED Ministerial Decree of 03 March 1978), which are considered as sufficiently cautious, also in terms of the potential environmental impact. On this point, reference is made to paragraph 5.2 no. 5: the indication has been incorporated into the ER (see 6) no. 6: reference is made to the responses provided on the opinion of ARPAT no. 8: the indication has been incorporated into the ER no. 9: the siting of new plants, it is specified that, at present, the NP does not envisage the development of

Observation submitted by		Acquisition protocol	Considerations on the observations received
			new storage or processing infrastructures outside the industrial scopes managed by SOGIN (clearly with the exception of the NR, whose site is not yet final). no. 10: the requests for clarification relative to the state of proceedings on the siting of the National Repository, reference is made to paragraphs 1.5.4 and 5.3. no. 11-12: the indication has been incorporated into the ER no. 13: the ER does not analyse alternatives to the action strategies indicated in the NP, as they are encoded by sources of legislation and government guidelines that do not envisage possible exceptions. no. 14: the indication has been incorporated into the ER
40	Emilia Romagna Regional Council	RIN-8590 01-06-2016	The requests for change and/or investigation contained in the observation were accepted by the ER, apart from the following: - study of alternative plan scenarios, as the strategies of the NP are encoded by sources of legislation and government guidelines that do not envisage possible exceptions The ER has not highlighted any need for action to mitigate the impacts generated by the implementation of the action lines analysed. The ER does not contain information about the siting of the NR insofar as to date, the competent Ministries have not yet issued the clearance for publication of the CNAPI. NORM are not classified as radioactive waste in accordance with Art. 2, paragraph 5 of Ministerial Decree of 07 August 2015 and are therefore not included in the National Programme
41	Emilia Romagna ARPA	RIN-8742 06-06-2016	The responses already provided to Emilia Romagna Regional Council are recalled. NORM are not classified as radioactive waste in accordance with Art. 2, paragraph 5 of Ministerial Decree of 07 August 2015 and are therefore not included in the National Programme.
42	Molise Regional Council	RIN-8766 06-06-2016	The contents of the observation have not been incorporated by the ER insofar as the level of technical-project detail of the actions described in the NP does not support this detail, which will instead be correctly assessed under the scope of the construction practices prior to the development of new plants (see paragraph 7.3). Therefore, in the ER, the seismic assessment has been limited to the classification of areas coming under the scope of potential influence.

The following observations were also received beyond the terms envisaged for the scoping procedure

Observation submitted by		Acquisition protocol	Considerations on the observations received
1	Lombardy Regional Council	DVA-15485 10-06-2016	For comments on this observation, see also point 10 of the table above. (observation of Lombardy ARPA prot. RIN-7717 of 19-05-2016). As regard the other observations made, the following is noted: • in relation to the "duration of the National Programme", it is specified that, as envisaged by Art. 7, paragraph 2 of Italian Legislative Decree no. 45/2014, the National Programme is subject to assessment for potential update every 3 years; • the siting procedure of the National Repository is not covered by the National Programme and the criteria for the siting of the areas potentially suitable have already been specified in GT 29, which is subject to international review; The requests for change and/or investigation contained in the observation were accepted by the ER with the exception of those relating to the agricultural food heritage and soil consumption indicators, for which the study has shown there are no appreciable impacts except in connection with the siting and development of the National Repository, and said activity is not investigated by the ER
2	Metropolitan City of Venice	RIN-9571 21-06-2016	The requests for change and/or investigation contained in the observation were accepted by the ER
3	Lecce ASL (Local Health Authority)	RIN-9980 30-06-2016	Observation not pertinent insofar as it regards the siting procedure of the National Repository, not covered by the National Programme.
4	Regional Park – Entity of Migliarino San Rossore Massaciuccoli	RIN-10454 11-07-2016	The definition of the National Programme stems from Directive 2011/70/Euratom, which applies to all phases of the management of spent fuel, when deriving from civilian activities and of the management of radioactive waste, from generation to disposal, when the radioactive waste results from civilian activities, as envisaged by Art. 2, paragraph 1. Therefore, the CISAM nuclear plant is not considered.
5	Ministry of Cultural Heritage and Cultural and Tourism Activities	DVA-19394 25-07-2016	The requests for change and/or investigation contained in the observation were accepted by the ER
6	Veneto Regional Council	RIN-12965 06-09-2016	Same note already received and reference as protocol RIN-8348 of 30-05-2016.

2 Identification of the territorial scope of the NP

The figure below shows the main producers/holders of radioactive waste of civilian origin today present on national territory.

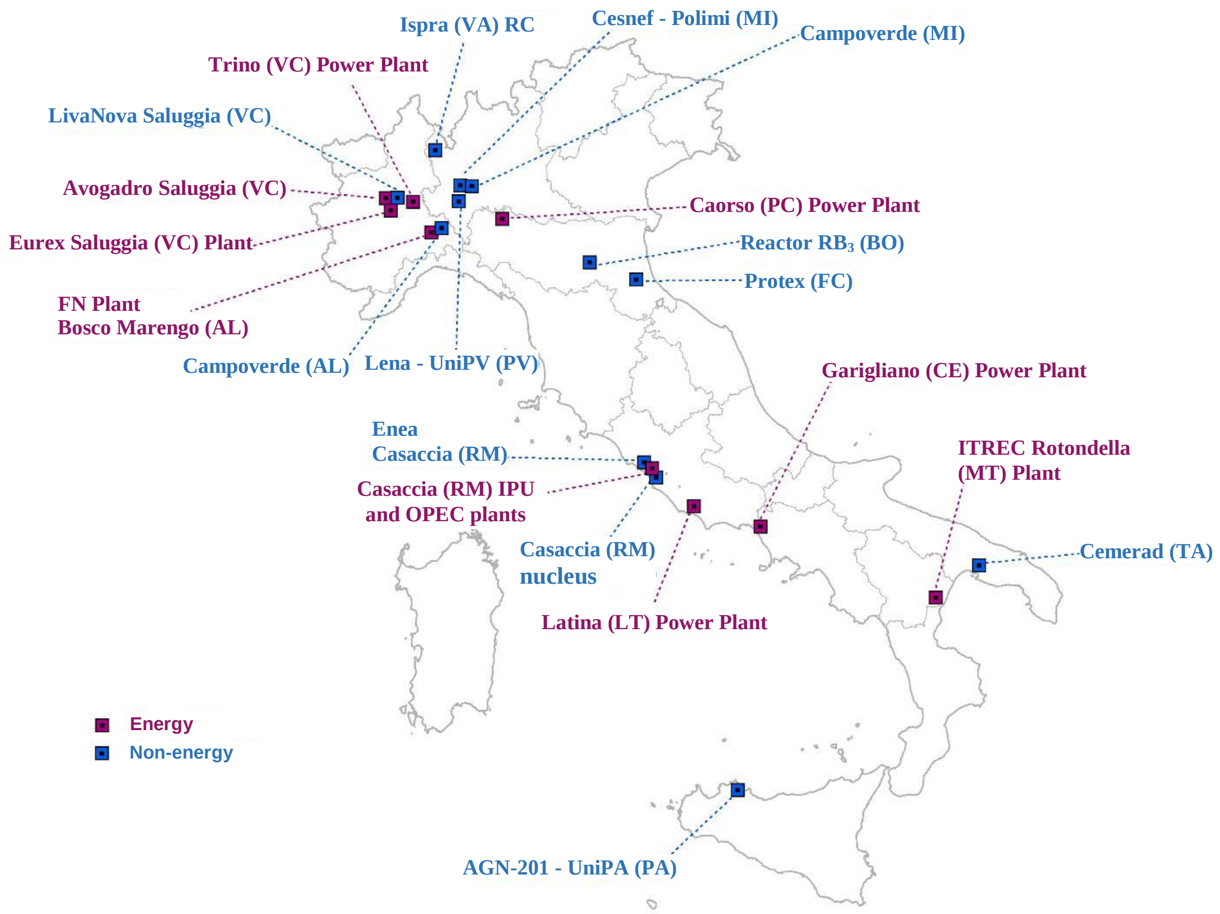


Figure 2-1: Main producers/holders of radioactive waste of civilian origin today present on national territory.

2.1 Energy segment

Origin Radioactive waste	Producers/Holders	Municipalities concerned
Energy	SOGIN Deposito Avogadro	Trino, Caorso, Latina, Sessa Aurunca, Saluggia, Bosco Marengo, Rome, Rotondella

2.1.1 Nuclear power plants

Trino nuclear power plant - Trino (VC)

The Trino nuclear power plant (Fig. 2.1-1), with power of 270 MWe, was designed and developed in the early 1960s by a consortium of Italian companies led by Edison. With a pressurised water type reactor (PWR), it was commissioned in October 1964 and produced 26 TWh electricity. In March 1987, at the end of the ninth cycle, the reactor was stopped to carry out the operations envisaged for the refilling of the core and the completion of seismic requalification activities. The Plant was thereafter not started up again due to political guidelines regarding the pursuit of the operation of nuclear plants in Italy.

Figure 2.1-1: Trino nuclear power plant

In 1999, plant ownership was transferred to SOGIN to be decommissioned in a single stage, as per the strategic indications of the Government.

To date, decommissioning of the secondary circuit is complete and the non-contaminated parts of the plant, demolishing the emergency systems, the diesel buildings and the cooling towers. The primary system was also decontaminated and all dangerous insulation containing asbestos, removed. The container ventilation system was decommissioned and replaced with one suitable for decommissioning and, thanks to the authorisation for global decommissioning received in 2012 and completion in 2015 of the removal of the nuclear fuel, the decommissioning project of the primary system was launched.

The activities that started in 2015 involving sorting, sampling, characterisation and supercompaction, for the repackaging of previous waste, are currently in progress.

Forthcoming activities, of which some have already been started, include the adjustment of the temporary depots already existing on the site and the management and packaging of spent ion exchange resins produced during operation and decontamination of the steam generators, the development of an experimental treatment plant based on wet oxidation technology (WOT) and a cementing plant called SiCoMoR (Modular packaging system for radioactive waste) for the packaging of residues produced by the treatment process. Under this scope, the old gaseous waste treatment system has been decommissioned and the unnecessary electrical systems removed in order to adjust the existing premises, in which the new treatment plant will be installed, and tests were started in the pilot plant installed at the Bosco Marengo site.

Finally, the decommissioning materials management structures are currently being designed (Materials Management Station - MMS and cementing).

Caorso nuclear power plant - Caorso (PC)

The Caorso nuclear power plant (Fig. 2.1-2) is the largest in all Italy, with a power of 870 MWe. It was designed and built in the 1970s by ENEL and Ansaldo Meccanica Nucleare and commissioned in May 1978; it has been in commercial service since December 1981 and has produced 29 TWh of electricity.

In 1999, the plant was taken over by SOGIN to be decommissioned.

Figure 2.1-2: Caorso nuclear power plant

To date, the irradiated nuclear fuel has been sent for reprocessing and decommissioning is complete of the external infrastructures, the nuclear island and the auxiliary systems (off-gas system, RHR towers, decommissioning of systems and components of the turbine Building).

In 2014, authorisation was obtained for global decommissioning, on the condition that by way of priority for the decommissioning of the reactor, adjustment of the waste treatment systems must be completed and of the temporary depots, for the management and custody of radioactive waste. The adjustment of the depots is, in turn, subject to the removal of the resins (used to purify the plant process fluids) from the previous operation.

More specifically, as regards the management of spent ion exchange resins, in June 2015 the contract was stipulated with the temporary consortium Javys-Ansaldo NewClear Consortium for the recovery, transport, treatment (incineration) and packaging at a plant of said resins in Slovakia, as no such plant is available in Italy. The conditioned resins, together with the sludge residues deriving from the treatment, will be returned to the Caorso site. At present, incineration tests are in progress at said treatment plant, aimed at defining the process parameters so as to obtain residues with suitable chemical-physical characteristics.

The forthcoming activities for development regard the adjustment of the Turbine Building to a "buffer area" and Waste Processing Station.

Moreover, after acquiring the authorisations of the relative Detailed Projects/Operative plan, the procedures of which are currently in progress, the adjustment will be pursued of the temporary depots already present on site, the works prior to the decommissioning of systems and components in the Reactor Building, such as the development of a materials route between the Reactor Building and the Turbine Building (a "waste route") and the installation of the Supercompaction and cementing station.

Latina nuclear power plant - Borgo Sabotino (LT)

The Latina nuclear power plant (Fig. 2.1-3), with a power of 210 Mwe, which was then reduced to 160 MWe, was designed and build in the late 1950s by ENI, was commissioned in May 1963 and has produced 26 TWh of electricity. The GCR-Magnox type reactor belongs to the first generation of English gas-cooled graphite-moderated nuclear plants. It was shut down in September 1986.

In 1999, the plant was taken over by SOGIN to be decommissioned.

All the spent fuel was sent for reprocessing during the plant operation and has been reprocessed.

The Latina site has completed decommissioning of the external infrastructures of the nuclear island and auxiliary systems (Turbines Building, former Diesel Room and Blowers Room).

Authorisation has not yet been obtained for global decommissioning and, therefore, only limited decommissioning activities have been possible, with specific authorisations specified below.

ACTIVITY	**DEED OF APPROVAL IN ACCORDANCE WITH ART. 6 OF ITALIAN LAW NO. 1860/1962**
REMOVAL OF PRIMARY CIRCUIT PIPES REMOVAL	ANPA no. 8774 of 19/04/2001
REMOVAL AND PACKAGING OF RADIOACTIVE SLUDGE FROM THE LATINA POWER PLANT	APAT-LATINA-02/2003 (Prot. APAT no. 17529 of 31/07/2003)
CONSTRUCTION OF A TEMPORARY DEPOT FOR CATEGORY TWO RADIOACTIVE WASTE	IRPA-RIS-LATINA-02-08 (Prot. IRPA no. 27970 of 07/08/2008)
DEMOLITION OF THE TURBINES BUILDING	Prot. ISPRA no. 30131 of 10/08/2012
RECLAMATION AND DECONTAMINATION OF THE NUCLEAR FUEL POOL	MED authorisation of application Art. 148 of Italian Legislative Decree no. 230/95 as subsequently amended and supplemented with prot. no. 18322 of 18/09/2012 Authorisation of the operative plan (phase 1), doc. ISPRA-RIS/AA/2014/04/LATINA, with prot. ISPRA no. 33606 of 19/08/2014
DEVELOPMENT OF A MATERIALS PROCESSING STATION	MED authorisation of application Art. 148 of Italian Legislative Decree no. 230/95 as subsequently amended and supplemented with prot. no. 24928 of 19/12/2012
REMOVAL OF CLADDING FROM THE BLOWERS	MED authorisation of application Art. 148 of Italian Legislative Decree no. 230/95 as subsequently amended and supplemented with prot. no. 18322 of

	18/09/2012
REMOVAL OF BONNA TUBES	Authorised by ISPRA as a plant amendment on 28/04/2014 prot. ISPRA 17609.
DEMOLITION OF THE "CIVILIAN" BUILDING	MED CLEARANCE with prot. no. 17355 of 18/09/2014
DEVELOPMENT OF THE ITEA (ACTIVE EFFLUENT PROCESSING PLANT)	MED authorisation of application Art. 148 of Italian Legislative Decree no. 230/95 as subsequently amended and supplemented with prot. no. 21462 of 16/09/2015

To date, the Temporary depot for radioactive waste has been developed and should shortly start being loaded with previous waste. The solid and liquid radioactive residue processing plant (LECO plant) is currently being completed, relative to fuel management.

Figure 2.1-3: Latina nuclear power plant

Moreover, following the acquisition of the authorisations of the related Detailed Projects/Operative plans whose procedures are currently in progress, the following activities can be completed: decontamination of the fuel pool; demolition of the blower bodies and the start of works developing a structure for the processing of materials coming from the decommissioning of the reactor (including the boilers); repackaging works of the rock wool from the primary circuit and the start of works to remove the KCFC filters, as well as the start of works on the development of the ITEA active effluent processing plant and supercompaction of previous solid waste.

Garigliano nuclear power plant - Sessa Aurunca (CE)

The Garigliano nuclear power plant (Fig. 2.1-4), with power of 160 MWe, was designed and built in the early 1960s by the company Elettronucleare Nazionale and was commissioned in April 1963; it has produced 12.5 TWh of electricity. The BWR type reactor belongs to the first generation of nuclear power plants and in 1982, it was definitively deactivated and put under "passive protective custody".

In 1999, the plant was taken over by SOGIN to be decommissioned.

At the Garigliano site, given that authorisation was obtained in 2012 for global decommissioning, it was possible to start considerable activities functional to the decommissioning of the plant, such as: the development and/or adjustment of temporary depots of radioactive waste (Depot D1 and adjustment of the former Diesel building); the completion of the reclamation of two low level radioactive waste decommissioning trenches (the conclusion of the activities for the reclamation of the third and final trench is envisaged within the next three years); start-up of the demolition of the systems and components of the Turbine Building; the reactivation of the service systems of the Reactor Building at the end of its decommissioning and those relative to the development of the new processing and release system of the aqueous liquid effluents in lieu of the old plant that is now obsolete.

Figure 2.1-4: Garigliano nuclear power plant

As regards the route for the expulsion of gaseous effluents, the decontamination phase has been completed with scarifying, prior to demolition, set to take place over the next few months.

The forthcoming developments instead regard the completion of the following works: restructuring and commissioning of the new “Hot workshop” in order to be able to continue the processing of solid waste (sanding), reclamation of asbestos present in the ventilation channels of the Turbine Building, adjustment of the former Compaction building to a temporary depot for radioactive waste; development of the new water procurement system, elimination of the existing water tower and supercompaction of previous solid waste.

Finally, activities are underway with a view to sending to the foundry, at a foreign plant, for smelting, materials deriving from the decommissioning of the Vapour Cycle in the Turbine Building.

2.1.2 Plants linked to the nuclear fuel cycle

Bosco Marengo nuclear fuel fabrication plant - Bosco Marengo (AL)

The plant (Fig. 2.1-5) was developed in the early 1970s by Ansaldo Meccanica Nucleare and General Electric, started operating in 1973 and produced fuel elements with maximum enrichment of 5% for nuclear power plants in Italy and abroad. Production was suspended in 1987 following the nuclear referendum.

Figure 2.1-5: Bosco Marengo FN plant

In 1989, the plant was transferred under the management of ENEA and in 2005, the plant was taken over by SOGIN for decommissioning.

For the Bosco Marengo site, the global decommissioning authorisation was obtained in 2008, hence decommissioning of the nuclear infrastructures has been completed.

The residual activities soon to be carried out include: the adjustment of the temporary depot for the storage of previous waste and that produced by the decommissioning whilst awaiting conferral to the National Repository; the elimination of some civilian infrastructures; the radiological control of refuse from demolition.

Finally, as regards the radioactive waste from the decommissioning activities, for the management of which packaging is envisaged at a plant external to the site (NUCLECO SpA) and subsequent return, the documentation relating to transport is currently being revised, before being submitted to the Competent Authorities for the related Clearance (MED Decree and approval of the Operative Plan by ISPRA).

The activities relating to the radiological characterisation for the unconditional release of the site buildings are currently underway, as well as the environmental surveys of the buffer zone where the presence of waste packages has been noted of waste packages in the subsoil (up to a depth of 5m).

Saluggia nuclear complex: Plants linked to the energy cycle - Saluggia (VC)

The Saluggia nuclear complex (Fig. 2.1-6) includes the ENEA research centre, the LivaNovi industry (formerly Sorin) and the AVOGADRO depot, as well as the SOGIN Saluggia site

More specifically, the installations serving the energy cycle are the Eurex Plant (operating since the 1970s for the re-processing of spent fuels, the U-Pu cycle, whose activities were suspended in 1984) and the Plutonium Conversion Manual Unit (operative since 1988, for the production of mixed U-Pu oxides, whose activities were completed in 1991), developed by CNEN, located within the ENEA Centre, and the AVOGADRO depot (owned by FIAT and operative since 1980 as a temporary depot for the storage of ENEL irradiated nuclear fuel).

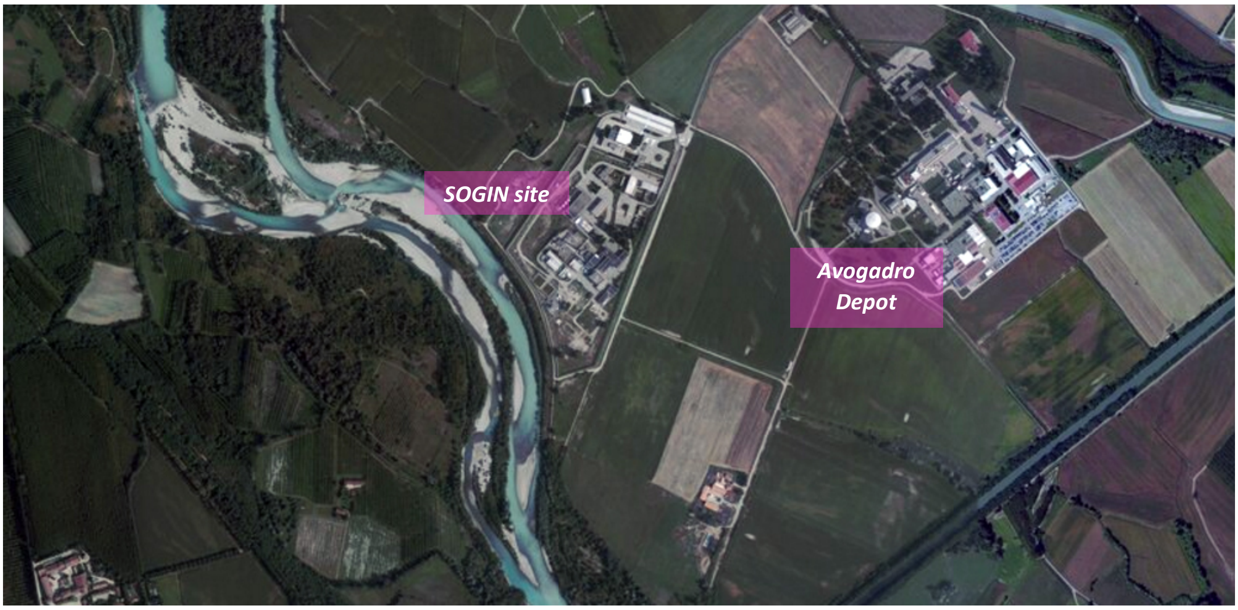


Figure 2.1-6: Saluggia nuclear complex

Saluggia SOGIN site

The two installations present in the Saluggia ENEA Centre since 2003 are managed by SOGIN for their decommissioning.

In recent years, the removal of nuclear fuel has been completed and, therefore, the storage pool reclaimed.

Some Process Cells have been decommissioned; a Temporary Depot has been developed for previous solid radioactive waste, which will shortly start being loaded, a New Tanks Farm for high level liquid radioactive waste that had previously been stored in inadequate conditions, a New Electrical Power System ("NCE") for future waste processing plants and for the needs relating to the Site decommissioning.

In 2014, an application was submitted for authorisation to global decommissioning, however, by means of specific authorisations obtained separately to the global decommissioning decree, it has been possible to carry out important activities prior to the decommissioning, as reported below.

ACTIVITY	DEED OF APPROVAL IN ACCORDANCE WITH ART. 6 OF ITALIAN LAW NO. 1860/1962
WMF DEVELOPMENT	Directorial Decree of 30/07/2013 (prot. MED no. 15856 of 30/07/2013)
DEVELOPMENT OF CEMEX AND EXTENSION OF THE TERMS FOR THE SOLIDIFICATION OF LIQUID WASTE	Directorial Decree of 23/12/2010 (MED prot. no. 24795 of 23/12/2010)
DEVELOPMENT OF THE NEW ELECTRICITY CABINET	Ministerial Decree of 12/05/2010 (prot. MED no. 7115 of 12/05/2010)
CHANGE TO THE RE-LAUNCH LINE FROM THE "WASTE PONDS"	Directorial Decree of 23/12/2009 (prot. MED no. 144198 of 23/12/2009)
DEMOLITION OF BUILDINGS 1600 A/B/C AND 2700	Directorial Decree of 12/08/2009 (prot. MED no.

	94312 of 12/08/2009)
DEVELOPMENT D-2	Directorial Decree of 25/06/2008 (prot. MED no. 11387 of 25/06/2008)
SIS REMOVAL	MED Directorial Decreeof 01/02/2008
DECOMMISSIONING OF THE FIRE-FIGHTING PLANT SERVICE OF CELL 08	Directorial Decree no. XIII-456 of 10/12/2004
NPS DEVELOPMENT	ORDER 4/2003 OF THE APPOINTED COMMISSIONER of 05/09/2003
DEVELOPMENT OF THE NEW WATER PROCUREMENT SYSTEM	Directorial Decree no. XIII-449 of 20/08/2002
CHANGES TO CELLS 010 AND 011 FOR “CORA” INSTALLATION	Directorial Decree no. XIII-410 of 13/01/2000
CHANGES TO PIPING ZONE 800	Directorial Decree no. XIII-374 of 19/11/1996
CHANGE TO ROOM 018 - 020 TO HOUSE A SORTING BOX AND LOW LEVEL SOLID WASTE PRESS	Directorial Decree no. VII-307 of 05/07/1991
UMCP DEVELOPMENT	Directorial Decree no. VII-189 of 11/06/1984

Late 2015, the construction was also started of a processing and packaging plant called CEMEX, for high level liquid radioactive waste currently stored in the New Tanks Farm.

Avogadro depot

The Avogadro RS-1 plant was a pool type nuclear reactor used for research, the first of its kind to be built in Italy, designed for the manufacture of radiopharmaceuticals in 1959 by Nuclear Research Companies, a joint venture between Fiat and Montecatini to carry out research into nuclear physics and the technology of materials. It ceased operating in 1971, due to difficulties being encountered by the nuclear sector in Italy.

Thereafter, some of the reactor structures were removed and the pool adjusted to be used as a nuclear fuel depot that FIAT, as from 1981, made available to ENEL and thereafter SOGIN for the storage of part of the irradiated fuel coming from Italian nuclear power plants, whilst waiting to sent it abroad for reprocessing before definitive allocation to a single confinement system nationwide.

Between April 2003 and February 2005, upon conclusion of the contracts stipulated at the time by ENEL with the British company BNFL, approximately two thirds of the fuel stored was sent to Great Britain for reprocessing.

During the two years 2007 - 2008, the fuel stored in the EUREX plant pool was transferred to the Avogadro depot.

In implementation of the Lucca Agreement between Italy and France on the reprocessing of irradiated fuel, in 2010, transfers began to France of the fuel stored at the depot, aiming to completely empty the depot pool.

End 2012 marked the conclusion of the removal to the United States of America of 10 Dutch reactor lamina from Petten, previously held at Eurex and then transferred to the Avogadro depot. This process, regulated by specific international agreements, was managed and duly completed by Sogin.

The activities next planned regard the completion of the fuel transfer to the reprocessing plant of La Hague in France.

ENEA Casaccia Research Centre (RC) nuclear complex - SOGIN site

In the ENEA Casaccia centre (Fig. 2.1-7), there are three installations, developed by the CNEN and since 2003 managed by SOGIN, for their decommissioning:

- OPEC I plant;
- OPEC II plant;
- plutonium plant.

Figure 2.1-7: ENEA Casaccia Research Centre nuclear complex - SOGIN site

The **OPEC I plant**, which started operating in 1962, was the first Italian laboratory able to perform post-radiation tests on elements of metal uranium and/or uranium oxide irradiation with action of up to 2000 Curies (74 TBq). This laboratory was systematically used for examinations on irradiated fuels in support of the national energy programmes in progress at the time.

The deactivation of OPEC-1 began in 1990 and led to the encapsulation of the remaining irradiated fuel, the complete decommissioning of the equipment and the decontamination of the three hot cells present.

In 2011, in implementation of the Ministerial Decree authorising the decommissioning of the underground Waste A and B tanks, launched the execution of the preliminary interventions (consisting of preparing the site areas and developing the confinement structure, equipped with movement and auxiliary systems), with a view to completing the activities in 2015. The components produced from the decommissioning (tanks and pumps), were then transferred to the NUCLECO plants, where they will be processed and conditioned.

The **OPEC II plant**, which was built in the 1970s to expand on the activities of the OPEC I, has today been transformed into a Temporary depot for alpha-contaminating waste.

The nuclear tests and consequently the start of operation of the Temporary depot to house waste contaminated by plutonium, are close to being carried out and will be followed by the transfer of alpha-contaminated waste from the NUCLECO depots and the Warehouse of the Plutonium plant.

The **Plutonium plant**, which was built in the late 1960s for research into the manufacture of U-Pu fuel elements and the fine-tuning of the analysis methods to control the initial, intermediate and finished product materials. Activities were suspended in the early 1990s.

In 1992, the 1976 operating licence was revoked and, at the same time, the operation of the Plant was authorised for decontamination and decommissioning of equipment and glove boxes already used in the process operations, maintaining only limited equipment with which to carry out interventions and/or handle small quantities of alpha emitting materials, and for the processing and storage, whilst awaiting definitive consignment to another holder, of the residual radioactive material.

In 2010, decommissioning of the obsolete glove boxes (GBs) installed in the Plutonium plant laboratories, was authorised. Decommissioning started once approval had been obtained form ISPRA of the operative plan for decommissioning. The level one and level II GBs have been demolished, whilst the level III ones are still being dismantled and the start of level IV GBs (the last level) is being planned, but awaiting ISPRA authorisation.

The IPU plant contains nuclear material in the form of fuel bars or pieces from past activities, hence characterisation will take place and the consequent appropriate repackaging, essentially aiming to ensure the definitive conferral to a geological depot.

The activities to be carried out in the next few years regard the operation of an aqueous liquid waste packaging plant, the design of a system for the conferral of organic liquid waste to third party plants and the development of a WMF plant for the reduction (supercompaction) and decontamination (sanding) of radioactive waste that can potentially be removed. The other treatments necessary to the site decommissioning will be carried out at the nearby NUCLECO plant, as envisaged by the SOGIN plant operating licence.

Fuel Elements Re-Manufacture and Processing Plant (ITREC) plant – Rotondella (MT)

The ITREC plant, at the ENEA Trisaia centre (Fig. 2.1-8) was developed by CNEN to reprocess irradiated fuels from the Uranium-Thorium cycle. More specifically, from 1969 to 1971, following an agreement reached between CNEN and USAEC, 84 elements of uranium-thorium irradiated fuel were transferred to the ITREC plant for reprocessing, obtained from the experimental nuclear reactor of "Elk River" (Minnesota). In 1973, CNEN took over the 84 elements of spent fuel. The plant started operating with "nuclear tests" in 1975, processing 20 of the 84 elements of spent fuel from the USA.

It definitively closed down after the 1987 referendum and between 1995 and 2000, through the SIRTE-MOWA Plant, it cemented low and high level aqueous liquid radioactive waste produced during the reprocessing campaigns.

Figure 2.1-8: ITREC plant – Rotondella

Since 2003, the Plant has been managed by SOGIN for deactivation.

The ITREC plant only obtained its operating licence in 2006, with the possibility of carrying out, through specific applications for authorisation, some activities preliminary to its deactivation: irradiated fuel dry arrangement; solidification of the “Finished Product” (U-Th mixture) by cementing (FPCP) and reclamation of the High Level Ditch (Ditch 7.1). Moreover, part of the nuclear material subject to non-proliferation agreements (HEU) was sent to the United States of America and characterisation, processing and packaging of previous low level solid waste began (SiRiS project).

In 2014, authorisation was requested for global decommissioning.

As regards the activities in progress, please note the reclamation of “Ditch 7.1”.

In 2014, development of the Finished Product Cementing Plant (FPCP) began.

Under the scope of the project for the dry arrangement of Elk River irradiated fuel, development began on the new confinement capsules, to which the elements of fuel today allocated under water in the ITREC Plant pool, will be transferred. These elements, when duly confined, will thus be placed into highly integral containers (“casks”) that can be stored dry in the specific area of the depot, an integral part of the FPCP plant, currently under construction at ITREC. Thereafter, in these casks, they will be transferred to the National Repository.

2.2 Non-energy segment

Origin Radioactive waste	Producers/Holders	Municipalities concerned
Non-energy	ENEA-NUCLECO Cemerad Campoverde Protex LivaNova Saluggia	Tortona, Saluggia, Milan, Forlì, Rome, Statte

2.2.1 Integrated Service Plants

ENEA Casaccia Research Centre nuclear complex - NUCLECO site

The NUCLECO site (Fig. 2.2-1) is located within the Casaccia (Rome) ENEA centre, near the SOGIN area.

Figure 2.2-1: ENEA Casaccia Research Centre nuclear complex - NUCLECO site

NUCLECO S.p.A. (a nuclear eco-engineering company) was established on 5 May 1981, following a resolution passed by the Inter-Ministerial Budgets Committee ("CIPE") on 11/07/1980; at first, its shareholders are the ENI Group companies (first Agip and then Ambiente S.p.a.), which hold the majority share, and ENEA for the remaining 40%. On 16 September 2004, the majority share was purchased by SOGIN S.p.A. (a nuclear plant management company), which, in thus doing, formed the SOGIN Group; the minority share is held by ENEA.

The NUCLECO business sectors involve:

- radiological characterization and radioprotection services, envisaged under the scope of all waste management activities and decommissioning plans of nuclear plants and installations;
- integrated management of low and medium activity waste and sources, processes carried out as part of the Integrated Service, of which a description is given in paragraph 3.3.2;
- waste management, which includes activities aimed at achieving the decommissioning of nuclear installations an environmental reclamations (in particular reclamations from asbestos in areas with a radiological risk).

In order to carry out the activities on the list, the site has chemical and radiochemical laboratories, areas used for acceptance and the characterisation of incoming radioactive waste from other producers, processing plants of solid and liquid radioactive waste and storage depots.

More specifically, as regards the activities of "*Radiological characterization and radioprotection services*", NUCLECO, a member of the NEA Data Bank, not only uses destructive measurement techniques and the related dedicated instruments, but also conducts radiological analyses on all types of samples and has its own laboratory that uses fixed and mobile gamma spectrometry systems and a transportable type neutron count investigation system that can, thanks to the use of non-destructive measurement techniques and dedicated software, perform the radiological characterization of waste, components and/or parts of plants of all sizes and types, making it extremely competitive on the market.

As regards the sector of the "*Integrated management of waste and low and medium activity waste sources*", the activities carried out at the NUCLECO site relate to:

- Collection (preparation for transport and transport).
- Processing and custody (conferral, acceptance, processing, packaging, "temporary limited" deposit).
- Confinement ("term" deposit and/or definitive confinement).

The competence in the activities of the collection, processing and custody lies with NUCLECO, whilst confinement is the competence of ENEA, which takes ownership of the waste, relieving the producer of all liability.

As instead regards the "*Waste Management*" sector, the main interventions relate to the decontamination of industrial sites that are contaminated both in radiological and non-radiological (e.g. asbestos) terms and processing and packaging radioactive waste. These interventions are mainly carried out at external sites.

At present, the main activities carried out regard asbestos reclamation in radiologically contaminated environments, the processing and packaging of previous radioactive waste or that generated by the decommissioning of Nuclear Installations linked to the energy sector, as well as offering operative support to the decommissioning of other clients (Ispra - Varese Research Centre, etc.).

Campoverde depot

Campoverde S.r.l. has adhered to the ENEA Integrated Service for waste management since 1998 and is authorised to collect radioactive waste in accordance with Art. 31 of Italian Legislative Decree no. 230/95 (Annex X to Italian Legislative Decree no. 241/2000), with certificate issued by the Ministry for Production on 31.5.2002, of unlimited validity and to transport radioactive substances by road.

It has two storage depots for the decay of radioactive waste produced by industry and the biomedical sector, of which one is in the municipality of Milan and the second in the municipality of Tortona (AL).

The core business of Campoverde S.r.l. is the management of radioactive matter, with activities that extend to cover the whole of the product life cycle, from its marketing through to its management and disposal as radioactive waste. More specifically, it ensures the collection and storage of radioactive material from any site and in any form (from metal scrap to by-products of medical research), as well as the distribution of radioactive sources (for nuclear medicine, calibration and industry) and special instruments to measure radiation.

Protex depot

As part of the Integrated Service, the Protex Laboratories Group offers, throughout national territory, a service of packaging, collection, transport and storage of radioactive waste produced for medical and industrial purposes. As in the case of the company Campoverde, the Protex depots are also used for short lived waste storage. The collection of waste for greater activities is instead transferred to NUCLECO for any processing or stored in ENEA depots in the Casaccia ENEA RC.

Cemerad

The Cemerad depot in Statte is currently being made safe and reclaimed, in an action that is coordinated by the extraordinary commissioner appointed by the Government[5].

The depot (used from 1989 to 2000 to store solid and liquid radioactive waste produced by medical, industrial and research activities) currently contains "3,344 radioactive drums and 13,380 deteriorated drums, for a total of 16,724 drums"[6] and, in a well-defined area, 84 drums containing radioactive waste filters (contaminated by Chernobyl radiation) and decommissioned radioactive sources.

The strategy proposed for making safe waste and reclaiming the site is that of an "unconditional release" from all radiology restrictions in the area. This objective will be achieved by removing all waste and removable components present in the structures, managed in compliance with current legislation governing interventions with a risk of ionising radiations (Italian Legislative Decree no. 230 of 17 March 1995 and Italian Legislative Decree no. 241 of 26 May 2000) and that in force for the management of waste classified as "special dangerous" (Italian Legislative Decree no. 152 of 03 April 2006). The activities carried out at the site will regard the movement of drums and any other containers present in the area of intervention, their assessment in terms of if they are intact and level of containment, radiological "dose" and "contamination", their preparation for transport by road to authorised plants for subsequent timely characterisation, processing, packaging and storage in a depot (of only waste that is verified as being radioactive waste)[7].

LivaNova Saluggia

At the site, radioactive waste is stored deriving from previous nuclear research activities. The site is included in those listed in the additional Protocol but is not included in the sites coming under the civil liability of the Paris Protocol. There are therefore no nuclear materials.

2.2.2 Nuclear research plants

In Italy, there are five operative nuclear research centres in the field of medical sciences, physics and radiochemistry. All radioactive waste produced by the research is handled, in compliance with the procedures laid down by Italian Legislative Decree no. 230/1995, by the Integrated Service.

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[5] By Decree of the President of the Council of Ministers of 19.11.2015, Vera Corbelli was appointed Extraordinary Commissioner for the implementation of the making safe and management of dangerous and radioactive waste in the ex Cemerad depot, in the municipal territory of Statte (TA).

[6] Source "*Nota sintetica intervento di messa in sicurezza e gestione dei rifiuti pericolosi e radioattivi siti nel deposito ex Cemerad del comune di Statte*" produced by the commission structure in February 2017.

[7] The activities carried out at the site will regard the movement of drums, their assessment in terms of if they are intact and level of containment, radiological "dose" and "contamination", their preparation for transport by road to authorised plants for subsequent timely characterisation, processing, packaging and storage in a depot (of only waste that is verified as being radioactive waste).

To date, apart from reactor RB3 (Nuclear Engineering Laboratory of Montecuccolino of Bologna University, for which decommissioning activities, authorised in 2010, are currently being completed), none of the plants have had deactivation authorisation issued.

Origin Radioactive waste	Producers/Holders	Municipalities concerned
Nuclear research	Euratom Ispra JRC CESNEF (L54M reactor) Pavia University (Lena reactor) ENEA (Tapiro and Triga RC1 reactor) Palermo University (AGN 201 reactor) Bologna University (RB3 reactor)	Ispra, Milan, Pavia, Rome, Bologna, Palermo

Ispra JRC

The European Commission Ispra Joint Research Centre is currently organising a global decommissioning and waste management programme aimed at decommissioning the nuclear plants that operated in the Centre and carrying out a complete characterisation and packaging of the radioactive waste produced from previous activities. The authorisation and control activities are carried out by the Italian authorities on the basis of the current agreement between the Italian Republic and the Euratom Community stipulated in 1960. The construction of a temporary depot on site has recently been completed.

Originally, the Ispra JRC was entirely given over to nuclear research, however over time its activities have diversified.

In 1999, the Commission decided to launch the Decommissioning and radioactive waste management programme for obsolete nuclear plants. In this, the Commission has adopted the new approach chosen by most European Union Member States, preferring to implement immediate decommissioning rather than opt for deferred decommissioning.

The last communication on the progress made on the Programme was presented to the European Council and Parliament in 2013.

At the Ispra JRC site, most of the nuclear plants are obsolete or no longer necessary. Definitive closure has therefore been envisaged, in order to proceed with decommissioning.

At the Ispra JRC, various waste processing and conditioning plants are under construction.

Moreover, on 27 November 2009, Euratom signed an agreement with the Italian Government, to:

- remedy the historic responsibilities on the site, transferring the responsibility for decommissioning of the Ispra-1 reactor to the Italian government;
- formalise the transfer of all waste from the site to the future National Repository by the end of the Programme;
- limit the risk of subsequent repackaging of waste that may be the result of changes to the Italian radioactive waste admission criteria.

The agreement has not yet been ratified by the Italian parliament and, consequently, the transfer of the licence for the Ispra-1 reactor licence to an Italian operator has not yet been completed.

Most of the spent fuel of the Ispra JRC has been returned to the United States, whilst the residual spent fuel, mainly stored in the ESSOR reactor pool, will be stored dry in specific dual purpose containers, whilst awaiting delivery to the National Repository. Approximately 90% of the non-irradiated nuclear materials has been removed from the site, ownership transferred and then sent to the USA and France for recycling.

At the Ispra JRC, waste is stored in local facilities, whilst awaiting availability of the National Repository. In the meantime, the Ispra JRC is building and restructuring various waste management plants with a view to correctly processing, characterising, conditioning, packaging and immobilising the existing waste and waste deriving from the decommissioning operations. The conditioned waste will be stored on site in a dedicated temporary depot.

CESNEF

The CEsNEF (Enrico Fermi Nuclear Studies Centre) L54-M reactor is inside the Milan Polytechnic University Nuclear Energy Department.

The reactor is homogeneous in type, powered by uranyl sulphate, and was the first to be used in Italy for teaching and research purposes.

The reactor, which developed a thermal power of 50 kW, remained operative from 1960 to 1979, when it was switched off and sent for decommissioning.

In 2015, radiological characterization, packaging and containment of contaminated materials took place, as well as the removal of radioactive sources for the envisaged decommissioning of the reactor.

L.E.N.A.

The Laboratory of Applied Nuclear Energy (LENA) is located at Pavia University, in the city. The laboratory has an installed, functional, research 250 kW nuclear reactor type Triga Mark II.

The Pavia Triga Mark II is currently the most widely used irradiation instrument in our country for research and service activities, particularly in the healthcare industry.

The plant also has category II radioactive waste.

The spent fuel is stored in specific spaces of the reactor building. There are 5 housings, two of which respectively contain 9 elements of spent fuel. Moreover, there are grilles positioned in the reactor pool, where elements of fuel are stored that are partially used, to be potentially inserted into the reactor.

No decommissioning activities are scheduled.

TRIGA

The TRIGA RC-1 (Training Research Isotopes General Atomics - Reactor Casaccia 1) research nuclear reactor situated at the ENEA Casaccia research centre, is a source of thermal neutrons.

TRIGA RC-1 was built in 1960 in its first version with power of 100 kW, as part of the USA Atoms for Peace initiative and, thereafter, in 1967, it was taken to a power of 1 MW, on ENEA design.

The core of TRIGA RC-1 consists of an annular structure immersed in water, with the latter acting as primary cooler. The elements of the core fuel are geometrically arranged over seven coaxial cylinders.

The reactor can be used in numerous research sectors:

- irradiation of materials in thermal spectrum
- neutronigraphy and tomography
- isotopes for medicine and industry
- analysis for activation
- radiological characterization.

No decommissioning activities are scheduled.

TAPIRO

The TAPIRO research nuclear reactor, whose name derives from the Italian acronym of *TAratura PIla Rapida Potenza ZerO* (power zero rapid battery calibration), situated at the ENEA Casaccia research centre is a source of rapid neutrons. Constructed to offer support to the experimental programme on fast reactors, it began operating in 1971.

In the years that ran between 1980 and 1986, a measurement campaign was run for the neutron characterisation of the reactor on the basis of an agreement between ENEA and SCK/CEN Mol (Belgium). This characterisation campaign showed that the TAPIRO was able to supply neutron flows with extremely variable energy spectra starting from that close to the fission spectrum that is at the centre of the core. This characteristic, together with the good spherical symmetry of the spatial distribution of the flow, makes the TAPIRO suitable for considerable metrological applications.

The reactor can be used in numerous research sectors:
- in the study of damage due to fast neutrons;
- in experiments for the production of nuclear data;
- in the validation of calculation codes for IV generation reactors;
- in the qualification of innovative disclosure chains;
- as teaching support in university and post-graduate courses.

The reactor is designed to operate at a maximum level of 5 kW.
No decommissioning activities are scheduled.

RB3 reactor

The RB3 reactor (Bologna Tre Reactor) was developed in 1967 at the Bologna University Nuclear Engineering Laboratory of Montecuccolino. The laboratory was founded in 1962, above all to encourage field studies of nuclear reactors, thanks to the collaboration between university, Enea and Agip Nucleare.

The RB3 reactor was deactivated in 1989 following the national referendum on the elimination of nuclear energy for electricity generation.

The reactor obtained a licence to decommission the plant in 2010 and, following this, in April 2013 the radiological characterization plan was approved for the removal of materials from the site.

Decommissioning operations began in September 2012, whilst the conclusion of activities through to green field condition of the site is expected for end 2016.

AGN-201 "Costanza"

The “zero power” research reactor has been situated at the former Nuclear Engineering Department (“DIN”) of the University of Palermo, since 1960. It was one of Italy’s first nuclear reactors and is still operating today.

In around 1975, the AGN-21 was positioned in the current site of the former DIN, in a dedicated hall, and was equipped with screening, safety systems and control devices that are regularly updated and improved. It is currently used for teaching purposes and for production by means of neutron activation of short-lived radio-isotopes, for the calibration of measurement instruments.

In the past, the reactor was also used as support for scientific research intended for the disclosure of kinetic parameters and the study of the physical conduct of the core.

No decommissioning activities are scheduled.

3 NP action strategies and objectives

In this chapter, in order to suitably discuss the assessment process, the regulatory references and external coherence and environmental sustainability criteria/objectives have been identified, from current legislation and sector and supra-ordinate programming and planning tools, which the Programme has had to reference in defining its choices.

3.1 General objectives of the NP

Below is a list of the general objectives contained in the NP:

	General objectives of the national policy (paragraph 2.2 of the National Programme)
1	To implement the decommissioning of the nuclear installations until release of the sites without radiological restrictions and, consequently, to process and condition all liquid and solid radioactive waste deposited on the sites, in order to transform them into certified waste packages, temporarily stored at the production site, ready for transfer to the National Repository
2	To update the national inventory of radioactive waste and spent fuel once a year
3	To safely dispose of the radioactive waste generated in Italy, by way of a priority, in national territory, as established by Directive 2011/70/EURATOM
4	To site, construct and run the National Repository intended to hold radioactive waste generated in national territory, from industrial activities, research and the medical-healthcare sector and previous management of nuclear plants, when deriving from civilian activities, including a Technology Park inclusive of a Study and experiments centre, as specifically regulated by Article 27 of Italian Legislative Decree no. 31 of 15 February 2010
5	To dispose, in the National Repository, the low and medium activity waste deriving from industrial operations, research and the medical-healthcare field and from previous management of nuclear plants, when deriving from civilian activities
6	To store, on a long-term provisional basis, in the same National Repository, high activity waste and spent fuel obtained from the previous management of nuclear power plants, when deriving from civilian activities. For the disposal of the latter, the solution that is currently most accepted worldwide by specialists, is that of disposal in geological formations. In the Italian case, considering that the quantity of high activity waste (including spent fuel) to be disposed of is modest, the solution of developing a geological depot in national territory is somewhat oversized, as well as infeasible economically. Therefore, during the transitional period for which the high activity waste will remain in the National Repository, the most suitable solution will be identified for its disposal in a geological depot, also considering the opportunities offered up by possible international agreements that may be stipulated in the meantime
7	To transport abroad the spent nuclear fuel still present on national territory, for it to be processed and reprocessed, in accordance with specific directives/government agreements, without prejudice to special cases which in any case will be correctly managed in line with the above standards of the Directive 2011/70/Euratom. Upon completion of processing, to return to Italy the radioactive waste deriving from the specific contracts/agreements for the reprocessing of spent nuclear fuel
8	To guarantee fulfilment of the commitments made between the Italian Republic and the European Atomic Energy Community (EURATOM) on the management of radioactive waste at the site of the Ispra (VA) Research Centre
9	To develop a programme for research and development exclusively aimed at the safe management of spent fuel and radioactive waste, in line with the contents of the National Programme
10	By way of priority, in order to achieve the previous objectives, to implement a correct, objective, timely form of information, so as to guarantee transparency and the effective participation of the public in the decision-making processes concerning the management of spent and radioactive waste

For all the above-listed objectives in the following paragraphs, the related consistency analysis has been conducted in detail, as envisaged by current Guidelines.

3.2 General environmental protection objectives

In order to define the environmental protection objectives considered as important, the starting point was the questions listed under letter e) of Annex I to the SEA Directive and there was an examination of the general standards applicable to the NP for the management of spent fuel and radioactive waste, in connection with its possible interactions with the environment.

Below are the environmental matters and main international standards of reference, in particular European Community and national, considered, with the related main objectives considered pertinent for the SEA of the NP.

- Environmental Assessments
- Ionising radiations
- Water
- Air
- Soil use
- Soil and subsoil
- Floods
- Biodiversity
- Waste
- Noise
- Research, development and innovation
- Man-made danger
- Energy
- Landscape and cultural heritage

3.2.1 European legislation objectives and guidelines

This paragraph describes the main supranational reference standards with the related strategic objectives and guidelines, in connection with the various environmental matters examined.

Environmental assessments

As regards the environmental assessments of the NP, reference was made to European Parliament and Council Directive 2001/42/EC of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment, the main aims of which are shown in the table below.

Theme	Standard	Objectives
SEA	Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment	To provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development, by ensuring that, in accordance with this Directive, an environmental assessment is carried out of certain plans and programmes which are likely to have significant effects on the environment

Water

In connection with the water segment, the following Directives were analysed:

- Directive 2000/60/EC establishing a framework for Community action in the field of water policy (as amended by: Decision 2455/2001/EC, Directive 2006/11/EC, Directive 2008/32/EC, Directive 2008/105/EC, Directive 2009/31/EC, Directive 2013/39/EU, Directive 2013/64/EU, Directive 2014/101/EU);
- Directive 2006/118/EC on the protection of groundwater against pollution and deterioration;
- Directive 2006/7/EC concerning the management of bathing water quality and repealing Directive 76/160/EEC (as amended by: Regulation 596/2009/EC, Directive 2013/64/EU);
- Directive 98/83/EC as subsequently amended and supplemented, on the quality of water intended for human consumption, which, in terms of the parameters of radioactivity, was amended by Italian Legislative Decree no. 28 of 15 February 2016, incorporating European Council Directive 2013/51/EURATOM.

The table below summarises the main objectives of said regulations.

Theme	Standard	Objectives
Water	Directive 2000/60/EC establishing a framework for Community action in the field of water policy, as subsequently amended and supplemented	The purpose of this Directive is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater which: a) prevents further deterioration and protects and enhances the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems; b) promotes sustainable water use based on a long-term protection of available water resources; c) aims at enhanced protection and improvement of the aquatic environment, inter alia, through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances; d) ensures the progressive reduction of pollution of groundwater and prevents its further pollution, and contributes to mitigating the effects of floods and droughts and thereby contributes to: - the provision of the sufficient supply of good quality surface water and groundwater as needed for sustainable, balanced and equitable water use, - a significant reduction in pollution of groundwater, - the protection of territorial and marine waters, and achieving the objectives of relevant international agreements, including those which aim to prevent and eliminate pollution of the marine environment, by Community action under Article 16(3) to cease or phase out discharges, emissions and losses of priority hazardous substances, with the ultimate aim of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for man-made synthetic substances.
	Directive 2006/118/EC on the protection of groundwater against pollution and deterioration	This Directive establishes specific measures as provided for in Article 17(1) and (2) of Directive 2000/60/EC in order to prevent and control groundwater pollution. These measures include in particular: a) criteria for the assessment of good groundwater chemical status; and b) criteria for the identification and reversal of significant and sustained upward trends and for the definition of starting points for trend reversals. This Directive also complements the provisions preventing or limiting inputs of pollutants into groundwater already contained in Directive 2000/60/EC, and aims to prevent the deterioration of the status of all bodies of groundwater.

	Directive 2006/7/EC concerning the management of bathing water quality and repealing Directive 76/160/EEC, as subsequently amended and supplemented	This Directive lays down provisions for: a) the monitoring and classification of bathing water quality; b) the management of bathing water quality; and c) the provision of information to the public on bathing water quality. The purpose of this Directive is to preserve, protect and improve the quality of the environment and to protect human health by complementing Directive 2000/60/EC. This Directive shall apply to any element of surface water where the competent authority expects a large number of people to bathe and has not imposed a permanent bathing prohibition, or issued permanent advice against bathing.
	Directive 98/83/EC on the quality of water intended for human consumption, as subsequently amended and supplemented	The objective of this Directive shall be to protect human health from the adverse effects of any contamination of water intended for human consumption by ensuring that it is wholesome and clean, laying down that chemical and bacteriological standards envisaged must be respected, not only at the point of water delivery but also at the consumer's tap. In line with this aim, water must comply with the minimum requirements laid down by it and which include numerous parameters (Annex I, parts A, B and C), grouped into three classes: microbiological, chemical, indicators; in addition to these, there are also indications relative to the radioactivity of water and a series of accessory microbiological parameters that must be sought as the competent local health authority sees fit.

Air

As regards air quality, Directive 2008/50/EC (as amended by Directive 2015/1480/EU) was examined, on ambient air quality and cleaner air for Europe, whose main objectives are shown in the table below:

Theme	Standard	Objectives
Air	Directive 2008/50/EC as subsequently amended and supplemented on ambient air quality and cleaner air for Europe	This Directive lays down measures aimed at the following: 1) defining and establishing objectives for ambient air quality designed to avoid, prevent or reduce harmful effects on human health and the environment as a whole; 2) assessing the ambient air quality in Member States on the basis of common methods and criteria; 3) obtaining information on ambient air quality in order to help combat air pollution and nuisance and to monitor long-term trends and improvements resulting from national and Community measures; 4) ensuring that such information on ambient air quality is made available to the public; 5) maintaining air quality where it is good and improving it in other cases; 6) promoting increased cooperation between the Member States in reducing air pollution.

Soil use

For this matter, it was not possible to identify a reference legislation insofar as, in May 2014, the Commission withdrew its proposed Soil Framework Directive (COM(2006) 232) on the protection of soil that would have transformed the Soil Thematic Strategy into binding rules, considering it impossible to adopt as a result of major opposition by some Member States.

However, the table below shows the strategic objectives that the European Commission has declared it wishes to pursue.

Theme	Standard	Objectives
Soil use	Proposed Soil Framework Directive (COM(2006) 232) on the protection of soil (Withdrawn in May 2014)	The Commission has declared that it wishes to maintain its commitment to pursue the objective of protecting the soil and will continue to assess options on the best ways to reduce the main threats, substantially represented by: erosion, local and diffused contamination, impermeabilisation, compaction, loss of organic substance, reduction of biodiversity, mudslides, salinisation and desertification.

Floods

The main European reference is the Floods Directive 2007/60/EC whose objectives are shown in the table below:

Theme	Standard	Objectives
Floods	Floods Directive 2007/60/EC	The purpose of this Directive is to establish a framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods in the Community.

Biodiversity

As regards biodiversity, the two main European Directives have been considered, aiming to define interventions seeking to conserve species and ecosystems:

- The Birds Directive 2009/147/EC on the conservation of wild birds;
- The Habitats Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.

The objectives of these regulations are given in the table below.

Theme	Standard	Objectives
Biodiversity	The Birds Directive 2009/147/EC on the conservation of wild birds	This Directive relates to the conservation of all species of naturally occurring birds in the wild state in the European territory of the Member States to which the Treaty applies. It shall apply to birds, their eggs, nests and habitats. The Directive sets out to protect, manage and regulate these species and governs their use; to this end, it establishes the Special Protection Areas (SPAs).
	Habitats Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora	The aim of this Directive shall be to contribute towards ensuring bio-diversity through the conservation of natural habitats and of wild fauna and flora in the European territory of the Member States to which the Treaty applies. Measures taken pursuant to this Directive shall be designed to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest; to this end, it institutes the SCIs (Sites of Community Importance), which are thereafter designated as Special Areas of Conservation (SACs), by way of completion, together with the SPAs instituted in compliance with the Birds Directive 2009/147/EC of the Natura 2000 network.

Waste

As regards waste management, the following Directives were examined:

- Directive 2008/98/EC (amended by: Regulation 1357/2014/EU (08/01/2015), Directive 2015/1127/EU (31/07/2015), Rectification 13 November 2015 (13/11/2015), Rectification 18 February 2017 (18/02/2017));
- Directive 1999/31/EC; Directive 2011/97/EU (13/12/2011).

The related environmental protection objectives are shown in the table below.

Theme	Standard	Objectives
Waste	Directive 2008/98/EC as subsequently amended and supplemented	This Directive lays down measures to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste and by reducing overall impacts of resource use and improving the efficiency of such use. More specifically, the Directive objectives are: a) To reduce the negative impacts of waste production and management, identifying the following hierarchy on waste management and prevention: • prevention; • preparing for re-use; • recycling; • other recovery, e.g. energy recovery; and • disposal. b) To promote, as a priority, the prevention, reduction of production and harmful nature of waste, as well as the adoption of measures aimed at preferring the recovery of waste in compliance with priority criteria.
	Directive 1999/31/EC as subsequently amended and supplemented	The aim of this Directive is, by way of stringent operational and technical requirements on the waste and landfills, to provide for measures, procedures and guidance to prevent or reduce as far as possible negative effects on the environment, in particular the pollution of surface water, groundwater, soil and air, and on the global environment, including the greenhouse effect, as well as any resulting risk to human health, from landfilling of waste, during the whole life-cycle of the landfill.
	Directive 2011/97/EU	Amending Directive 1999/31/EC as regards specific criteria for the storage of metallic mercury considered as waste

On 02 December 2015, the European Commission presented the “circular economy” package, comprising a Communication and a proposed regulation revising various directives, including, in particular, the Waste Framework Directive (2008/98/EC), the Packaging Directive (94/62/EC) and the Landfill Directive (1999/31/EC). The proposal also contains less important amendments (relative above all to the reporting obligations), the WEEE Directive (2012/19/EC), the Batteries Directive (2006/66/EC) and the End-of-life Vehicles Directive (2003/53/EC).

This review serves the dual purpose of respecting on the one hand the revision clauses envisaged by the Directives, and on the other, of adjusting the objectives established in said Directives to the guidelines given in the “Roadmap on Resource Efficiency” and the “7th Environmental Action Programme”.

Noise

The reference legislation examined is Directive 2002/49/EC (as amended by Regulation 1137/2008/EC of 11/12/2008 and Directive 2015/996/EU of 02/07/2015) relating to the assessment and management of environmental noise, of which the main objectives are outlined below.

Theme	Standard	Objectives
Noise	Directive 2002/49/EC as subsequently amended and supplemented relating to the assessment and management of environmental noise	The aim of this Directive shall be to define a common approach intended to avoid, prevent or reduce on a prioritised basis the harmful effects, including annoyance, due to exposure to environmental noise. To that end the following actions shall be implemented progressively: a) the determination of exposure to environmental noise, through noise mapping, by methods of assessment common to the Member States; b) ensuring that information on environmental noise and its effects is made available to the public; c) adoption of action plans by the Member States, based upon noise-mapping results, with a view to preventing and reducing environmental noise where necessary and particularly where exposure levels can induce harmful effects on human health and to preserving environmental noise quality where it is good.

Research and Development

As regards this matter, the European Commission Communication 2014/C 198/01 “Framework for State aid for research and development and innovation”, was considered, of which the main objectives are shown in the table.

Theme	Standard	Objectives
Research, development and innovation	European Commission Communication 2014/C 198/01 “Framework for State aid for research and development and innovation”	Promoting research and development and innovation is an important Union objective laid down in Article 179 of the Treaty: “The Union shall have the objective of strengthening its scientific and technological bases by achieving a European research area in which researchers, scientific knowledge and technology circulate freely, and encouraging it to become more competitive, including in its industry, while promoting all the research activities deemed necessary [...]”. Articles from 180 to 190 of the Treaty establish the activities to be carried out in pursuing these objectives and determine the scope and method of implementation of the multi-year framework programme.

Man-made danger

For this matter, the regulations governing human activities, essentially of an industrial nature, were considered, as potentially dangerous to human health and the environment as a consequence of the use and storage of certain substances.

More specifically, Directive 2012/18/EU (Seveso III) was examined, with the respective objectives described below.

Theme	Standard	Objectives
Man-made danger	Directive 2012/18/EU (Seveso III)	This Directive lays down rules for the prevention of major accidents which involve dangerous substances, and the limitation of their consequences for human health and the environment, with a view to ensuring a high level of protection throughout the Union in a consistent and effective manner. The main objectives are listed below: • to raise the current protection and control levels in plants at Risk of Major Accident; • to incorporate Regulation 1272/2008 “CLP” for the classification of dangerous substances.

Energy

For Energy, the rules governing the interaction between energy development and the environment have been examined, with particular attention paid to limiting climate-altering emissions and energy efficiency.

Therefore, the following reference standards were identified, with their related objectives and guidelines.

Theme	Standard	Objectives
Energy	European Parliament and Council Directive 2003/87/EU as subsequently amended and supplemented establishing a scheme for greenhouse gas emission allowance trading	This Directive establishes a scheme for greenhouse gas emission allowance trading within the Community in order to promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner, by means of the following actions: • establishing a scheme for greenhouse gas emission allowance trading, aimed at reducing said emissions; • increasing reductions in greenhouse gas emissions in order to help reach the elimination levels considered necessary, from a scientific viewpoint, to avoid dangerous climate changes; • definition of provisions for the assessment and implementation of a more rigorous use by the Community of the reductions of greenhouse gas emissions, to be applied after approval by the European Community of an international agreement on climate change.
	Kyoto Protocol (Kyoto, 11 December 1997) The European Union ratified the Kyoto Protocol on 31 May 2002. The protocol came into force on 16 February 2005, after being ratified by Russia.	The Kyoto Protocol concerns the emissions of six greenhouse gases and is an important step forward in the fight against global warming, because it contains binding, quantified objectives to limit and reduce greenhouse gases. Globally, the States included in Annex I of the United Nations Framework Agreement on climate change (i.e. the industrialised countries) collectively undertake to reduce their greenhouse gas emissions in the period 2008-2012 for a reduction of total emissions of developed countries of at least 5% with respect to 1990 levels. Annex B to the protocol contains the quantified commitments subscribed by the contracting States.
	European Parliament and Council Directive 2009/28/EU as subsequently amended and supplemented. Promotion of the use of energy from renewable sources	This Directive establishes a common framework for the promotion of energy from renewable sources. It sets mandatory national targets for the overall share of energy from renewable sources in gross final consumption of energy and for the share of energy from renewable sources in transport. It lays down rules relating to statistical transfers between Member States, joint projects between Member States and with third countries, guarantees of origin, administrative procedures, information and training, and access to the electricity grid for energy from renewable sources. It establishes sustainability criteria for biofuels and bioliquids.
	European Parliament and Council Directive 2012/27/EU as subsequently amended and supplemented. Energy Efficiency Directive	This Directive establishes a common framework of measures for the promotion of energy efficiency within the Union in order to ensure the achievement of the Union's 2020 20 % headline target on energy efficiency and to pave the way for further energy efficiency improvements beyond that date.

Landscape and cultural heritage

For landscape and cultural heritage, the following regulatory documents or guidance have been analysed on a European and international level:

- European Landscape Convention - European Council, Florence, 20 October 2000;
- UNESCO SITES census, instituted and proposed.

The respective objectives are shown in the table below.

Theme	Standard	Objectives
Landscape and cultural heritage	European Landscape Convention - European Council, Florence, 20 October 2000	The Convention encourages the public authorities to adopt local, regional, national and international policies and provisions for the safeguarding, management and planning of landscapes in Europe. It regards all landscapes, both exceptional and ordinary, and acknowledges the key role in determining the quality of life of inhabitants. The text envisages a flexible approach for landscapes whose specific characteristics require different types of intervention, from careful preservation by protection, management and improvement, through to effective creation. The Convention proposes national and international legal and financial provisions aimed at creating "landscape policies" and promoting interactions between local and central authorities and a cross-border cooperation for the protection of landscapes. It indicates a series of solutions that can be applied by States, according to their specific needs. The intergovernmental committees of the European Council will control the application of the convention.
	UNESCO SITES census, instituted and proposed	Safeguarding cultural heritage acknowledged as heritage of humanity.

3.2.2 National legislation objectives and guidelines

Nationally, below is the reference legislation on environmental protection with which the contents of the NP must be harmonised, with a view to ensuring consistency with the European Community framework inspiring the NP and the environmental protection that should be offered by said NP.

Ionising radiations

As regards the ionising radiations component, the reference legislation identified has been divided up, in turn, into the main matters indicated in the tables below, for each of which the related objectives are given.

Theme	Standard	Objectives
Nuclear power plants Radioactive waste	Italian Legislative Decree no. 230 of 17 MARCH 1995 as subsequently amended and supplemented, setting out the implementation of Directives 89/618 Euratom, 90/641 Euratom, 96/29 Euratom, 2006/117 Euratom on ionising radiations, 2009/71 Euratom on the nuclear safety of nuclear plants and 2011/70 Euratom on the safe management of spent fuel and radioactive waste deriving from civilian activities	• To guarantee the safety of nuclear power plants and spent fuel and radioactive waste management plants (CHAPTER VII-BIS) • To safely manage the methods of removal/collection/deposit of radioactive waste (CHAPTER VI)

Theme	Standard	Objectives
National Repository Radioactive waste	Italian Legislative Decree no. 31 of 15 February 2010 regulated the "Regulation of systems for the storage of irradiated fuel and radioactive waste, as well as economic benefits, in accordance with Article 25 of Italian Law no. 99 of 28 July 2009", as subsequently amended and supplemented by Italian Legislative Decree no. 41 of 23.3.2011, by Italian Law no. 75 of 28.5.2011, by Italian Law no. 27 of 24.3.2012 and by Italian Legislative Decree no. 45 of 4.3.2014 and by Italian Law no. 11 of 27 February 2015.	Primary objective: Development of the National Repository and Technology Park • Regulation of the siting, timing and authorisation procedures for the construction and operation of the NRTP • Involving local entities and populations • Regulating the economic benefits relative to the operation of the NR to be paid to residents, businesses operating in the territory around the site and local entities concerned

Theme	Standard	Objectives
Radioactive waste	Italian Legislative Decree no. 45/14 "Implementation of Directive 2011/70/EURATOM, establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste"	Establishment of a framework for the safe, responsible management of spent fuel and radioactive waste

Landscape and cultural heritage

As regards cultural heritage and landscape, Italian Legislative Decree no. 42 of 22 January 2004 as subsequently amended and supplemented, was examined, which has the following objectives.

Theme	Standard	Objectives
Cultural heritage Landscape	Italian Legislative Decree no. 42/04 "Landscape and Cultural Heritage Code, in accordance with Article 10 of Italian Law no. 137 of 06 July 2002" as subsequently amended and supplemented	To protect and optimise the cultural heritage so as to preserve the memory of the national community and its territory and develop its culture. To protect and optimise the landscape (the activities planned by the NP in compliance with the ER must consider the provisions of this legislative decree with a view to safeguarding the landscape)

Environmental Assessments - Air - Water - Soil and Subsoil - Waste

In a national context, the matters in question are duly regulated by Italian Legislative Decree no. 152 of 03 April 2006 "Environmental standards", whose main objectives are set out below.

EIA, SEA, IEA	Italian Legislative Decree 152/06 “Environmental standards” as subsequently amended and supplemented. This Decree also defines the SEA procedures of the NP	• Primary objective: promotion of quality of human life, to be achieved through the safeguarding and improvement of environmental conditions and the careful, rational use of natural resources. • To carry out environmental assessments upon preparing, adopting and approving the P/P (Art. 4);
Soil and subsoil		• to ensure the protection and recovery of the soil and subsoil, the hydrogeological recovery of the territory through the prevention of disruption, the making safe of risk situations and the fight against desertification (Art. 53);
Water		• To ensure the protection of surface, marine and underground water, pursuing the following objectives: • to prevent and reduce pollution and implement the recovery of polluted water bodies; • to successfully improve the condition of water and suitable protection of that intended for specific uses; • to pursue sustainable, lasting uses of water resources, prioritising drinking water; • to maintain the natural capacity for self-purification of the water bodies and the capacity to support extensive, diversified animal and plant communities; • to mitigate the effects of flooding and drought; • to prevent further deterioration and protect and enhance the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems.
Waste		• To manage waste and reclaim polluted sites, protecting human health and ensuring a high level of environmental protection (Art. 178);
Air		• To prevent and limit atmospheric pollution (Art. 267).
Environmental damage		• Compensation protection against environmental damages intended as any deterioration, which is significant and can be measured, direct or indirect, of a natural resource or utility assured by the latter;
	Italian Legislative Decree 49/2010, incorporating Directive 2007/60/EC on the assessment and management of flood risks	• regulates the assessment and management of the flooding risk in order to reduce the negative consequences on human health, the territory, heritage, the environment, cultural heritage and social and economic activities deriving from said flooding.

For Air, Italian Legislative Decree no. 155/2010, was also analysed, which implements Directive 2008/50/EC, the objectives of which are listed below:

Air quality	Italian Legislative Decree 155/2010 “Implementation of Directive 2008/50/EC on ambient air quality and cleaner air for Europe”	• To identify objectives for ambient air quality designed to avoid, prevent or reduce harmful effects on human health and the environment as a whole; • to assess ambient air quality on the basis of common methods and criteria throughout national territory; • to obtain information on ambient air quality as a basis on which to identify the measures to be taken to fight pollution and the harmful effects of pollution on human health and the environment and to monitor long-term trends, as well as improvements due to the measures adopted; • to maintain air quality where it is good and improve it in other cases; • to guarantee the public information on ambient air quality; • to ensure a better cooperation between European Union Member States on atmospheric pollution.

3.2.3 Objectives and guidelines contained in territorial planning

REGION OF PIEDMONT

The regional territory contains:

- the site of the Trino Enrico Fermi nuclear power plant;
- the Bosco Marengo Nuclear Fuel Fabrication Plant (FN);
- the Saluggia nuclear complex comprising the Sogin site, the ENEA Research Centre, the LivaNova research and development site and the Avogadro depot;
- the radioactive waste depot managed by Campoverde S.r.l.

Trino Enrico Fermi nuclear power plant

The site of the nuclear power plant is in the municipality of Trino, Province of Vercelli, on the left bank of the River Po.

The geographic area that comprises the Plant is affected by the following restrictions and environmental and territorial landscape heritage (Piedmont PPR):

- water course buffer strips (150 m from each shore), restricted in accordance with Italian Legislative Decree no. 42/2004 (formerly Italian Law no. 431/85);
- heritage identified in accordance with Italian Law no. 778/1922 and 1497/1939;
- heritage identified in accordance with Italian Law no. 1497/1939, Ministerial Decree of 21/09/1984 and Italian Decree Law no. 312/1985 with Ministerial Decrees of 01/08/1985;
- territories covered by forests and woodlands, even if crossed or damaged by fire, and those subject to reforestation restrictions, as defined by Article 2, paragraphs 2 and 6 of Italian Legislative Decree no. 227/2001.

The following are also present in the area:

- areas subject to hydrogeological restriction in accordance with Royal Decree no. 3267 of 30 December 1923;
- areas involved by major disasters: strips pertaining to the River Po, as defined in the Extract Plan for the hydrogeological structure and the Flood Risk Management Plan (“PGRA”) prepared by the River Po Basin Authority.

Finally, in the area surrounding the Trino power plant, there are the protected areas and Natura 2000 Sites listed below:

- SPA IT1180028 River Po - Vercellese Alessandrino section;
- SCI IT1180005 Ghiaia Grande (River Po);
- SCI and SPA IT1120002 Partecipanza di Trino forest;
- SCI IT112007 San Genuario swamp;
- SCI and SPA IT112008 Fontana Gigante (Tricerro);
- SCI IT112023 Island of Santa Maria;
- SPA IT1120029 Swamp of San Genuario e San Silvestro;
- SCI IT1120030 Riverbanks of Palazzolo vercellese;
- Special nature reserve of Fontana Gigante;
- Nature park of the Sorti della Partecipanza di Trino forest;

- Nature reserve of Ghiaia Grande;
- Nature reserve of the Island of Santa Maria;
- Nature park of Sacro Monte di Crea;
- Special nature park of the San Genuario swamp.

Saluggia nuclear complex

The complex, which includes the Sogin site, the ENEA research centre, the LivaNova research and development site and the Avogadro depot is located near provincial road no. 37 Saluggia - Crescentino, approximately 2 km south-east of Saluggia city centre and on the left bank of the River Dora Baltea.

In view of the short distance between these structures, the restrictions are considered for a shared area of interest.

The geographic area that includes the Complex is affected by the following restrictions and environmental and territorial landscape heritage (Piedmont PPR):

- water course buffer strips (150 m from each shore), restricted in accordance with Art. 146 of Italian Legislative Decree no. 490 of 29 October 1999 (formerly Italian Law no. 431/85);
- territories covered by forests and woodlands, even if crossed or damaged by fire, and those subject to reforestation restrictions, as defined by Article 2, paragraphs 2 and 6 of Italian Legislative Decree no. 227/2001;
- areas of archaeological interest.

The following are also present in the area:

- areas subject to hydrogeological restriction in accordance with Royal Decree no. 3267 of 30 December 1923;
- overflow areas and flood barriers for major disasters, as defined in the Extract Plan for the hydrogeological structure and the Flood Risk Management Plan ("PGRA") prepared by the Po Basin Authority.

More specifically, we note the Area at Significant Risk of Saluggia (ASR on a "district level"), which is immediately upstream of the flow into the Po and is characterised by the presence of two important settlements containing radioactive waste inside the region pertaining to the river, which, in the section in question, is bordered continuously from the edge of the high terrace.

These settlements are located to the left of Dora Baltea in the municipality of Saluggia, in the section running between the railway bridge and the bridge over the Cavour canal and are: the ENEA research centre within which there is the Eurex nuclear power plant and the Sorin industrial complex at which, in the past, the production of radiopharmaceuticals, nuclear research and the collection of radioactive waste took place and where the Avogadro depot is, with the storage of irradiated fuel.

The entire riverside area in question, outlined in bracket B in the Extract Plan for River Areas ("PSFF") - approved by Decree of the President of the Council of Ministers of 24 July 1998) and the Extract Plan for the hydrogeological structure ("HSP" - approved by Decree of the President of the Council of Ministers of 24 May 2001) was affected by extensive flooding in October 2000, during which the flood water, although not directly involving the radioactive depots, effectively surrounded the settlements and involved all access routes to the area.

Following subsequent investigations conducted by the Basin Authority (Feasibility Study of the hydraulic works of Dora Baltea, 2004), the river areas were updated as part of a specific Variant to the HSP extended to the entire river network (Resolution of the Institutional Committee no. 4/2008). This update to the basin planning also considers the defence interventions carried out at the ENEA - EUREX site.

The PGRA, which was approved by Decree of the President of the Council of Ministers of 27 October 2016 reports the boundaries of the flood areas for the high and medium probability scenario (TR 20 and 200 years) in the segment of the water course in question, which was carried out considering the areas that would potentially flood, as outlined in the Feasibility Study (AdbPo, 2004).

For the unlikely or extreme event scenario, consideration was taken of all information available, including, in particular, the bracket C limit of the HSP, the TR 500 full limit of the Feasibility Study and the areas that had flooded during the worst event recorded in history, of 2000. The bank defence works carried out after the events of 2000 and which were considered in outlining the maps of danger levels, are those in the left Dora Baltea, upstream of the Saluggia railway bridge, at the ENEA - Eurex site.

The District ASRs correspond to critical nodes of strategic relevance where the high or very high risk conditions involved settlements of homes and major production plants, numerous service infrastructures and the main communication routes.

High danger level situations, consequent to considerable full capacities and major extension of the areas subject to flooding, require complex interventions to mitigate the risk, which impact the entire hydrographic basin or extensive sectors of the main hydrographic reticulum, thereby requiring the coordination of the policies of several regions. The extension of the district ASR is defined by the perimeter of the areas subject to flooding closed upstream and downstream, along the administrative boundaries of the municipalities that are most exposed to the risk. In some cases, in connection with the continuity of exposure to risk throughout the entire river network, the ASR regards the entire water course or significant portions of it.

The measures of the PGRA can fall both within the scope of the ASR and involve outside areas, generally upstream, with localised works, such as expansion boxes or natural lamination or with diffused interventions, such as maintenance plans. They may be present in areas adjacent to or neighbouring the district ASRs, regional ASRs or local ASRs, in which case the measures envisaged must be coordinated between them.

Finally, near the complex, there are the protected areas and Natura 2000 Sites listed below:

- Area neighbouring the river bracket of the Po - Turin section;
- Nature reserve of the Isle of Ritano (SAC and SPA IT1120013 Isle of Ritano - Dora Baltea);
- Nature reserve of Confluenza della Dora Baltea (SCI and SPA IT1110019 Baraccone - confluence of Po - Dora Baltea);
- Nature Reserve of Mulino Vecchio (SCI IT1110050 Mulino Vecchio - river bracket of the Po).

Campoverde depot

The depot is situated in the municipality of Tortona, in the province of Alessandria, on the right bank of the Stream Scrivia.

The geographic area that includes the depot is affected by the following restrictions and environmental and territorial landscape heritage (Piedmont PPR):

- heritage identified in accordance with Italian Law no. 778/1922 and 1497/1939;
- rivers, streams, water courses entered on the lists envisaged by the consolidated act of the provisions of law on water and electric plants, approved by Royal Decree no. 1775/1933 and the related shores or feet of the banks for a bracket of 150 m each;

- territories covered by forests and woodlands, even if crossed or damaged by fire, and those subject to reforestation restrictions, as defined by Article 2, paragraphs 2 and 6 of Italian Legislative Decree no. 227/2001;
- overflow areas and flood barriers for major disasters, as defined in the Extract Plan for the hydrogeological structure and the Flood Risk Management Plan ("PGRA") prepared by the Po Basin Authority;
- areas of archaeological interest.

Moreover, the SCI/SPA IT1180004 "Greto dello Scrivia" is near the area.

Bosco Marengo plant

The structure falls within the municipality of Bosco Marengo in the province of Alessandria.

The geographic area that includes the depot is affected by the following restrictions and environmental and territorial landscape heritage (Piedmont PPR):

- rivers, streams, water courses entered on the lists envisaged by the consolidated act of the provisions of law on water and electric plants, approved by Royal Decree no. 1775/1933 and the related shores or feet of the banks for a bracket of 150 m each;
- territories covered by forests and woodlands, even if crossed or damaged by fire, and those subject to reforestation restrictions, as defined by Article 2, paragraphs 2 and 6 of Italian Legislative Decree no. 227/2001.

Below is an analysis of the territorial plans and related objectives, for the areas on which the Piedmont plants stand.

Regional urban and special waste management plan from production, commercial and service activities

The Urban waste plan was approved by resolution of the Regional Council no. 140-14161 of 19 April 2016 and was published in the Regional Official Bulletin on 05/05/2016. The Special Waste Plan was approved by resolution of the Regional Council no. 436-11546 on 30 July 1997. Changes and adjustment to comply with current legislation are located in section 2 relative to the Plan for special waste deriving from production, commercial and service activities, approved by resolution of the Regional Council no. 41-14475 of 29 December 2004. The reference legislation, within the context of which the Plan defines its lines of intervention, consists of Italian Legislative Decree no. 22/1997 as subsequently amended and supplemented, Italian Legislative Decree no. 36/2003 and Regional Law no. 24/2002.

The Plan pursues the following objectives:

- to ensure the autonomous management of waste produced on a regional level;
- to ensure the disposal of special waste in locations close to those of production.
- reduction of quantities and danger levels of special hazardous and non-hazardous waste;
- promotion of recovery activities;
- satisfaction of systems needs through the identification of criteria for the siting of recovery and disposal plants.

Regional environmental energy plan ("PEAR")

The Regional environmental energy plan ("PEAR") currently in force is a programming document that was approved by the Regional Council in 2004 and which contains guidelines and strategic objectives in the energy field and specifies the consequent lines of intervention.

The Plan is prepared in implementation of Art. 30 of Italian Legislative Decree no. 112/98, Art. 52 of Regional Law no. 44/2000 and Art. 7 of Regional Law no. 23/2002.

The Plan objectives are:

- to prefer energy production from renewable sources;
- the financing and implementation, in collaboration with research institutes and universities, of research programmes aimed at developing products that can be recycled and production systems that favour the maximum use of secondary raw materials deriving from recycling processes;
- the development of separate waste collection, recycling and reuse of waste, with residual use of waste-to-energy, in accordance with the guidelines of the Regional waste plan and Italian Legislative Decree no. 22/1997 and the recovery of energy from biogas in order to achieve a better environmental balance;
- reduction of energy intensity in the industrial, tertiary and civil sector through the encouragement of interventions aimed at increasing energy efficiency and respect for the environment, with the consequent reduction of economic costs and the reduction of polluting emissions in energy production and transformation processes, including through the use of low-emissions fuel sources;
- support of policies to reconvert thermoelectric and hydroelectric generation plants;
- promotion of energy efficient behaviour, through the support and incentives of qualifying projects aiming to improve the energy efficiency of buildings owned by the regional, provincial and municipal authorities;
- reduction of energy consumption and pollutant emissions in the transport sector, by offering incentive to the progressive replacement of vehicle fleets of public entities with low-emission vehicles and the urban fleets used for public transport with natural gas powered vehicles;
- incentives for innovation and technological research aimed at offering support to experimental and strategic projects, including through the optimisation of existing technological farms and centres, as well as the creation of mixed poles that associate research in the energy-environmental field with the siting of production settlements in areas marked by the presence of important electricity generation infrastructures, such as the area neighbouring the combined cycle plant of Leri Cavour, in the municipality of Trino;
- promotion of information with specific regards to operators and the end consumer;
- promotion of specific training addressed to energy managers pursuant to Art. 19 of Italian Law no. 10/1991, designers and public and private technical-administrative managers, in collaboration with the scientific world and the system of national and local agencies in the energy and environmental protection field;
- abandonment of nuclear technology for energy, with a guarantee of safety in the nuclear power plants of Piedmont for the residual storage of radioactive waste as well as the disposal activities, requesting appropriate comprehensive solutions on a national level for the centralised storage of all radioactive waste;
- allocation of plants according to the priority criterion of the least possible environmental impact, in the general context of town planning and territorial planning, excluding situations of

- excessive concentration and, in particular, the co-existence of waste disposal and processing plants and energy production plants, apart from waste-to-energy solutions.

In 2009, the Regional Council launched a process to revise the Plan, approving the Energy Policy Report that outlines the new trajectories to achieve as at 2020 the objectives regarding the development of renewable sources, the reduction of energy consumption and CO_2 emissions, with the primary objective of maintaining the part of the system fully efficient and function, which is still prevalent in quantitative terms, based on the use of fossil fuels.

In 2015, the "Preliminary document of the PEAR" was proposed for discussion with the "reference values for regional planning" in order to launch the Strategic Environmental Assessment (SEA) process.

The regional strategy outlined in the Preliminary Document of the PEAR mainly envisages the implementation of measures and actions aimed at achieving the European energy policy objectives defined in the "Europe 2020" strategy, in particular through achieving the objective assigned by Ministerial Decree of 15 March 2012 ("Burden Sharing").

The Preliminary Document of the PEAR identifies 4 macro objectives:

- to favour the development of the FER, minimising the use of fossil fuels;
- to reduce energy consumption in final uses;
- to encourage the sustainable strengthening of Energy infrastructures (also with a view to the disseminated generation and smart grids);
- to promote the green economy in order to foster the increase of competitiveness of the regional production system and new work opportunities.

In a parallel fashion, the document envisages the implementation of system actions aimed both at improving the effectiveness of the decision support system, and to provide guidelines to local entities so that they apply the principle of administrative simplification in authorisation processes.

Water protection plan ("PTA")

On 13 March 2007, the Regional Council of Piedmont approved the Water protection plan ("PTA"), which is still in force, an instrument aimed at achieving quality objectives of water bodies and, more general, the protection of the whole of the surface and underground water system of Piedmont (Regional Council Decree 117-10731).

In implementation of Directive 2000/60/EC establishing a framework for Community action in the field of water policy, and national legislation pursuant to Italian Legislative Decree no. 152/1999, subsequently flowed into Italian Legislative Decree no. 152/2006, the PTA constitutes the general planning document that contains the interventions aimed at pursuing the following objectives:

- to prevent and reduce pollution and implement the recovery of polluted water bodies;
- to improve the condition of water and identify suitable protection of that intended for specific uses;
- to pursue sustainable, lasting uses of water resources;
- to maintain the natural capacity for self-purification of the water bodies and the capacity to support extensive, diversified animal and plant communities.

The PTA is a dynamic instrument that, on the basis of the results of the verification programme and the trend of the quality, allows for the update and consequent adjustment of all measures by which to achieve objectives in connection with each hydrographic area. A two-yearly report by the Regional Council explains the steps adopted, the state of implementation of the protection and recovery measures envisaged by the Plan and, consequently, the plan of activities for following years, in order to allow the Board to formulate directives and guidelines by which to pursue the Plan implementation.

Regional plan for the restoration and protection of air quality (“PRQA”)

The Plan, approved according to the objectives and procedures of Regional Law no. 43 of 07 April 2000 is the tool used for programming, coordination and control of matters relating to atmospheric pollution, aimed at the progressive improvement of environmental conditions and the safeguarding of human health and the environment.

The Plan objectives intend to:

- reduce the risk of exceeding the limit values and alarm thresholds for one or more pollutants;
- guarantee compliance with the limits and objectives within the terms established by the legislation;
- preserve and conserve the ambient air quality where the levels of pollutants do not entail a risk of exceeding the limits and objectives established.

Regional landscape plan (“PPR”) and Territorial regional plan (“PTR”)

The Regional landscape plan (“PPR”) regulates the planning of the landscape and, together with the Territorial regional plan (“PTR”) defines the strategic guidelines for the sustainable development of the territory of Piedmont. The PPR is drawn up in line with the provisions of the European Landscape Convention (“ELC”), the Landscape and Cultural Heritage Code and current national and regional legislation, whilst the contents of the PTR are in line with the provisions of Regional Law no. 56/1977 and the PPR.

The general objectives shared by both Plans are:

- *Territorial requalification, protection and optimisation of the landscape*
  - Optimisation of the polycentrism and cultural and social-economic identities of the local systems;
  - safeguarding and optimising biodiversity and the natural-environmental heritage;
  - optimisation of the tangible and intangible cultural heritage of the territories;
  - protection and requalification of the features and identifying image of the landscape;
  - requalification of the urban and periurban context;
  - optimisation of the specificity of rural contexts;
  - safeguarding and integrated optimisation of the river and lake brackets;
  - revitalisation of the mountain and hill;
  - recovery and restoration of the degraded, abandoned and decommissioned areas.
- *Environmental sustainability, energy efficiency*
  - Protection and optimisation of the primary resources: water, air, soil and subsoil, forest heritage;
  - promotion of an efficient energy system;
  - prevention and protection of natural and environmental risks;
  - limitation of production and optimisation of the waste collection and disposal system.
- *Territorial integration of the mobility, communication and logistics infrastructures*
  - Reorganisation of the territorial network of transport, mobility and the related infrastructures;
  - reorganisation and development of the logistics nodes;
  - balanced development of the telematic network.
- *Research, innovation and economic-production transition*
  - Selective promotion of research, technological transfer, services for businesses and specialist training;
  - promotion of local agricultural and agricultural-industrial production systems;

    - promotion of local industrial and artisan production systems;
    - requalification and selective development of tertiary activities;
    - promotion of tourist circuits and networks.
- *Optimisation of human resources and institutional capacities*
    - Promotion of a territorial governance process and promotion of supra-municipal integrated design;
    - optimal organisation of collective services on the territory.

Consolidated text on the protection of natural areas and biodiversity

Regional Law no. 19 of 29/06/2009 defines the methods by which to conserve biodiversity and manage territories that are part of the regional ecological network instituted in compliance with Italian Law no. 394 of 06 December 1991.

The objectives of the Consolidated Text are:

- conservation of biodiversity;
- management and promotion of territories that are part of the regional ecological network.

Planning of the current basin consists of:

- Extract Plan for the Hydrogeological Structure ("HSP") approved by Decree of the President of the Council of Ministers of 24 May 2001, which, over the years, has been updated, subject to variants, supplemented and amended on several occasions, with a view to adjusting it as much as possible to fit with the evolution of the situation currently in progress and the results of studies and additional knowledge developed during the years that followed its coming into force.
- Plan for the management of the hydrographic district of the river Po ("PDGPO"), prepared in accordance with the Water Directive (Directive 2000/60/EC) and approved by Decree of the President of the Council of Ministers of 13 May 2013, introduces the instrument of Operative Planning, both on a district level ("POD") and on a regional level ("POR") in order to standardise and consolidate the implementation of measures in progress with the new measures proposed to favour the achievement of quality objectives for the water bodies.

Extract plan for the hydrogeological structure ("HSP")

The territory in question comes under the competence of the River Po Basin Authority.

The HSP (2001) is the knowledge, regulatory, technical-operative tool by which the actions and rules for use regarding the hydraulic and hydrogeological structure of the hydrographic basin were planned and programmed, in order to guarantee a suitable level of safety with respect to hydraulic and geological dangers.

The HSP identifies specific areas of danger - outlined in the Table of disruption in the hills and mountains and on the Tables of the River Brackets drawn for the River Po and its main plains effluents - in which, on the one hand, it pursues safety objectives for the assets already present and compatible with the flow conditions and expansion of overflows and on the other a severe protection of the conditions of hydraulic function, with a detailed regulation of the uses of soil permitted and the methods by which said uses may develop.

The HSP was immediately current with regards to town and territorial planning, which to a large extent has adjusted to comply with its provisions.

In turn, the Regions and Provinces, under the scope of their competences on Civil Protection matters, considered the risk conditions present in the river areas and hilly and mountainous territories.

The HSP laid down the essential principles for the management of the flood risk in the Padua basin:

- safeguarding of human life;
- identification of acceptable risk levels in connection with the conditions of vulnerability of the populations and territory;
- the achievement of standardised protection levels for all assets.

Flood risk management plan ("PGRA")

The territory in question comes under the scope of the Padua Hydrographic District. The Flood risk management plan, approved by Decree of the President of the Council of Ministers of 27 October 2016, derives from a planning process that was prefigured on a European level back in 2000, with the Framework Water Directive (Directive 2000/60/EC, the "Water Directive"), and which was then specifically encoded in subsequent Directive 2007/60/EC (the Floods Directive), incorporated into the Italian legal order by Italian Legislative Decree no. 49 of 23 February 2010. The PGRA is therefore the instrument introduced by the Floods Directive to reduce the negative impacts of floods on health, the economy and the environment and to favour, after a flood, the prompt reconstruction and post-event assessment.

With reference to the four categories indicated in the Floods Directive, the general objectives of the PGRA can be outlined as follows:

- Protection of human health
  - reduction of risk to human life and/or health;
  - reduction of risk for the operations of structures of social interest that ensure the existence and operation of strategic systems (schools, universities, hospitals, nursing homes, refuges, municipalities, prefectures, barracks, prisons, etc.);
- Environmental protection
  - reduction of risk for areas protected from the negative effects caused by possible pollution in the event of flooding;
  - mitigation of the negative effects for the ecological state of water bodies caused by possible pollution in the event of flooding, with regards to the achievement of the environmental objectives pursuant to Directive 2000/60/EC.
- Protection of cultural heritage
  - Reduction of risk to heritage comprising existing cultural, historic and architectonic heritage;
  - Mitigation of possible damages caused by flooding on the landscape system.
- Protection of economic activities
  - mitigation of damages to the primary infrastructural network (railways, motorways, major roads, regional roads, airports, etc.);
  - mitigation of damages to the economic and production system (both public and private);
  - mitigation of damages to properties;
  - mitigation of damages to systems that enable the maintenance of economic activities (electricity networks and power plants, drinking water networks, water processing plants, purification plants, etc.).

The PGRA of the Po Valley district aims to effectively guide the action to the areas of significant risk, organised and placed in a hierarchy with respect to all areas at risk, to define the safety objectives and intervention priorities on a district level, jointly with all administrations and managers, with the involvement of stakeholders and the public in general.

The plan measures focus on three priority targets:

- to improve the safety of the populations exposed as quickly as possible, using the best practices and the best and most effective technologies available;
- to stabilise in the short-term and reduce in the medium-term, the social and economic damages caused by floods;
- to favour a timely reconstruction and post-event assessment to learn from the information collected.

The PGRA constitutes the strategic framework for the management of floods in the River Po basin, within which the current basin planning has been converged, together with the Civil Guard emergency planning and the regional planning, so as to foster the development of synergies and facilitate and coordinate the flood risk management procedures in place.

The plan has, in fact, taken account of the current organisation of the national system for the prevention, forecasting and management of natural risk to promote joint actions involving state, regional and local authorities.

In order to be effective, the PGRA must therefore be able to activate several levels of government and operations in a coordinated, concomitant manner, and this is why it has been structured on different territorial and operative levels and, consequently, the general objectives are laid out in local strategies and actions to favour the location of the financial resources and activation of a form of governance that is functional to ensuring a timely implementation of risk mitigating actions.

The Plan Report notes the need for further verifications as regard the verification of the hydraulic compatibility of plants at risk of major incident and to implement the provisions of Art. 38 ter of the previous HSP. In actual fact, according to the recognition performed in the SAFE Project and updated as part of the risk mapping activities, in the PRGA, it would appear that the areas subject to flooding have numerous plants located there at risk of major incident as well as storage sites of radioactive waste, hence the danger scenarios must be investigated further, with particularly close attention paid to those of residual risk and the definition of the vulnerability of sites and plants.

Territorial provincial coordination plan (“PTCP”) - Province of Vercelli

The PTCP of the Province of Vercelli is compliant with the provisions of Italian Law no. 142/1990, replaced by the consolidated text on the orders of local autonomies - Italian Legislative Decree no. 267 of 18/08/2000 - and Regional Law no. 56/77 as subsequently amended and supplemented.

The Territorial regional plan (“PTR”) is a supra-ordinate plan with respect to the PTCP; any amendments and supplements to the PTR contained in the PTCP take on the value of a proposed variant to the PTR and shall take effect when the PTCP is approved by the Region of Piedmont.

The PTCP defines the following general objectives:

- environmental protection and optimisation;
- protection from hydrogeological disruption;
- optimisation of the historical-cultural heritage;
- consolidation of the settlement and infrastructural system.

<u>Territorial provincial plan (“PTP”) - Province of Alessandria</u>

The Province of Alessandria has a Territorial provincial plan prepared in accordance with title II of Regional Law no. 56/77 as subsequently amended and supplemented. The final project of the PTP was adopted by the Provincial Council by resolution no. 29/27845 of 03/05/1999. On 19/02/2002, by Resolution no. 223-5714, the Regional Council definitively approved the Territorial provincial plan.

The PTP pursues the following objectives:

1. To establish a reference framework and guidelines for a rational planning of the vast area that is able to define:
   - priorities in terms of major roads and transport;
   - methods for searching for design solutions or common strategies with neighbouring provinces;
   - support for landscape design;
   - reference document able to guide and provide strategies for the operative instruments in the field of activities and services.
2. Supply local administrators a synoptic, reference framework for the interpretation of all restrictions arising from national and regional laws, falling within the provincial territory.
3. Identify throughout the province territory, different levels of criticality in light of the geographic-environmental knowledge (“invariant”, “conditional invariant”, “variant” scopes).
4. Establish a point of reference and guideline for local and sector planning, according to development objectives identified by the Region in the PTR and further verified and specified by the PTP for areas of homogeneous vocation.

REGION OF EMILIA ROMAGNA

The Region of Emilia Romagna hosts two sites:

- the Caorso power plant;
- the radioactive waste depot owned by Protex S.p.A.

Caorso power plant

The power plant is located in the area of Zerbio in the municipal territory of Caorso, approximately 2.5 km north of the town centre, in the portion of the Po Valley on the border between Lombardy and Emilia Romagna, on the right bank of the River Po.

The geographic area that comprises the Plant is affected by the following restrictions and environmental and territorial landscape heritage (Emilia Romagna PTPR):

- Environmental protection areas of lakes, basins and water courses (pursuant to Art. 17), restriction along the River Po, Chiavenna, Riglio, and Nure streams;
- Reservoirs and water courses of lakes, basins and water courses (pursuant to Art. 18), present on the River Po, Chiavenna, Riglio, and Nure streams;
- Surface and underground water body protection areas (pursuant to Art 28), present in the area of Fontanazza and Cascina Morlenzo;
- Areas of special landscape-environmental interest (pursuant to Art. 19), restriction present in some areas along the River Po;
- Areas and elements of particular historic interest: historic urban settlements and historic non-urban settlement structures (Art. 22), restriction present for the town centre of Mortizza, Muradello, Pontenure, Castelvetro Piacentino, Monticelli d'Ongina, S. Nazzaro, Caorso, Polignano, S. Pietro in Cerro.

Moreover, the area is also involved by overflow areas and flood barriers for major disasters, as defined in the Extract Plan for the hydrogeological structure prepared by the Po Basin Authority.

Just a few kilometres from the power plant, there are items of archaeological heritage subject to Art. 10 of Italian Legislative Decree no. 42/2004:

- Direct restriction: "Remains of Roman rustic villa, with Roman republican and late Roman phases"; "Remains of a Roman villa from the early imperial age"; "Remains of a Roman imperial age rustic villa of huge proportions and long-lasting";
- Indirect restriction: "Remains of a Roman villa dating to the early imperial age" approx. 6 km in a south-east direction.

Finally, in the area surrounding the Caorso power plant, there are the protected areas and Natura 2000 Sites listed below:

- Regional Park of Adda Sud;
- Park of the Po and Morbasco;
- SPA IT2090503 Castelnuovo Bocca d'Adda;
- SCI/SPA IT4010018 River Po from Rio Boriacco to Bosco Ospizio;
- SCI IT20A0016 Beaches of Spinadesco;
- SPA IT20A0501 Spinadesco.

Protex s.p.a. depot

The depot is in the eastern industrial area of the town centre of Forlì.

The geographic area that comprises the depot is affected by the following restrictions and environmental and territorial landscape heritage (Emilia Romagna PTPR):

- Surface and underground water body protection area (Art. 28);
- Environmental and water course protection area (Art. 17).

Moreover, the SCI IT4080006 Meandri del Fiume Ronco is near the area.

Below is an analysis of the territorial plans and related objectives, for the areas on which the Emilia Romagna plants stand.

Regional waste management plan ("PRGR")

According to the provisions of Italian Legislative Decree no. 152 of 2006, the Regions are competent to prepare and adopt Waste management plans in compliance with the standards and purposes indicated by the European Community legislator. For the Region of Emilia Romagna, Regional Law no. 23 of 23 December 2011 redefined the optimal territorial scope (pursuant to Articles 147 and 200 of Italian Legislative Decree no. 152/2006), causing it to coincide with the entire regional territory. By virtue of part IV of Italian Legislative Decree no. 152/2006, the Regional waste management plan ("PRGR") is the planning document that aims to standardise the sector instruments in compliance with European Community and national policies, defining guidelines, directives and instructions to be incorporated into the plans, with the general aim of improving the environmental effectiveness of the various waste management operations in the geographic area concerned. The Plan currently in force was approved by resolution of the Regional Assembly no. 67 of 03 May 2016, the plan time frame is through to 2020.

More specifically, the Plan pursues the objective listed below:

- reduction of the production of municipal waste per capita and increased separate waste collection;
- increased recycling capacity of paper, metals, plastic, wood, glass and organic;
- increased separate waste collection of Electrical and Electronic Waste (WEEE) in accordance with Italian Legislative Decree no. 49/2014, implementing Directive 2012/19/EU;
- increased recovery of the organic fraction for the production of quality compost;
- the principle of maximum recovery of material with respect to energy recovery;
- minimisation of the production of municipal waste not sent for recycling and minimisation of disposal as from conferral to a landfill;
- the ban on conferral to a landfill of non-separated waste as-is;
- self-sufficiency for disposal in the regional area of non-hazardous municipal waste and waste deriving from its processing, by making optimal use of existing plants;
- fair territorial distribution of the environmental burdens deriving from waste management.

Regional energy plan ("PER")

The new Regional energy plan ("PER") was approved by the legislative assembly of the Region of Emilia Romagna on 1 March 2017.

The PER establishes the strategies and objectives of the Region of Emilia Romagna for climate and energy through to 2030 on the matter of reinforcing the green economy, energy savings and efficiency, the development of renewable energies, interventions on transport, research, innovation and training.

More specifically, the Plan adopts the European objectives through to 2020, 2030 and 2050 as regards climate and energy. They therefore become strategic for the Region:

- the reduction of climate-altering emissions by 20% by 2020 and 40% by 2030 with respect to the 1990 levels;
- the increase to 20% by 2020 and 27% by 2030 of the portion of cover of consumption through the use of renewable sources;
- the increase in energy efficiency to 20% by 2020 and 27% by 2030.

The sectors on which interventions concentrate to achieve the objectives set by the European Union and incorporated by the PER are that of transport, electricity and thermal, with their knock-on effect on the whole of the regional fabric. More specifically, the main aims are:

- technological improvement and increased efficiency of vehicles thanks to new engines, materials and design models;
- dissemination of vehicles with sustainable fuel technologies: hybrid vehicles (25% car registrations in 2030), natural gas (25%), LPG and electricity (40%);
- development of ICT technologies for a more efficient, safer and more accessible mobility system;
- dissemination of photovoltaic plants and solar technologies (+2.5 GWe between 2014 and 2030);
- development of high yield cogeneration, including fuelled by renewable sources (bioenergies);
- dissemination of bioenergy powered plants (+170 MWe) with a logic for ensuring environmental compatibility (biogas, gasification of the biomass, location in hilly and mountainous areas, etc.);
- progressive electrification of the economy;
- dissemination of heating and cooling plants powered by electricity (heat pumps), possibly coupled with photovoltaic systems;
- development of high yield cogeneration, including fuelled by renewable sources (bioenergies);
- dissemination of devices that consume electricity (ICT technologies, etc.);
- penetration of highly efficient devices in all sectors (e.g. cogeneration);
- progressive growth of construction recovery and energy requalification (in 2030, approximately 90% of buildings subject to recovery and 30% to energy requalification);
- level of penetration of heating technologies more orientated towards heat pumps and efficient biomass plants (new or requalification of existing ones);
- dissemination of consumption management and control systems (in 60% of heat-autonomous homes)

<u>Territorial regional plan (“PTR”)</u>

The Territorial regional plan (“PTR”) is the planning tool with which the Region defines the objectives by which to ensure social development and cohesion, increase the competitiveness of the regional territorial system, guarantee reproducibility, qualification and the optimisation of social and environmental resources.

The general objectives of the PTR that should be substantiated by strategies, actions and policies, are:

- to promote an orderly development of the territory, urban fabrics and production system;
- to ensure that the transformation processes are compatible with safety and the protection of physical integrity and the cultural identity of the territory;
- to improve quality of life and the health of urban settlements;
- to safeguard the areas of high environmental, biological, landscape and historic value;

- to reduce the pressure of settlements on natural and environmental systems, including through suitable interventions to reduce and mitigate the impacts;
- to promote the improvement of environmental, architectonic and social quality of the urban territory through requalification interventions on the existing fabric;
- to envisage the consumption of new territory only where there are no alternatives deriving from the replacement of the existing settlement fabrics or their reorganisation and requalification;
- to promote energy efficiency and the use of renewable energy sources, with a view to helping protect the environment and sustainable development.

Territorial regional landscape plan ("PTPR")

The Territorial regional landscape plan ("PTPR") is a thematic part of the Territorial regional plan ("PTR") and sets itself at the centre as point of reference for regional planning and programming, laying down rules and objectives for the conservation of regional landscapes. The Plan provides environmental, territorial and landscape guidelines and directives, taking the approach adopted by the European Landscape Convention stipulated in Florence in 2000 and ratified by the Italian State by Italian Law no. 14 of 09 January 2006 and according to the guidelines of Italian Legislative Decree no. 42 of 22 January 2004, subsequently amended by Italian Legislative Decree no. 156 and 157 of 2006 and 97/2008.

The general objectives of the PTPR on a regional level are:

- to retain the recognisable features of the historic events of the territory in its complex relations with the populations settled there and their human activities;
- to guarantee the environmental, natural and anthropic quality and its collective use;
- to ensure the safeguarding of the territory and its primary, physical, morphological and cultural resources;
- to identify the action necessary for the maintenance, restoration and integration of the landscape and environmental values, also by means of the implementation of specific plans and projects.

Provincial plan for restoration and protection of air quality ("PPRTQA") - Province of Piacenza

Regional Law no. 3 of 21 April 1999 "Reform of the regional and local system" assigns the delegation of the zoning functions of the territory and planning for the recovery of air quality. In application of these provisions, the provincial air quality recovery plans currently in force have been approved.

The Plan was approved by Regional Council Resolution no. 77 of 15/10/2007 and has been in force since 07 November 2007 (Regional Official Bulletin no. 160 of 07/11/2007).

Whereas by Regional Government Decree no. 43 of 19/01/2004, the Region of Emilia Romagna envisaged the breakdown of regional (and provincial) territory into the following zones:

- Zone A: territory where there is a risk of exceeding the limit value and/or alarm threshold;
- Agglomeration: portion of zone A where the risk of exceeding the limit value and/or alarm threshold is particularly high;
- Zone B: territory where the air quality values are below the limit value.

The general objective of the Plan strategy is to reduce the emissions of pollutants that lead to critical conditions in the agglomeration and zone A, so as to take air quality, where weather conditions are equal, back to within the standards envisaged by the legislation. In Zone B, the ultimate aim is to maintain air quality unaltered, avoiding the flow of emissions from significantly increasing over time.

Alongside the general objective of maintaining air quality, where good, and to improve it in zones where there are critical issues, the plan pursues the following themed objectives:

- production system: to promote the reduction of polluting emissions;
- private mobility: to cool passenger and cargo mobility;
- public transport: to improve its function and efficiency, increasing demand;
- settlement and tertiary system: to improve energy efficiency and yield;
- training and education: to promote information on health, fossil fuel savings and the efficient and appropriate use of energy sources, renewable sources.

Air quality management plan ("PGQA") - Province of Forlí-Cesena

The Plan was approved by Regional Council Resolution no. 84071/175 of 24/09/2007 and has been in force since 24 October 2007 (Regional Official Bulletin no. 156 of 24/10/2007).

The Air quality management plan is the instrument whereby the Province of Forlí-Cesena, on the basis of the regulatory provisions of Italian Legislative Decree no. 351/99 and Italian Legislative Decree no. 183/04, pursues the following objectives:

- to know and asses the state of ambient air quality on provincial territory;
- to have sufficient information on ambient air quality and to ensure that this is made public;
- to maintain air quality, where good, and improve it in other cases in relation to the objectives established by sector legislation, so as to avoid, prevent or reduce damaging effects for human health and the environment as a whole.

Water protection plan ("PTA")

The Water protection plan of the Region of Emilia Romagna was definitively approved by Resolution no. 40 of the legislative assembly on 21 December 2005.

The PTA, in compliance with the provisions of Italian Legislative Decree no. 152/99 and European Directive 2000/60 (Water Framework Directive) is the regional tool aimed at achieving the environmental quality objectives of internal and coastal water in the Region and guaranteeing a sustainable water supply in the long-term.

- The main objectives identified in the PTA are:
- to implement the recovery of polluted water bodies;
- to successfully improve the condition of water and suitable protection of that intended for specific uses;
- to pursue sustainable, lasting uses of water resources, prioritising drinking water;
- to maintain the natural capacity for self-purification of the water bodies and the capacity to support extensive, diversified animal and plant communities.

Planning of the current basin consists of:

- Extract Plan for the Hydrogeological Structure ("HSP") approved by Decree of the President of the Council of Ministers of 24 May 2001, which, over the years, has been updated, subject to variants, supplemented and amended on several occasions, with a view to adjusting it as much as possible to fit with the evolution of the situation currently in progress and the results of studies and additional knowledge developed during the years that followed its coming into force.
- Plan for the management of the hydrographic district of the river Po ("PDGPO"), prepared in accordance with the Water Directive (Directive 2000/60/EC) and approved by Decree of the President of the Council of Ministers of 13 May 2013, introduces the instrument of Operative Planning, both on a district level ("POD") and on a regional level ("POR") in order to standardise and consolidate the implementation of measures in progress with the new measures proposed to favour the achievement of quality objectives for the water bodies.

<u>Hydrogeological structure plan ("HSP")</u>

The site of Caorso comes under the territory of competence of the River Po Basin Authority, whilst the depot owned by Protex S.p.A. comes under that of the Romagna Regional Basins Authority.

The Hydrogeological Structure Plan aims to ensure, through the scheduling of structural works, restrictions, directives, the defence of the soil with respect to hydraulic and hydrogeological disruptions and the protection of the related environmental aspects, in line with the general purposes and as specified under Art. 3 of Italian Law no. 183/89 and with the contents of the Basin Plan established by Art. 17 of the same law.

The general objectives regard:

- the restoration of hydrogeological and environmental balance;
- the recovery of the river environments and the water system;
- the scheduling of the uses of soil for the purpose of defence, stabilisation and consolidation of soils;
- the recovery of the river areas, with particular attention paid to those degraded, including through recreational uses.

The HSP laid down the essential principles for the management of the flood risk in the whole of the Po Valley basin:

- safeguarding of human life;
- identification of acceptable risk levels in connection with the conditions of vulnerability of the populations and territory;
- the achievement of standardised protection levels for all assets.

<u>Regional programme of protected areas and Natura 2000 Sites</u>

The Regional system programme of protected areas and Natura 2000 Sites is prepared in accordance with Art. 12 of Regional Law no. 6 of 17 February 2005, in order to pursue the objective of sustainable development through the care for the territory and protection of natural resources, considering the objectives for the environment and biological diversity fixed by the Convention on biodiversity signed in Rio de Janeiro on 05 June 1992 (ratified in accordance with Italian Law no. 124/1994), the European Community programmes of environmental action, the European Community Directives 79/409/EEC and 92/43/EEC and their national incorporation and in compliance with Italian Law no. 394/1991 (Framework Law on Protected Areas).

The general objectives of the Programme are:

- to conserve, protect, restore and develop the function of the ecosystems, habitats and natural and semi-natural landscapes for the protection of specific, ecosystem, genetic biological diversity, in consideration of the ecological, scientific, educational, cultural, recreational, aesthetic, social and economic values;
- to promote knowledge and the conservative use of natural, environmental and landscape heritage, in order to enrich the opportunities for civil and cultural growth of the general public;
- to conserve and optimise the places, the historic-cultural identities of the local populations and typical products of protected areas, fostering the active participation of the populations involved by the planning, scheduling and management of their territory;
- to integrate the system of protected natural areas and the Natura 2000 Sites in the unitary strategies for planning environmental, territorial and landscape quality, which promote the sustainable development of Emilia Romagna;
- to help train and ensure the coordinated management of the national system of Natural protected areas, the regional ecological network and national one and the promotion of sustainable actions and projects on a regional, inter-regional and national area for the Protected areas belonging to the territorial systems of the Apennines and the river basin of the river Po.

Flood risk management plan ("PGRA")

The territory in question comes under the scope of the Northern Apennines Hydrographic District. The Flood risk management plan, approved by Decree of the President of the Council of Ministers of 27 October 2016, derives from a planning process that was prefigured on a European level back in 2000, with the Framework Water Directive (Directive 2000/60/EC, the "Water Directive"), and which was then specifically encoded in subsequent Directive 2007/60/EC (the Floods Directive), incorporated into the Italian legal order by Italian Legislative Decree no. 49 of 23 February 2010. The PGRA is therefore the instrument introduced by the Floods Directive to reduce the negative impacts of floods on health, the economy and the environment and to favour, after a flood, the prompt reconstruction and post-event assessment.

With reference to the four categories indicated in the Floods Directive, the general objectives of the PGRA can be outlined as follows:

- *Objectives for the protection of human health*
  - reduction of risk to human life and/or health;
  - reduction of risk for the operations of structures of social interest that ensure the existence and operation of strategic systems (schools, universities, hospitals, nursing homes, refuges, municipalities, prefectures, barracks, prisons, etc.)
- *Objectives for environmental protection*
  - reduction of risk for areas protected from the negative effects caused by possible pollution in the event of flooding;
  - mitigation of the negative effects for the ecological state of water bodies caused by possible pollution in the event of flooding, with regards to the achievement of the environmental objectives pursuant to Directive 2000/60/EC.

- *Objectives for the protection of cultural heritage*
    - reduction of risk to heritage comprising existing cultural, historic and architectonic heritage;
    - mitigation of possible damages caused by flooding on the landscape system.
- *Objectives for the protection of economic activities*
    - mitigation of damages to the primary infrastructural network (railways, motorways, major roads, regional roads, airports, etc.);
    - mitigation of damages to the economic and production system (both public and private);
    - mitigation of damages to properties;
    - mitigation of damages to systems that enable the maintenance of economic activities (electricity networks and power plants, drinking water networks, water processing plants, purification plants, etc.).

The PGRA of the Po Valley district aims to effectively guide the action to the areas of significant risk, organised and placed in a hierarchy with respect to all areas at risk, to define the safety objectives and intervention priorities on a district level, jointly with all administrations and managers, with the involvement of stakeholders and the public in general.

The plan measures focus on three priority targets:

- to improve the safety of the populations exposed as quickly as possible, using the best practices and the best and most effective technologies available;
- to stabilise in the short-term and reduce in the medium-term, the social and economic damages caused by floods;
- to favour a timely reconstruction and post-event assessment to learn from the information collected.

The PGRA constitutes the strategic framework for the management of floods in the River Po basin, within which the current basin planning has been converged, together with the Civil Guard emergency planning and the regional planning, so as to foster the development of synergies and facilitate and coordinate the flood risk management procedures in place.

The plan has, in fact, taken account of the current organisation of the national system for the prevention, forecasting and management of natural risk to promote joint actions involving state, regional and local authorities.

In order to be effective, the PGRA must therefore be able to activate several levels of government and operations in a coordinated, concomitant manner, and this is why it has been structured on different territorial and operative levels and, consequently, the general objectives are laid out in local strategies and actions to favour the location of the financial resources and activation of a form of governance that is functional to ensuring a timely implementation of risk mitigating actions.

The Plan Report notes the need for further verifications as regard the verification of the hydraulic compatibility of plants at risk of major incident and to implement the provisions of Art. 38 ter of the previous HSP. In actual fact, according to the recognition performed in the SAFE Project and updated as part of the risk mapping activities, in the PRGA, it would appear that the areas subject to flooding have numerous plants located there at risk of major incident as well as storage sites of radioactive waste, hence the danger scenarios must be investigated further, with particularly close attention paid to those of residual risk and the definition of the vulnerability of sites and plants.

Territorial provincial coordination plan (“PTCP”) - Province of Piacenza

By deed no. 69 of 02 July 2010, the Provincial Council approved the general variant of the PTCP. The Plan came into force on 29 September 2010 by virtue of the publication of the notice of its approval in the file of the Regional Official Bulletin no. 125 (Second part no. 91).
The general objectives of the Plan involve the following matters:

1. *environmental quality*

- improvement to quality of life thanks to a management and development of the territory that does not exceed the environment carrying capacity;
- to reduce the negative environmental impacts deriving from anthropic activities such as the running out of natural resources and/or their pollution;
- to restore balance to the territory ecosystem structure and slow the loss of biological diversity as an essential element by which to ensure the capacity of living beings and therefore of man to adapt and resist change;
- to control and reduce the risks of seismic, hydraulic and climatic disruption.

2. *quality of the landscape and historic and cultural heritage*

- to recognise the landscape, including in its historic-cultural component, as a fundamental resource of society, the economic system, the provincial territory and to develop knowledge of it as a shared, common heritage underlying all intervention policies;
- to protect the physical and morphological characteristics and cultural resources of the territory, guaranteeing their quality and collective use;
- to identify sustainable development lines of the territory compatible with the values and recognised meanings of the landscape;
- to identify the action necessary to optimise, recover and requalify the properties and areas that have been compromised or deteriorated and to restore the pre-existing values or create new landscape values.

3. *quality of the settlement system*

- to effectively and efficiently respond to the needs of citizens and businesses;
- to support the competitiveness and development of the economic system;
- to guarantee the sustainability of the settlement expansion processes;
- to safeguard and promote the quality of the urban environment.

4. *quality of the rural territory*

- to promote the development of a multifunction sustainable agriculture and the retaining of agricultural activities as territorial measure;
- to preserve soils with a high agricultural vocation, enabling different use only where there are no local alternatives that are technically and economically valid;
- to maintain and develop the economic, ecological and social functions of forestry;
- to promote the safeguarding and optimisation of the rural landscape in its natural-environmental, economic and traditional structural features;
- to optimise the function of the rural space of environmental re-balancing and mitigation of the negative impacts of the urban centres.

5. *quality of mobility and networks*

- to ensure the compatibility of infrastructures and the environmental system, to be pursued both through suitable preventive assessment instruments (starting from the Valsat of this plan) and through the adoption of design solution aiming to minimise the impacts on the urban and natural environment;
- to reinforce the connection between the provincial system and long, tangible and intangible networks, which are gradually outlined in an extra-provincial, regional, national and European context;
- to reinforce the territorial cohesion between the various territorial areas of the provincial system, improving the circulation of people, goods and information within the province, with particular reference to the more isolated areas.

Territorial provincial coordination plan ("PTCP") - Province of Forlí-Cesena

In 2001, the Provincial Administration of Forlí-Cesena adopted a Territorial provincial coordination plan "Landscape investigations in implementation of Art. 7 of the PTPR", approved by the Region of Emilia Romagna by Regional Government Resolution no. 1595 of 31/07/2001.

The general objectives of the Plan are divided up into three areas:

1. *Preservation of the natural and environmental system*
   - Safeguarding of the environment, climate, forests and the principle of environmental sustainability and sustainable development, through an in-depth knowledge of the territory's characteristics, its current state and the evolutionary processes that mark it;
   - framework of environmental systems and resources, as well as their degree of reproducibility and vulnerability;
   - definition of the conditions of sustainability of settlements with respect to the quantity and quality of surface and underground water, the hydraulic and hydrogeological critical issues with the territory, the water supply and the capacity for waste water disposal;
   - to establish guidelines and directives for the development of ecological and environmental measures in the urban and peri-urban areas, of ecological networks and spaces for regeneration and environmental compensation;
   - to identify, in line with the provisions of the Basin plans, the territorial areas characterised by hydrogeological disruption, potential geological instability and hydraulic danger levels.
2. *Objective for the settlement and infrastructural system*
   - to identify the settlement system so as to define the relevant physical and functional structure, to improve its overall function;
   - to indicate the sub-provincial territorial areas within which it is appropriate to develop forms of coordination of the municipal planning and programming instruments and functional integration policies;
   - to structure the regulations of territorial measures in relation to the role played by the centres;
   - to structure the overall areas for equipment and collective spaces;
   - to create works and interventions that go towards improving the quality of the urban environment, mitigating the negative impacts generated by atmospheric, water, acoustic, electromagnetic pollution, etc.
3. *Objectives for the rural territory*
   - to promote the development of sustainable, multifunction agriculture;
   - to preserve soils of high agricultural vocation;
   - in marginal areas, to promote the continuation of agricultural activities and the maintenance of a vital rural community as territorial measure, encouraging the development of complementary activities in agricultural businesses;
   - to maintain and develop the economic, ecological and social functions of forestry;
   - to promote the protection of the soil and hydrogeological, geological and hydraulic structures and safeguard the safety of the territory, the natural and environmental resources;
   - to promote the optimisation and safeguarding of the rural landscape in its economic and traditional structural features;
   - to optimise the function of the rural space of environmental re-balancing and mitigation of the negative impacts of the urban centres.

REGION OF LOMBARDY

The following sites are present on the territory:

- Milan Polytechnic University CESNEF reactor;
- radioactive waste depot managed by Campoverde s.r.l. (MI);
- ISPRA Joint Research Centre (VR);
- LENA reactor (PV).

CESNEF reactor

The reactor used for research purposes is in the laboratories of Milan Polytechnic University in Piazzale Leonardo and is managed by the Energy Department.

Near the plant, there is the environmental and territorial landscape heritage and restrictions (Lombardy PTR) described below.

- Landscape restriction (Italian Law no. 1497/39):
  - "Porta Magenta zone; Foro Bonaparte zone; Sforzesco castle - park and arena; district of Brera characterised by Mediaeval traces and the area of Ca Grande with the late Mediaeval block and pre-existing Roman findings";
  - "zone of Corso Venezia with nineteenth century buildings and gardens";
  - "zone of Via Benedetto Marcello; zone between Piazzale Bacone, Via Morgagni and Piazza Lavater with liberty building, gardens and streets and block in Corso Vercelli of Milan-style architecture from the start of the century";
  - "area of Piazza Duomo and the historic centre".
- Archaeological restrictions (Italian Legislative Decree no. 42/04): presence of multiple protected areas.
- Buffer area of protected water courses (Italian Legislative Decree no. 42/2004);
- overflow areas and flood barriers for major disasters, as defined in the Extract Plan for the hydrogeological structure prepared by the Po Basin Authority;
- Territories bordering with the lakes.

Moreover, in the area surrounding the plant, there are the protected areas listed below:

- North Milan regional park;
- South Milan agricultural park;
- East park "delle Cave";
- Park of Media valle del Lambro.

Campoverde s.r.l. depot

The depot is in the south-east outskirts of the municipality of Milan, near the airport of Milan Linate and the River Lambro.

Near the plant, there is the environmental and territorial landscape heritage and restrictions (Lombardy PTR) described below.

- Landscape restriction (Italian Law no. 1497/39):
  - “zone of Corso Venezia with nineteenth century buildings and gardens”;
  - “zone of Via Benedetto Marcello; zone between Piazzale Bacone, Via Morgagni and Piazza Lavater with liberty building, gardens and streets and block in Corso Vercelli of Milan-style architecture from the start of the century”;
  - “area of Piazza Duomo and the historic centre”;
  - “zone of Chiaravalle including the abbey and vast areas with meadow crops”.
- Buffer area of protected water courses (Italian Legislative Decree no. 42/2004);
- Overflow areas and flood barriers for major disasters, as defined in the Extract Plan for the hydrogeological structure prepared by the Po Basin Authority.

Moreover, near the area, there are the protected areas listed below:

- South Milan agricultural park;
- Levadina WWF oasis.

ISPRA joint research centre (RC)

The Research centre covers a vast area within the municipality of Ispra, in the province of Varese, in a piedmont area that falls between Lake Maggiore (to the west) and Lake Monate (to the east).

The geographic area that includes the centre is affected by the following restrictions and environmental and territorial landscape heritage (Lombardy PTR):

- Heritage and property of considerable public interest (Italian Legislative Decree no. 42/04);
- Area of considerable public interest (Italian Law no. 1497/39);
- Buffer area of protected water courses (Italian Legislative Decree no. 42/2004);
- Territory bordering with the lakes (Italian Legislative Decree no. 42/04);
- Archaeological restrictions (Italian Legislative Decree no. 42/04): at Lake Monate, there are two prehistoric archaeological sites (the “Prehistoric pile-dwelling settlements of the ‘Sabbione’” and the “Prehistoric pile-dwelling settlement of the ‘Occhio’”.

Moreover, in the area surrounding the Site, there are the protected areas and Natura 2000 Sites listed below:

- Ticino Valley UNESCO-MAB (Man & Biosphere Reserve) and Regional Park;
- Regional natural monument of Sasso Cavallaccio;
- Quassa Gulf park;
- SCI IT2010006 Lake Biandronno
- SCI IT2010017 Bozza - Monvallina swamp;
- SCI IT2010021 Sabbie d'Oro;
- SPA IT2010502 Reeds of Lake Maggiore.

LENA reactor (PV)

This is a research reactor of the University of Pavia, managed by the Laboratory of Applied Nuclear Energy (LENA) from which it takes its name, and situated in the north-west outskirts of the city of Pavia.

The geographic area that includes the plant is affected by the following restrictions and environmental and territorial landscape heritage (Lombardy PTR):

- Area of considerable public interest (Italian Law no. 1497/39) - a restricted zone of the River Ticino, including various landscape areas; the zone of the “visconteo” park;
- Buffer area of protected water courses (Italian Legislative Decree no. 42/2004);
- overflow areas and flood barriers for major disasters, as defined in the Extract Plan for the hydrogeological structure prepared by the Po Basin Authority.

Moreover, in the area surrounding the plant, there are the protected areas and Natura 2000 Sites listed below:

- Ticino Valley UNESCO-MAB (Man & Biosphere Reserve);
- Lombardy park of the Ticino Valley;
- Garzaia della Carola nature reserve;
- Negri forest LIPU oasis;
- SCI IT2080014 Siro Negri e Moriano forest;
- SCI/SPA IT2080018 Garzaia della Carola;
- SPA IT2080301 Ticino forest.

Below is an analysis of the territorial plans and related objectives, for the areas on which the Lombardy plants stand.

Regional waste management plan (“PRGR”)

By Regional Government Decree no. 1990 of 20 June 2014, the Regional Council of Lombardy approved the new Regional waste management plan ("PRGR”), complete with the Regional Reclamations Plan. The Plan, which goes towards the implementation of European Community programmes for sustainable development, represents the programming tool whereby the Region of Lombardy defines, in an integrated manner, the policies for the prevention, recycling, recovery and disposal of waste, as well as the management of polluted sites requiring reclamation.
The document is divided up into three main sections: the first provides valuable information on waste production and management, clarifies what waste is, what the types of waste are and the quantities produced in the Region, what the objectives are laid down by Europe and how the Region intends to proceed to achieve them.
The second section investigates waste processing methods, with particular attention paid to regional plants and recovery and recycling processes.
Finally, the last section defines the future of waste, which is imagined for the region: important objectives are set of prevention and reduction of the production of waste, improvement of separate waste collection, increasing the efficiency of existing plants and protecting the territory in the siting of plants.

Regional environmental energy plan (“PEAR”)

The PEAR is the strategic planning tool (Regional Law no. 26/2003) whereby the Region of Lombardy defines the methods to cope with the commitments made through to 2020 by the European Union by the “Climate Action”.

The Programme, which was approved in 2015, operates in line with the objectives involving the development of renewable sources identified for regions (through the so-called “Burden Sharing Decree”) and the new framework of measurements for energy efficiency envisaged by Italian Legislative Decree no. 102/2014 incorporating Directive 27/2012/EC (also known as the EED Directive).

The PEAR also adopts, setting them out in objectives and “system interventions”, the guidelines defined by the European Union under the scope of the regulatory framework relating to the European Regional Development Fund 2014-2020, which combines energy and environmental objectives with economic (growth, GDP, innovation, etc.) and social (new employment, better quality of life, etc.) ones.

The regional energy strategy also comes within the European and national context outlined previously, adopting some of the priorities identified by the SEN (National energy strategy) through to 2020;

- the promotion of energy efficiency;
- the sustainable development of renewable energy;
- the development of the electricity market, fully integrated with the European one.

On a regional level, it also adopts three of the four main objectives of the SEN:

- the significant reduction in the cost of energy gap for consumers and businesses, with an alignment with European energy prices and costs;
- the achievement and surpassing of the environmental objectives defined in the European Climate-Energy Package 2020;
- the boost to sustainable economic growth through the development of the energy segment and energy saving related chains.

Water protection plan (“PTA”)

With the approval of Regional Law no. 26 of 12 December 2003 as subsequently amended and supplemented, the Region of Lombardy indicated the Water protection plan as the tool by which to plan the qualitative and quantitative protection of water. The Plan is prepared in line with the hydrographic district plan. The PTA consists of Guidelines and a Programme for the protection and use of waters (“PTUA”). The Programme for the protection and use of waters was adopted by Resolution no. 1083 on 16 November 2005.

By Regional Government Decree no. 3539 of 08/05/2015, the procedure began to approve the Regional water protection plan (“PTA”) and related Strategic Environmental Assessment (SEA).

By Regional Government Decree no. 6027 of 19 December 2016, the proposed PTUA was acknowledged, whose revision process formally began in May 2015.

The Guidelines to the policy for the use and protection of waters of the Region of Lombardy indicate the strategic objectives of the regional policy in the sector, in line with that envisaged by the Regional Development Programme of the VII legislature, the Economic and Financial Programming Documents and European and national legislation.

More specifically, the specified Deed envisages that, in order to develop a “policy aimed at the sustainable use of the water system, optimising and protecting the water resource as a common good, a guarantee not only of the conservation of a heritage that has some unique traits, but also of social-economic development, the following strategic objectives shall be pursued:

- the priority protection of underground water and lakes, due to their unique value, also in relation to current and future drinking water supplies;
- the use for the production of drinking water and the safeguarding of all surface water collected to this end and of that envisaged as sources of procurement by planning;
- the suitability for bathing for all major pre-Alpine lakes and their emissary water courses;
- the designation as suitable for the life of fish of the great pre-Alpine lakes and water courses with good or sufficient quality;
- the development of unconventional uses of water, such as recreational uses and navigation and the protection of the connected ecosystems and water bodies;

- the balance of water for surface and underground waters, identifying and intervening in particular on over-exploited areas.

Regional plan of air quality interventions ("PRIA")

The planning and programming document called the "Regional plan of air quality interventions" ("PRIA") is compliant with the provisions of Directive 2008/50/EC incorporated by Italian Legislative Decree no. 155 of 13 August 2010, as specifically envisaged by said Regional Council Resolution 891/09. In the session held on 06 September 2013, by resolution no. 593, the Council definitively approved the PRIA. The PRIA is therefore the planning and programming instrument for the Region of Lombardy that covers the protection of air quality in accordance with current national and regional legislation.

As regards the identification of the strategic objectives and the general and specific objectives, the Guidelines pursuant to Regional Council Resolution no. 891/09 is the starting point to which reference is made. The strategic objective, envisaged by Regional Council Resolution no. 891/09, for the regional air quality policies, is to achieve quality levels that do not entail any risks or significant negative impacts on human health and the environment. This objective is fully in line with that required by national standards. The general regional programming objectives for air quality therefore remain:

- to bring back within the limit values, the areas and agglomerations where the level of one or more pollutants currently exceeds these references;
- to preserve air quality from worsening in the areas and agglomerations in which the levels of pollutants are permanently below these limits values.

It therefore follows that the immediate objective of the regional action is to constantly and progressively improve the state of air quality, implementing measures that reduce the emissions of the various sectors. The reduction of emissions and the consequent improvement to air quality is the first direct objective of the PRIA.

Territorial regional plan ("PTR")

In application of Art. 19 of Regional Law no. 12/2005, the Territorial regional plan ("PTR") has the nature and effects of a landscape territorial plan in accordance with national legislation (Italian Legislative Decree no. 42/2004). In this sense, the PTR incorporates, consolidates and updates the current Territorial regional landscape plan ("PTPR") in force in Lombardy since 2001, supplementing it and adapting the descriptive and regulatory contents and confirming the general set-up and purpose of protection.

The Territorial regional plan is the territorial governance and planning instrument in the region of Lombardy and represents the shared base on which the Lombardy stakeholders can coordinate their activities.

The Regional landscape plan thus becomes a specific section of the PTR, its landscape regulation, in any case maintaining its unitary identity.

The objective is therefore to draw attention to the landscape and landscape quality of the places in a more incisive manner in all plans, programmes and projects that act on the territory, i.e. to ensure that there is a widespread awareness of the value of the existing landscape, which requires protection and/or optimisation and with respect to new landscapes being constructed.

Protected areas regional plan (“PRAP”)

The Protected areas regional plan provides the essential guidelines to the regional management and technical-financial planning of the protected areas and the guidance of the planning and management of the managing entities. The PRAP is an essential tool in preserving protected areas, whose reference regulatory context consists of Regional Law no. 86 of 1983, concerning the “General plan of protected regional areas. Rules for the establishment and management of nature reserves, parks and monuments and areas of particular natural and environmental importance”. Art. 3bis of the Law envisages the PRAP as a guidance and technical-financial planning tool of actions necessary to the optimisation of the regional system of protected areas and defines the procedure for its approval.

The general objectives of the PRAP, which seek to increase biodiversity in Lombardy are, in short:

- to develop a shared vision of the strategic guidelines and objectives for the conservation and optimisation of the system of Protected Regional Areas, in line with the Regional Ecological Network;
- to guide political choices in a changing social-economic scenario;
- to coordinate the Protected Regional Areas system with the counterpart international, national and extra-regional systems;
- to spread awareness of the indivisibility of conservation and development;
- to implement the natural-environmental objectives of the PTR;
- to identify the specific objectives for the types of areas and individual protected areas;
- to propose the identification of new protected areas in connection with the Regional Ecological network;
- to define the indicators for the monitoring of objectives and intervention structures envisaged;
- to promote the design and management capacity in collaboration with stakeholders.

Extract plan for the Hydrogeological Structure (“HSP”)

The territory in question comes under the competence of the River Po Basin Authority.

The HSP (2001) is the knowledge, regulatory, technical-operative tool by which the actions and rules for use regarding the hydraulic and hydrogeological structure of the hydrographic basin were planned and programmed, in order to guarantee a suitable level of safety with respect to hydraulic and geological dangers.

The HSP identifies specific areas of danger - outlined in the Table of disruption in the hills and mountains and on the Tables of the River Brackets drawn for the River Po and its main plains effluents - in which, on the one hand, it pursues safety objectives for the assets already present and compatible with the flow conditions and expansion of overflows and on the other a severe protection of the conditions of hydraulic function, with a detailed regulation of the uses of soil permitted and the methods by which said uses may develop.

The HSP was immediately current with regards to town and territorial planning, which to a large extent has adjusted to comply with its provisions.

In turn, the Regions and Provinces, under the scope of their competences on Civil Protection matters, considered the risk conditions present in the river areas and hilly and mountainous territories.

The HSP laid down the essential principles for the management of the flood risk in the Po Valley basin:

- safeguarding of human life;
- identification of acceptable risk levels in connection with the conditions of vulnerability of the populations and territory;
- the achievement of standardised protection levels for all assets.

<u>Flood risk management plan ("PGRA")</u>

The territory in question comes under the scope of the Hydrographic District of the Po Valley. The Flood risk management plan, approved by Decree of the President of the Council of Ministers of 27 October 2016, derives from a planning process that was prefigured on a European level back in 2000, with the Framework Water Directive (Directive 2000/60/EC, the "Water Directive"), and which was then specifically encoded in subsequent Directive 2007/60/EC (the Floods Directive), incorporated into the Italian legal order by Italian Legislative Decree no. 49 of 23 February 2010. The PGRA is therefore the instrument introduced by the Floods Directive to reduce the negative impacts of floods on health, the economy and the environment and to favour, after a flood, the prompt reconstruction and post-event assessment.

With reference to the four categories indicated in the Floods Directive, the general objectives of the PGRA can be outlined as follows:

- Objectives for the protection of human health
  - reduction of risk to human life and/or health;
  - reduction of risk for the operations of structures of social interest that ensure the existence and operation of strategic systems (schools, universities, hospitals, nursing homes, refuges, municipalities, prefectures, barracks, prisons, etc.)
- Objectives for environment protection
  - reduction of risk for areas protected from the negative effects caused by possible pollution in the event of flooding;
  - mitigation of the negative effects for the ecological state of water bodies caused by possible pollution in the event of flooding, with regards to the achievement of the environmental objectives pursuant to Directive 2000/60/EC.
- Objectives for the protection of cultural heritage
  - Reduction of risk to heritage comprising existing cultural, historic and architectonic heritage;
  - Mitigation of possible damages caused by flooding on the landscape system.
- Objectives for the protection of economic activities
  - mitigation of damages to the primary infrastructural network (railways, motorways, major roads, regional roads, airports, etc.);
  - mitigation of damages to the economic and production system (both public and private);
  - mitigation of damages to properties;
  - mitigation of damages to systems that enable the maintenance of economic activities (electricity networks and power plants, drinking water networks, water processing plants, purification plants, etc.).

The PGRA of the Padua district aims to effectively guide the action to the areas of significant risk, organised and placed in a hierarchy with respect to all areas at risk, to define the safety objectives and intervention priorities on a district level, jointly with all administrations and managers, with the involvement of stakeholders and the public in general.

The plan measures focus on three priority targets:

- to improve the safety of the populations exposed as quickly as possible, using the best practices and the best and most effective technologies available;
- to stabilise in the short-term and reduce in the medium-term, the social and economic damages caused by floods;
- to favour a timely reconstruction and post-event assessment to learn from the information collected.

The PGRA constitutes the strategic framework for the management of floods in the River Po basin, within which the current basin planning has been converged, together with the Civil Guard emergency planning and the regional planning, so as to foster the development of synergies and facilitate and coordinate the flood risk management procedures in place.

The plan has, in fact, taken account of the current organisation of the national system for the prevention, forecasting and management of natural risk to promote joint actions involving state, regional and local authorities.

In order to be effective, the PGRA must therefore be able to activate several levels of government and operations in a coordinated, concomitant manner, and this is why it has been structured on different territorial and operative levels and, consequently, the general objectives are laid out in local strategies and actions to favour the location of the financial resources and activation of a form of governance that is functional to ensuring a timely implementation of risk mitigating actions.

The Plan Report notes the need for further verifications as regard the verification of the hydraulic compatibility of plants at risk of major incident and to implement the provisions of Art. 38 ter of the previous HSP. In actual fact, according to the recognition performed in the SAFE Project and updated as part of the risk mapping activities, in the PRGA, it would appear that the areas subject to flooding have numerous plants located there at risk of major incident as well as storage sites of radioactive waste, hence the danger scenarios must be investigated further, with particularly close attention paid to those of residual risk and the definition of the vulnerability of sites and plants.

Territorial provincial coordination plan (“PTCP”) - Province of Milan

The coming into force in 2005 of the Regional Law governing the territory, which redefined the matter overall, the system of competences and instruments, for the Provincial Authority of Milan provided a concrete opportunity to embark on a re-interpretation of the objectives and actions of the territorial coordination plan, in light of the effectiveness shown by the operation of the plan and consolidation of their sharing with those responsible for the territorial transformation and, above all, stimulated an in-depth reflection on supra-municipal scale planning.

The key objective for the PTCP is “quality”, intended as a complex concept involving aspects relating to landscape, environmental, aesthetic-perceptive, functional and relational aspects. The matter of open spaces and fringe areas is particularly important, together with that of environmental and spatial quality of the urban settlements.

The macro-objectives reformulated by the adjusted PTCP and listed under Art. 3 of the implementing regulation are as follows:

macro-objective 01
Landscape-environmental compatibility of transformations. To verify the siting choices of the settlement system, ensuring the protection and optimisation of the landscape, its elements and the environmental results, the defence of the soil and the protection of agriculture and its potential, making the most of the opportunities to reverse the deterioration processes currently underway.

macro-objective 02
Rationalisation and sustainability of the mobility system and its integration with the settlement system. To verify the coherence between the dimensions of the interventions and functions settled with respect to the different levels of accessibility, assessed according to the presence and capacity of the public and private transport of persons, goods and information, and to verify the environmental and economic sustainability of any specific greater requirements brought about by settlement forecasts.

macro-objective 03
Strengthening of the ecological network. To encourage the development of a system of conservation interventions and actions to strengthen biodiversity and safeguard non-built up openings, which are essential to the network and ecological corridors.

macro-objective 04
Polycentricism, reduction and qualification of soil consumption. To encourage the densification of the urban form, the recovery and restored function of the areas that have been decommissioned or which have deteriorated, the compacting of the urban form, conferring a consolidated destination, which privileges the green permeable surface over the free landlocked areas and in general which fall within the consolidated urban fabric. If the areas involved by forecast transformations by public or private initiative are not implemented, encourage a return to the agricultural use. To exclude processes joining the various built-up centres and the linear settlements along the infrastructures.

macro-objective 05
Raising the quality of the environment and living area. To foster a correct relationship between settlements and public and private services of public use, including through the increase of areas for public services, particularly green areas. To protect the identity and cultural values of the places. To foster the environmental requalification of the deteriorated areas and support to high quality urban and architectonic design and environmentally-sustainable and bioclimatic construction. To foster the use of compensatory and equalising town planning techniques on a municipal and supra-municipal level for the pursuit of the macro objective.
macro-objective 06
Increase in social housing in response to the need for accommodation and promotion of the house plan. To favour the diversification of the settlement offer in order to respond to the demand for social housing for households who cannot access the free property market. To foster high urban and architectonic quality social housing, integrated into the existing urban fabric and virtuous drivers for the recovery of the outskirts. To envisage the location of areas to be used for social housing interventions and the introduction into local planning instruments of town planning mechanisms that foster the development of the interventions.

Territorial provincial coordination plan ("PTCP") - Province of Pavia

In accordance with the law, the PTCP is the reference framework and instrument used to coordinate territorial policies and choices on a supra-municipal level, made by various entities (Provincial Authority and Municipal Authority first and foremost) and players on the territory.

The Province of Pavia has a Provincial Coordination Territorial Plan prepared according to the directives included in Regional Law 12/2005.

The Territorial provincial coordination plan is the planning instrument that defines the general objectives relative to the structure and protection of the provincial territory, guides the social-economic planning of the Province, coordinates the sector policies for which the province is competent and municipal town planning.

According to the sharing of objectives and the participation in the management of choices, the PTCP adopts the principle of a subsidiary nature in relations with local entities.

The system of objectives is based on general objectives, divided up into three systems: production and settlement, infrastructures and mobility, landscape and environment.

Territorial provincial coordination plan ("PTCP") - Province of Varese

The PTCP inspires the preparation of a document seeking to summarise multiple interests in a single unit, along with opportunities for action that may emerge from the territory, yet without assigning itself exclusive protection, use and transformation of the territory, instead also allowing for the use of other instruments and procedures, thereby avoiding rigidity and risks of preclusion with regards to possible forms of learning and innovation.

The objectives below have been defined starting from the desire to mainly act as a guide to provincial development

- to foster innovation in the provincial economic structure;
- more incisive connection between training/university and businesses;
- to optimise the role of Varese agriculture;
- to develop tourism and territorial marketing;
- to promote urban quality and the territorial system.

REGION OF LAZIO

The regional territory includes:

- the site of the former nuclear power plant of Latina, in Borgo Sabotino (LT);
- the site of Casaccia in the province of Rome, within which there are:
  - the IPU and OPEC plants;
  - the ENEA research centre;
  - the NUCLECO complex for the processing, packaging and deposit of radioactive waste.

Latina plant

The Plant is in Borgo Sabotino, a division of the municipality of Latina, approximately one kilometre from the Lazio coastline that faces out onto the Tyrrhenian Sea.

The geographic area that comprises the Plant is affected by the following restrictions and environmental and territorial landscape heritage (Table B, Lazio PTPR):

- Areas protected by the law (Art. 134, paragraph 1 letter b and Art. 142 paragraph 1 Italian Legislative Decree no. 42/04):
  - forest areas (Art. 10 Regional Law 24/98);
  - areas of archaeological interest already identified - timely assets and related buffer zone (Art. 13, paragraph 3, letter A, Regional Law 24/98);
  - public water courses (Art. 7, Regional Law 24/98) and related buffer zone;
- Areas and properties typified by the Plan (Art. 134, paragraph 1, letter c, Italian Legislative Decree no. 42/04):
  - hamlets that form the identity of rural architecture (Art. 31 bis, 1, Regional Law 24/98, Regional Law 27/2001);
  - individual assets forming the identity of rural architecture and related buffer zone of 50 metres (Art. 31 bis, 1, Regional Law 24/98, Regional Law 27/2001);
- Properties and areas of considerable public interest (Regional Law 37/83, Art. 14, Regional Law 24/98 - Art. 134, paragraph 1, letter a, Italian Legislative Decree no. 42/04 and Art. 136, Italian Legislative Decree no. 42/04):
  - vast area with traditional aesthetic value, panoramic beauty (Art. 136, Italian Legislative Decree no. 42/04);
- coastal and lakeside territories (300 m from the shoreline) (Italian Legislative Decree 42/2004, formerly Italian Law no. 431/85).

Outside the Plant area, there are areas subject to hydrogeological restriction in accordance with Royal Decree no. 3267 of 30 December 1923 and perimeters linked to the flood risk pursuant to the HSP of the Regional Basins Authority of Lazio, flowed into the PGRA of the Central Apennines.

Moreover, in the area surrounding the Latina power plant, there are the protected areas and Natura 2000 Sites listed below:

- National park of Circeo, instituted with Royal Decree no. 285 of 25/01/1934;
- Foglino forest - SCI2 IT6030047;
- Torre Astura coastline - SCI IT6030048;
- Wetlands in W. del F. Astura - SCI IT6030049;
- Sea bed between Torre Astura and Capo Portiere - SCI IT6000011;
- Sea bed between Capo Portiere and Lake Caprolace-mouth- SCI IT6000012;

- Lakes Fogliano (including wetlands instituted by DMAF 16/01/1978), Monaci, Caprolace and Pantani dell'Inferno - SCI IT6040012;
- Dunes of Circeo - SCI IT6040018.

Enea Casaccia Research Centre nuclear complex (RM)

The reference area is along via Anguillarese, approximately 25 km north-west of Rome, near Lake Bracciano. The restrictions instituted near the area of interest are the same for the three types of structures considered: the IPU and OPEC plants managed by SOGIN S.p.A.; the ENEA research centre; the NUCLECO complex.

The perimeter of the Research Centre borders with the buffer strips relative to some timely and linear architectonic and archaeological heritage. More specifically, the following restrictions are noted:

- Landscape-environmental restriction pursuant to Art. 136 of Italian Legislative Decree no. 42/2004 (formerly Italian Law no. 1497/39) instituted with Ministerial Decree of 22/05/1985 - Declaration of considerable public interest of the zone Galeria Vecchia, with the surrounding zones in the municipality of Rome (code cd058_122 of the new PTPR);
- Buffer strips for all public water courses of national territory pursuant to Art. 142 of Italian Legislative Decree no. 42/2004 (formerly Italian Law no. 431/85) of 150 m from each of the banks;
- Archaeological restriction with related buffer strip of Casale S. Brigida (code mp058_1368, east of the Centre), which borders the western perimeter of the Centre;
- Landscape restriction on the strip of territory covered by forest vegetation, shrubs and trees in the southern zone of the Centre. This restriction as overcome by the response to municipal observation no. 058091_P275;
- Individual assets that express the identity of rural architecture with related strip of 50 metres from Casale Pantanelle di Sotto (code trp_0413, north of the Plant), Casale Vaccheria (code trp_0414, north-east of the Centre), Casale in via Braccianese at km 8,400 (code trp_0415, south of the Centre).

Moreover, in the area surrounding the Research Centre, there are the protected areas and Natura 2000 Sites listed below:

- Regional nature park of the lake complex of Bracciano - Martignano;
- Natura monument Galeria Antica;
- SPA IT6030085 Bracciano-Martignano Complex.

Below is an analysis of the territorial plans and related objectives, for the areas on which the Lazio plants stand.

Waste management plan for the region of Lazio ("PRGR")

The new Regional waste management plan approved by Regional Government Decree no. 14 of 18 January 2012, which updates the previous plan approved by Regional Council Resolution no. 112 of 10 July 2002, is adjusted to the numerous regulatory innovations that took place following the incorporation of the new European Directive on waste 2008/98/EC, with the general aim of minimising the negative consequences of waste production and management for human health and the environment.

The Plan pursues three specific objectives, to be achieved by 2017, with subsequent updates at least once every six years:

- reduction of waste production at source;
- achievement of separate waste collection percentages in line with those envisaged by the national legislator;
- institution of an Integrated Service of waste collection and disposal plants that is efficient, has the best technology available and seeks to guarantee systems self-sufficiency.

Regional energy plan ("PER")

The energy plan currently in force was approved in 2001 and aims to ensure the competitiveness, flexibility and safety of the Energy and Production System and the rational, sustainable use of resources.

More specifically, the Plan pursues three specific, sector objectives:

- environmental protection;
- development of renewable energy sources;
- rational use of energy and energy savings.

The Plan is currently being updated by the Regional Authority of Lazio, which in 2015 issued a "*Strategic Document for the Energy Plan of the Region of Lazio*".

Water protection plan for the region of Lazio ("PTAR")

The Regional water protection plan is the main planning tool for water; it aims to pursue the maintenance of the integrity of the water resource, in line with the uses of said resources and the social-economic activities of the populations of Lazio. It also contains interventions aiming to guarantee the achievement and maintenance of the objectives of Italian Legislative Decree no. 152/2006, the measures necessary to the qualitative and quantitative protection of the water system.

The Plan was adopted by Regional Council Resolution no. 266 of 02 May 2006 and approved by Regional Council Resolution no. 42 of 27 September 2007 (Ordinary Supplement no. 3 to the "Official Journal" no. 34 of 10 December 2007).

By Regional Council Resolution - number 819 of 28/12/2016, the update of the PTAR was adopted.

The current Plan pursues the maintenance of the integrity of the water resource, insofar as compatible with the uses of the resource for the purposes of quality of life and maintenance of social-economic activities of the populations of Lazio.

More specifically, the Plan update pursues the following objectives:

- To maintain or reach for significant surface and underground water bodies, the objective of environmental quality corresponding to a state classified as "good";
- To maintain, where already existing, a "high" environmental quality;
- To maintain or achieve the quality objectives for the specific purpose for the water bodies with specific intended purpose;
- To maintain or make compliant the water falling within protected areas, with the quality standards and objectives envisaged by regulations;
- To identify the water bodies that have undergone major changes/are artificial, for which a status of "good" quality cannot be reached by 2027.

Air quality restoration plan of the region of Lazio

The Air quality restoration plan, a planning tool whereby the Region of Lazio applies Directive 2008/50/EC, establishes rules aiming to avoid, prevent or reduce the damaging effects for human health and the environment as a whole, determined by the dispersion of pollutants into the atmosphere.

The Plan pursues the following objectives:

- restoration of air quality in the zones where the limits envisaged by legislation are exceeded or there is a major risk of them being exceeded;
- maintenance of air quality in the rest of the territory.

Territorial regional landscape plan (“PTPR”)

The Plan, prepared on the basis of the Landscape and Cultural Heritage Code (Italian Legislative Decree no. 42/2004) and the European Landscape Convention (European Council, Florence, 20 October 2000), is the planning tool through which the methods of landscape governance are regulated, indicating the action taken aiming to conserve, optimise, restore or create landscapes.

The Plan pursues the following general objectives:

- maintenance of the characteristics, constituting elements and morphologies of protected assets, also considering the architectonic types and construction techniques and materials;
- identification of town planning and construction development guidelines that are compatible with the various levels of value recognised and the principle of lesser consumption of the territory and in any case such as not to reduce the landscape value of each area, with particular attention paid to the safeguarding of the sites included on the UNESCO world heritage list and agricultural areas;
- recovery and requalification of properties and areas that have been compromised or deteriorated, in order to restore the pre-existing values and develop new landscape values that are coherent and integrated;
- identification of other interventions to optimise the landscape, also in connection with the standards of sustainable development.

General territorial regional plan (“PTRG”)

The General territorial regional plan (“PTRG”) defines the general and specific objectives of the regional policies for the territory, programmes and sector plans of territorial relevance, as well as interventions of regional interest. These objectives constitute a point of reference for territorial policies adopted by provinces, metropolitan cities, municipalities and other local entities for their respective sector plans and programmes. The following objectives are pursued:

Territory

- to improve the settlement offer for activities involving the regional economy;
- to support industrial activities;
- to optimise agricultural-forestry resources.

Environmental system

- to defend the soil and prevent the different forms of pollution and disruption;
- to protect the environmental, natural and cultural heritage;
- to optimise and requalify the environmental heritage;

- to optimise tourism, support economic development and encourage social use.

Relational system

- to strengthen/integrate the interconnections of the Region with the rest of the world and the regional networks.

Settlement system of strategic assets: superior services and networks

- to guide and support the development and modernisation of the superior functions;
- to guide and support the decentralisation processes and the local development of superior functions throughout regional territory;
- to guide and support the integration processes and exchange between superior functions within and with the rest of the world.

Settlement system of strategic assets: industrial sites and networks

- to guide and support throughout regional territory, the processes being relocated, restructured and modernised of the industrial sites and related transport networks.

Settlement system: settlement morphology, services, residence

- to strengthen and optimise the diversity and identity of the local settlement systems and vast area and the different rules of urban construction in the territory;
- to improve the settlement quality in functional and formal terms;
- to improve the quality and distribution of services.

Administrative and regulatory framework

- to reorganise the territory administration;
- to ensure the programming and planning instruments (PRS and QRT) are suitably managed.

<u>Regional Law no. 29 of 6-10-1997 - Standards regarding protected natural regional areas</u>

The Law lays down rules for the establishment and management of protected natural areas of Lazio, under the scope of the standards of Italian Law no. 394 of 06 December 1991, Articles 9 and 32 of the Constitution and the provisions of the European Union on environmental matters and lasting, sustainable development.

The standard pursues the following objectives:

- to guarantee and promote the conservation and optimisation of areas of particular natural importance in the Region;
- environmental recovery and restoration of deteriorated areas.

<u>Extract plan for the Hydrogeological Structure (“HSP”)</u>

The territory in question comes under the competence of the Lazio Regional Basins Authority. The HSP, in implementation of the provisions of Regional Law 39/96 broaches the problem relating to the defence of soil, with the specific scope of competence being the organic planning of the territory through the defence of the banks and hydraulic regime.

The Plan pursues the following objectives:

- defence and consolidation of the banks and unstable areas;

- defence of homes and infrastructures from mudslides and other such disruptive phenomena;
- defence, arrangement and regulation of water courses;
- defence against flooding;
- ordinary and extraordinary maintenance of works and plants in the hydrogeological sector and conservation of heritage;
- regulation of the territories involved by the interventions in order to offer them environmental protection.

Flood risk management plan ("PGRA")

The territory in question comes under the scope of the Central Apennines Hydrographic District. The Flood risk management plan, approved by Decree of the President of the Council of Ministers of 27 October 2016, derives from a planning process that was prefigured on a European level back in 2000, with the Framework Water Directive (Directive 2000/60/EC, the "Water Directive"), and which was then specifically encoded in subsequent Directive 2007/60/EC (the Floods Directive), incorporated into the Italian legal order by Italian Legislative Decree no. 49 of 23 February 2010. The PGRA is therefore the instrument introduced by the Floods Directive to reduce the negative impacts of floods on health, the economy and the environment and to favour, after a flood, the prompt reconstruction and post-event assessment.

The Central Apennines district has six hydrographic systems and the management plans are therefore prepared for each individual hydrographic system and grouped together to form the district management plan.

The main hydrographic basins of the hydrographic district of the central Apennines are:

- Tevere, already national basin in accordance with Italian Law no. 183 of 1989;
- Tronto, already interregional basin in accordance with Italian Law no. 183 of 1989;
- Sangro, already interregional basin in accordance with Italian Law no. 183 of 1989;
- Lazio basins, already regional basins in accordance with Italian Law no. 183 of 1989;
- Abruzzo basins, already regional basins in accordance with Italian Law no. 183 of 1989;
- Potenza, Chienti, Tenna, Ete, Aso, Menocchia, Tesino and minor basins of the Marche region, already regional basins in accordance with Italian Law no. 183 of 1989.

With reference to the four categories indicated in the Floods Directive, the general objectives of the PGRA can be outlined as follows:

- Objectives for the protection of human health
  - reduction of risk to human life and/or health;
  - reduction of risk for the operations of structures of social interest that ensure the existence and operation of strategic systems (schools, universities, hospitals, nursing homes, refuges, municipalities, prefectures, barracks, prisons, etc.).
- Objectives for environmental protection
  - reduction of risk for areas protected from the negative effects caused by possible pollution in the event of flooding;
  - mitigation of the negative effects for the ecological state of water bodies caused by possible pollution in the event of flooding, with regards to the achievement of the environmental objectives pursuant to Directive 2000/60/EC.
- Objectives for the protection of cultural heritage
  - reduction of risk to heritage comprising existing cultural, historic and architectonic heritage;
  - mitigation of possible damages caused by flooding on the landscape system.

- Objectives for the protection of economic activities
    - mitigation of damages to the primary infrastructural network (railways, motorways, major roads, regional roads, airports, etc.);
    - mitigation of damages to the economic and production system (both public and private);
    - mitigation of damages to properties;
    - mitigation of damages to systems that enable the maintenance of economic activities (electricity networks and power plants, drinking water networks, water processing plants, purification plants, etc.).

<u>Territorial provincial general plan ("PTPG") - Province of Rome</u>
The Territorial provincial general plan ("PTPG") is the instrument that designs the development and indicates the priorities to be assigned when making the planning choices of the 121 municipalities of the province.
With the Territorial provincial general plan, the Metropolitan City of Rome took on competences in matters of town and territorial planning according to current provisions.
The PTPG is effective with regards to any act of programming, transformation and management of the territory involving the provincial interests and, in particular, it is effective with regards to general and sector plans, programmes and projects of the initiative of the Metropolitan City of Rome, the Mountain Communities and with regards to the town planning tools and the determinations of municipalities entailing territory transformations.
The proposals given in the Territorial provincial general plan head in the direction of helping and supporting the metropolitan function of the territorial provincial general plan with polycentric, sustainable development.
Sustainable development, to protect and optimise the major environmental, historic and archaeological resources that make Rome and our metropolitan area, unique worldwide.
Polycentric, to foster the development of services and production farms on a metropolitan level around the major mobility infrastructures, in particular near the railway network.

It tends to develop a correct relationship of integration between Rome and the rest of the territory.

The keywords proposed are:

- organise the metropolitan function of the provincial territory intended as an "integrated system" formed from settlement and functional components that are inter-connected by efficient, dynamic, reticular type relations, differentiated into several levels;
- create the dialectic between the metropolitan system as a whole, the local systems comprising it and the city of Rome, in terms of integration in the diversity of roles and resources;
- to place nature and history as components-value and unchanging aspects characterising the identity of the provincial territory, conditions of environmental sustainability and consistency in the settlement transformations with the historic construction of the territory;
- to promote the metropolitan citizenship, i.e. the sense of belonging to a society, institutions and a project of supra-local dimensions, promoting an inter-municipal nature, cooperation between institutions and participation from the bottom.

<u>Territorial provincial general plan ("PTPG") - Province of Latina</u>
The Territorial provincial general plan ("PTPG") is the main planning instrument on a vast area envisaged by Art. 19 of Regional Law no. 38/99, which fulfils the function of Territorial Coordination Plan in accordance with Art. 15 of Italian Law no. 142/90 and paragraph 2 of Art. 20 of Italian Legislative Decree no. 267/2000, provisions that were recently renewed by Italian Law no. 56/2014.

The general objective of the update of the draft PTPG is to equip the Province of Latina with a strategic planning tool aimed at ensuring sustainable development that is appropriate for the competences established by Italian Law no. 56/14 and in line with the other provinces of Lazio.

The specific objectives are:

- to fulfil the provisions contained in Italian Law no. 56/14, which indicate the reformed competences of the vast area entities, and with connected regional implementing indications, which refer to the legislation of the Territorial Government currently in force (Regional Law no. 38/78);
- to coordinate the different guidelines from both the supra-ordinate regional planning, such as the PTPR or the Extract Hydrogeological Structure Plan, and from the provincial sector plans, with municipal or sub-municipal planning instruments, in compliance with the functions assigned to the PTPG by the territorial government legislation (Regional Law no. 38/99, Art. 23);
- to develop the indications that have emerged during studies carried out with regards to criteria for the transformation of the territory, including under the scope of Strategic Environmental Assessment proceedings in which the Provincial Authority of Latina is called to express an opinion, as Competent Subject on environmental matters, or in the context of other regional sector plans;
- to validate the update through to 2016 of the territorial databases, also according to institutional obligations of transparency and the dissemination of territorial data, able to be achieved through operative internal platforms, like the provincial Webgis institutional site or external sites like that of the regional Open Data of Lazio or the National Geoportal.

<u>Territorial provincial general plan ("PTPG") - Province of Frosinone</u>

The Territorial provincial general plan ("PTPG") protects and promotes the features and values of the provincial territory and guides the transformation and development processes, in line with regional instructions and within the limits of the field of provincial interests, according to four types of objectives selected as strategic:

- widespread optimisation of the environment with requirements of extensive social usability, a condition for sustainable development (environmental system);
- reordering and qualification of the provincial settlement constructions, factor of identity of the local community, in the vast and inter-municipal area dimension in which they appear today (morphological settlement system and town planning);
- modernisation and development of provincial and local functional systems as an offer of sites for new strategic, service production functions, in competitive conditions, of integration and accessibility (functional and relational settlement system);
- efficiency of the system of mobility and public transport and greater specialisation of the networks and equipment at the levels of inter-provincial and provincial relations and local mobility basins (mobility system).

REGION OF CAMPANIA

The site of the Garigliano nuclear power plant is located in the municipality of Sessa Aurunca, in the province of Caserta, approximately 7 km from the Tyrrhenian sea.

The geographic area that comprises the Garigliano Plant in the municipality of Sessa Aurunca is affected by the following restrictions and environmental and territorial landscape heritage:

- Restriction established in accordance with Ministerial Decree 21/09/1984 with Ministerial Decree 28/03/1985 (area including the Roccamonfina volcano complex);
- Restriction established in accordance with Italian Law no. 1497/39 with Ministerial Decree 18/02/1957;
- Restriction established in accordance with Ministerial Decree 21/09/1984 with Ministerial Decree 22/05/1985 (Municipalities of Terracina and Minturno, which constitute a single landscape and natural complex);
- Restriction established in accordance with Italian Law no. 1497/39 with Ministerial Decree 28/08/1959 (Coastal strip in the municipalities of Formia and Minturno with the seashores, Mount Argento with its pine forest and Mount Scauri, which is rich in vegetation, bays, cliffs and overhangs over the sea);
- Restriction established in accordance with Italian Law no. 1497/39 for all coasts and public water courses of national territory for the purpose of Italian Law no. 431/85 (respectively 300 m from the shoreline and 150 m from each of the banks), where not otherwise restricted.

The following protected areas and Sites of Community Importance (SCIs) fall within the Plant area:

- Protected areas:
  - Regional park of Roccamonfina – Mouth of Garigliano established by Regional Council Resolution no. 1406 of 12/04/2002;
  - Sacci-Liri-Garigliano river system.
- SCIs (Sites of Community Importance)
  - River Garigliano (end section) IT6040025 Region of Lazio;
  - Lower River Garigliano IT801002 Region of Campania;
  - Mouth of the River Garigliano IT8010007 Region of Campania;
  - Pine forest of the mouth of the Garigliano IT8010019 Region of Campania;
  - Roccamonfina volcano IT8010022 Region of Campania.
- Archaeological sites and areas:
  - Archaeological park of Sessa Aurunca;
  - Roman villa of S. Limato Cellole.

With reference to the Flood Risk Management Plan (“PGRA”) of the Southern Apennines, it should be noted that the nuclear power plant is on the left bank of the River Garigliano. The area is not subject to flooding directly, but in any case it has some emergency management problems, and is completely surrounded by the river and areas subject to flooding.

Below is an analysis of the territorial plans and related objectives of the area in question.

Regional municipal and special waste management plan of Campania ("PRGR")

The Regional Council of Campania, in the meeting held on 16 December 2016, definitively approved Resolution no. 685 of 06 December 2016, published in the Official Journal of the Region of Campania no. 85 of 12 December 2016, whereby the Regional Council adopted the updates to the Regional plan for municipal waste management ("PRGRU") in accordance with paragraphs 2 and 6 of Art. 15 of Regional Law no. 14/2016, as amended by the proposed amendment submitted during discussion.

The update of the PRGRU starts out from the policy Guidelines approved by Regional Council Resolution no. 381 of 07/08/2015, which provides approximate indications on the levels of separate waste collection to be achieved by 2019 and estimates the needs for processing of the organic portion of separate waste collection, landfill and incineration.

The main priorities are summarised below:

- increased separate waste collection up to 65%, to be pursued by the privileged use of home collection; the promotion of collection centres; the implementation of incentive systems for service users; the preparation of guidelines to standardise collection throughout the territory; training and informing of users;
- financing and development of aerobic treatment plants of the organic portion for municipal consortia services;
- identification of areas to be morphologically requalified, in order to develop disposal sites for the diced wet fraction, following suitable stabilisation in compliance with the provisions laid down by Italian Legislative Decree no. 36/2003.

The update to the PRGRU identifies various different hypotheses for the development of the integrated municipal waste cycle for the period 2016-2020, defining, in particular, some management scenarios (of the municipal waste cycle), which differ, according to:

- the type of management of non-separated municipal waste (type A - guidelines - Regional Government Decree no. 381/2015, type B - Balances of matters relating to the PRGRU 2012, type C - Combined use of MBP plants and the incinerator).
- the percentages of separate waste collection achieved on a regional level (55% - 60% - 65%).

Upon completion of the analyses performed (the method of which is detailed in Annex 5 of the Environmental Report concerning "Scenario Assessment"), the Plan scenario chosen is that which seeks to achieve 65% separate waste collection by 2019 and which treats the management of non-separated municipal waste in mechanical-biological processing plants and waste-to-energy plants.

Regional energy plan

In 2009, the Region of Campania established a Proposed Regional energy plan, which set the main objectives of reducing CO_2 emissions and achieving a minimum level of coverage of the energy needs from renewable sources.

By Presidential Decree no. 166 of 21 July 2016, the Region established a technical round table for the preparation of the Regional environmental energy plan ("PEAR") and to propose interventions relating to the green economy.

Territorial regional plan ("PTR")

In order to guarantee the consistency of the provincial territorial planning instruments, in implementation of Regional Law no. 16/2004, the Region approved, by Regional Law no. 13/2008, the Territorial regional plan ("PTR"), in line with the objectives set by state programming and in coherence with the contents of the regional social-economic programming.

Through the PTR, the Region, in compliance with the general objectives of promoting sustainable development, guarantees the protection of physical integrity and cultural identity of the territory, in line with the guidelines for safeguarding, already defined by the competent state administrations and with the directives contained in the current state sector plans.

The general objectives of the PTR are:

- Sustainability, as the nature of the territory transformation interventions, for conservation, reproducibility and the recovery of natural and cultural resources, grounds for the development and quality of life of present and future populations;
- The qualification of the living environment, as a permanent objective of the public authorities;
- Lesser consumption of the territory and recovery of existing heritage;
- Endogenous development, as an objective to be achieved with reference to the economic objectives set through territorial planning in order to optimise the local resources and the self-management capacity of the public entities assigned institutional competence with respect to said resources;
- The subsidiary nature, as a criterion for the allocation of competences;
- Inter-institutional collaboration and co-planning as criteria and methods that facilitate a stable, loyal cooperation between the different administrative levels, both vertically and horizontally;
- Coherent public action, as a means by which to standardise the various public and private interests relative to the use of the territory so that, wherever possible, the interests of the smaller communities can make a positive contributions towards the interests of the larger communities and vice versa;
- Sensitisation, training and education;
- Participation and consultation, as an opportunity to gain knowledge of the common territory resources.

Air quality restoration plan ("PRQA")

Italian Legislative Decree 155/2010 as subsequently amended and supplemented, which incorporates Directive 2008/50/EC on ambient air quality and cleaner air for Europe, established a unitary regulatory framework on the assessment and management of ambient air quality.

The Region of Campania assesses the ambient air quality, classifies the regional territory into "zones" and "agglomerations" and prepares plans and programmes aimed at maintaining air quality, where it is good, and improving it, in other cases.

The Air quality restoration plan pursues the following objectives:

- The general objective is, everywhere, to achieve the Maximum Acceptable Level and, prospectively, with priority assigned to the more sensitive areas defined in the plan, the Maximum Desirable Level;
- An additional objective, but which is no less relevant, is that of making a significant contribution to compliance nationwide with the Kyoto commitments.

Regional water protection plan ("PRTA")

The Water protection plan, in accordance with Art. 121 of Italian Legislative Decree no. 152/06 is a specific sector plan and is structured according to the contents of the same Article, as well as according to the specifications indicated in part B of Annex 4 to part three of the same legislative decree.

The PTA was adopted by the region of Campania by Regional Government Decree 1120 of 06/07/2007.

The PTA is the priority instrument aimed at achieving the respective improvement in the qualitative and quantitative status, reduce pollution, pursue sustainable use of water resources, with priority assigned to drinking water, and maintain the natural self-purification capacity of the water bodies.

These aims are pursued by means of:

- Identification of the environmental quality objectives and specific purpose of the water bodies and interventions aimed at guaranteeing their achievement or maintenance and the quality and quantitative protection measures;
- Definition of actions by which to achieve the quality objectives established to solve the environmental critical issues noted during monitoring and characterisation of the water bodies and to verify the measures adopted on the basis of the classification of the water bodies, the designations of areas subject to specific protection and the analyses carried out for the preparation of the Plan;
- Definition of the programme of measures by which to achieve the environmental quality objectives in relation to the classification of the status of environmental quality of each significant water body or water body of interest, as well as the analysis of the characteristics of the relevant hydrographic basin and the analysis of the impact of anthropic activity on the status of the surface and underground water bodies.

Flood risk management plan ("PGRA")

The territory in question comes under the scope of the Southern Apennines Hydrographic District. The District of the Southern Apennines is one of the eight districts into which the Italian State territory is divided, as can be seen from Fig. 1, and which includes the following basins and/or hydrographic basin complexes:

- Liri-Garigliano, already national basin in accordance with Italian Law no. 183 of 1989;
- Volturno, already national basin in accordance with Italian Law no. 183 of 1989;
- Sele, already interregional basin in accordance with Italian Law no. 183 of 1989;
- Sinni and Noce, already interregional basins in accordance with Italian Law no. 183 of 1989;
- Bradano, already interregional basin in accordance with Italian Law no. 183 of 1989;
- Saccione, Fortore and Biferno, already interregional basins in accordance with Italian Law no. 183 of 1989;
- Ofanto, already interregional basin in accordance with Italian Law no. 183 of 1989;
- Lao, already interregional basin in accordance with Italian Law no. 183 of 1989;
- Trigno, already interregional basin in accordance with Italian Law no. 183 of 1989;
- Campania basins, already regional basins in accordance with Italian Law no. 183 of 1989;
- Apulia basins, already regional basins in accordance with Italian Law no. 183 of 1989;
- Basilicata basins, already regional basins in accordance with Italian Law no. 183 of 1989;
- Calabria basins, already regional basins in accordance with Italian Law no. 183 of 1989;
- Molise basins, already regional basins in accordance with Italian Law no. 183 of 1989.

Hydrogeological Structure Plan ("HSP")

The HSP, in accordance with Art. 1, paragraph 1 of Italian Decree-Law no. 180 of 11 June 1998, converted, with amendments, by Italian Law no. 267 of 03 August 1998, is a policy document that identifies risk scenarios connected with mudslides and flooding present and/or envisaged in the territory and associates regulations with these, limits to the use of the soil and types of structural and other interventions, which aim to mitigate the expected damages.

The HSP constitutes the reference framework with which all authorisation and concession provisions must comply and to which they must refer. The value of the supra-ordinate Plan, with respect to all sector plans, including town plans, entails its management and a careful coordination and involvement of the entities operating on the territory. The Objectives are as follows:

- As far as possible, to safeguard personal safety;
- To prevent any increase to the current risk levels beyond the threshold that defines the level of "acceptable risk";
- To envisage and regulate the restrictions and limits to the use of soil and the anthropic activities and interventions permitted;
- To establish rules for the correct use of the territory and natural resources;
- To lay the basis for an adjustment of the territorial town planning tools;
- To achieve acceptable safety conditions in the territory;
- To plan the arrangement, defence and regulation of water courses;
- To envisage the arrangement of shores and unstable areas in protection of the habitats and infrastructures;
- To define the criteria and type of intervention necessary to maintain the works.

Territorial provincial coordination plan of Caserta ("PTCP")

In accordance with Regional Law no. 16/2004, the Territorial provincial coordination plan of Caserta aims to ensure level one planning of a territorial provincial plan, dealing with the strategic choices relating to road infrastructures, areas of environmental interest to be safeguarded and hypotheses of urban development.

The plan pursues the following objectives:

- Limitation of the consumption of the soil, ensuring the protection and optimisation of rural territory and the requalification of deteriorated rural and urban areas;
- Defence of the soil with particular reference to hydraulic safety, the stability of the banks and the integrity of the coastline and coastal strip;
- The protection of the natural landscape and elements identifying the provincial territory;
- The strengthening and functional interconnection of the system of services and, in particular, of the rail mobility network;
- Energy savings and the promotion of alternative energies;
- The coordination of reclamation and municipal town and sector planning tools.

REGION OF BASILICATA

The ITREC (Fuel Elements Re-Manufacture and Processing Plant) is an Italian nuclear power plant located in the ENEA-Trsaia di Rotondella (MT) Research centre and developed to conserve and experiment with the reprocessing of nuclear fuel deriving from a thorium-uranium cycle.

The geographic area that includes the ENEA della Trisaia in Rotondella Research Centre is involved by the following environmental landscape heritage and restrictions, established in accordance with Italian Legislative Decree no. 42/2004 and Regional Law no. 47/98 (Directive EEC 97/11):

- Areas subject to landscape - environmental restriction (formerly Italian Law no. 1497/39);
- Areas subject to direct and indirect restriction due to archaeological heritage (formerly Art. 1-4 of Italian Law no. 1089/1939, Art. 21 of Italian Law no. 1089/1939);
- Forest vegetation areas (Italian Law no. 431/85);
- Water course buffer strips (150 m from each shore) (Italian Law no. 431/85);
- Marine coastal buffer strip (specified by the projection to 300 m within the coastline (formerly Italian Law no. 431/85));
- Areas subject to hydrogeological restriction in accordance with Royal Decree no. 3267 of 30 December 1923;
- Areas involved by major disasters: strips pertaining to the river for return times 30, 200, 500 of the rivers Sinni (as defined in the Extract plan for the hydrogeological structure (Extract Plan for River Areas) prepared by the Region's Basin Authority.

With reference to the Floods Risk Management Plan (the “PGRA”), it should be noted that the area in question falls within the basin of the Sinni (UoMITI024), but does not interfere with the areas subject to flooding identified by means of the studies, the results of which have been used to define the maps of flood danger levels attached to the PGRA.

Near the ITREC Site, there are also restrictions relating to the nature parks and Natura 2000 Sites;

- Regional nature reserve of the Forest Pantano di Policoro and Ionic Coast, mouth of the Sinni (SCI and SPA: IT 9220055);
- Ionic Coast and mouth of the Agri (SCI: IT9220080).

Below is an analysis of the territorial plans and related objectives of the area in question.

<u>Basilicata regional waste management plan (“PRGR”)</u>

The Regional waste management plan, approved by Regional waste management plan no. 568 of 29 December 2016, pursues a set of objectives with a view to improving the environmental sustainability of the waste management cycle. It is formulated with reference to the principles and hierarchy of the waste management operations established by European Community legislation, as well as in connection with the specific strategies approved on a regional level.

Below are the main objectives:

- Alignment of the separate waste collection standards and processing in accordance with national legislation and European Directives;
- Completion of the systems structure;
- Limitation of production;
- Limitation of the specific consumption of a controlled landfill;
- Thermal processing on SSF;

- Estimated costs of the recovery and disposal of municipal waste (implementation of the unitary processing tariff on a regional basis);
- Zero Waste 2020 regional strategy introduced by Art. 47 of Regional Law no. 4/2015 and adopted by subsequent Regional Government Decree no. 506 of 17/04/2015 and the main objectives:
- To maximise the reduction of the quantity of waste produced, the reuse of assets, the recovery of materials and energy and recycling, so as to head for zero by 2020;
- To protect the environment and health by preventing and reducing the negative impacts linked to waste production and management;
- To foster the access to information and the participation of citizens in matters relating to the environment and the waste processing cycle;
- To develop an industrial promotion programme, involving technological or process innovation, that aims to ensure the reuse, recycling, recovery and redesign of products, including through their disassembly.

Regional environmental energy plan ("PEAR")

The regional energy plan of 2010 contains the energy strategy adopted by the Region of Basilicata, to be implemented through to 2020 and the entire programming is hinged around 4 main macro objectives:

- reduction of energy consumption and the energy bill;
- increase in electricity production from renewable sources;
- increase in thermal energy production from renewable sources;
- creation of an energy district in Val d'Agri.

Regional water protection plan ("PTAR")

With the Regional water protection plan approved by the Regional Authority of Basilicata by Regional Government Decree no. 1888 of 21/12/2008, a careful preliminary inquiry was conducted and the instruments identified for the protection and conservation of the water resource, in application of Italian Legislative Decree no. 152/2006.

The Plan defines the interventions to protect and restore health to the significant water bodies and sustainable use of water, identifying the integrated measures of qualitative and quantitative protection of the water resource. It pursues the following objectives:

- Identification of the integrated measures of qualitative and quantitative protection of the water resource, which ensure the natural self-purification of the water bodies and their capacity to support animal and plant communities that are as extensive and diversified as possible;
- Indication of uses in progress and in the future, which must take place according to preservation, savings and reuse standards and which guarantee priority in use as drinking water, in respect of the Minimum Vital Flow to the reservoir;
- Indication of approximate measures to achieve the environmental quality objectives, as envisaged by Part III, Section II, Title II, Chapter I of Italian Legislative Decree no. 152/06.

Hydrogeological Structure Plan ("HSP")

The Plan serves two purposes: knowledge and planning-policy. As a tool of knowledge, it represents and outlines a framework of information that has been suitably collected and organised, continuously expanded and investigated, which reveals the critical environmental issue, the quality and quantity of the resources, the situation of territorial and sector emergency and the problems linked to the anthropic component.

The Basilicata Basin Plan - Extract of Hydrogeological Structure, in adopting the policy guidelines offered by Italian Legislative Decree no. 152/2006, sets itself the following objectives:

- To eliminate, mitigate or prevent the major risks deriving from natural geomorphological (severe disruption of banks) or hydraulic (flooding of water courses) disasters;
- Outlining the areas at greatest hydraulic and hydrogeological risk to the safety of people, for functional damages to buildings and infrastructures, with consequent impossibility to use them, for the suspension of functions of the social-economic structures and environmental and cultural heritage damages;
- To define the priority interventions to be carried out an the implementing rules relative to said areas.

REGION OF APULIA

The radioactive waste storage site of Cemerad is in the area of masseria Vocchiaro-Grottafornara, behind the state road 172 for Martina Franca, Statte (municipality of Taranto).

The geographic area that includes the Cemerad radioactive waste depot is involved by the following landscape-environmental restrictions and heritage present on municipal territory, which have been grouped together in the General Town Plan ("PUG").

- *Morphological, geological and hydrogeological restriction*:
  - Hydrogeological restriction (Italian Law no. 3917/1877, Royal Decree Law 3267/23);
  - Restriction regarding the banks, ridges and edges, identified by the Territorial themed/landscape urban plan;
  - Restriction regarding the river networks (former Art. 143 of Italian Legislative Decree no. 42/2004) identified by the Territorial themed/landscape urban plan, like water courses and surface water.

In municipal territory, the presence has been recognised of two particularly sensitive areas to the risk of flooding; these areas are classified as at Very High Risk (R4) and Hydraulic Danger with High Probability of flooding and are located:

  - North of the town centre of the municipality of Statte, involving the end part of the Gravina Miola and where it flows into the Gravina del Triglio;
  - In the western area of this same town centre, in contrada De Sinno. This area is involved by erosion furrows that have formed in a N-S direction, which represent areas of thalwegs of rainwater, which are part of the hydrographic network of the Gravina del Triglio.

- *Landscape restriction*, corresponding to the proposed landscape restriction of Italian Legislative Decree no. 42/2004 the "Environmental and Cultural Heritage Code" of the zone called "Murge Tarantine" (municipalities of Crispiano, Martina Franca, Montemesola, Statte and Taranto), for the safeguarding of a zone considered to be of particular landscape and environmental interest, with a view to preserving the zone from further damages and tampering by construction and urban growth, as well as changes to the soil's natural and agricultural structure;

- *Natural and environmental restriction*:
  - Restriction of the forest areas and Mediterranean shrubs identified by the Territorial themed/landscape urban plan constitutes sites of significant natural scientific value, both in terms of flora and fauna, due to the presence of biological examples;
  - Restriction of the caves, identified on the Territorial themed/landscape urban plan, which represent the sites where there are geomorphological emergencies involving the visible fossils and geological structural elements;
  - Restriction regarding the perimeter of the protected natural areas, represented by the "Park of Terra delle Gravine";
  - The SCI (Site of Community Importance) and SPA (Special Protection Area) called "Area delle Gravine", which extends for a total of 2,674 hectares, includes the municipalities of Castellaneta, Crispiano, Ginosa, Laterza, Massafra, Mottola, Palagianello and Statte;
  - The municipal territory is also bordered to the south by the SCI Masseria Torre Bianca (IT9130002).

Below is an analysis of the territorial plans and related objectives of the area in question.

Apulia regional waste management plan ("PRGR")

The region of Apulia has adopted a Municipal waste plan - approved by Regional Council Resolution 104 of 08 October 2013 and which is currently being updated, as resolved by Regional Government Decree 1691 of 08 November 2016 - and a Special waste plan, adopted by Regional Government Decree 1023 of 19 May 2015.

The aim to be pursued by the Regional waste management plan, through the design of new integrated municipal solid waste collection services, is to achieve the separate waste collection levels envisaged by Italian Legislative Decree no. 152/2006 as subsequently amended and supplemented (65 % in 2012) and the levels of recovery and recycling envisaged by Directive 2008/98/EC and by Italian Legislative Decree no. 152/06 (50% by 2020).

The new municipal solid waste collection services have been envisaged in an integrated manner, so as to ensure achievement of the following general objectives:

- to develop circuits to intercept highly productive waste;
- to guarantee maximum purity of the materials collected.

Moreover, a definition is established of general objectives, connected with the siting of municipal solid waste management plants, such as:

- The speeding up of achievement of the objectives relating to separate waste collection, recycling and recovery;
- The reinforcement of the systems used by the integrated cycle;
- The assessment of the technologies for energy recovery from secondary solid fuels deriving from municipal waste;
- The rationalisation of the costs of the integrated waste processing cycle.

Regional environmental energy plan ("PEAR")

The regional energy plan, updated in 2015, as sanctioned by Italian Legislative Decree no. 28/2011, Directive 2009/28/EC and Ministerial Decree of 15 March 2012, has the following objectives:

- to discourage new installations of photovoltaic and wind power on an industrial level, on the ground;
- to promote innovative FER or consolidated FER technologies that are not present in the territory of Apulia;
- to promote the development of small photovoltaic and thermal solar plants on building roofs;
- to promote the sustainable production of energy from biomass;
- to promote energy rationalisation of the existing constructions;
- to promote research in the energy field;
- to promote the completion of the production chains and occupation on the territory;
- to promote the dissemination and sensitisation in matters of energy and savings.

Territorial regional landscape plan ("PPTR")

The Plan provides environmental, territorial and landscape guidelines and directives, taking the approach adopted by the Landscape Convention stipulated in Florence in 2000 and ratified by the Italian State by Italian Law no. 14 of 09 January 2006 and according to the guidelines of Italian Legislative Decree no. 42 of 22 January 2004, subsequently amended by Italian Legislative Decrees no. 156 and 157 of 2006 and 97/2008.

The general objectives of the PTPR on a regional level that should be substantiated by strategies, actions and policies, are:

- To activate social production of the landscape;
- To develop the hydro-geomorphological balance of the hydrographic basins;
- To develop the environmental quality of the territory;
- To optimise the landscape and long-term territorial figures;
- To optimise historic rural landscapes: economies and landscapes;
- To optimise the cultural-settlement identity heritage;
- To requalify the landscapes that have been degraded by contemporary town planning;
- To optimise the aesthetic-perceptive structure of the landscapes of Apulia;
- To optimise the slow use of landscapes;
- To requalify and optimise the coastal landscapes of Apulia;
- To define territorial and landscape standards in the development of renewable energy;
- To define territorial and landscape quality standards in the settlements, requalification and reuse of production activities and infrastructures;
- To define quality standards for construction, urban areas and the territory, for urban and rural residential settlements.

Regional General Structure Document (“DRAG”)

The DRAG, sanctioned by Regional Law no. 20/2001, is a set of administrative and planning acts, aimed at defining an optimal structure of the regional territory, through the regional territorial planning tools and through guidelines established for provincial and municipal planning, which must be compatible with them.

The general objectives are:

- The protection and optimisation of the landscape, through the renewal of the current planning instruments, in accordance with the provisions of the Landscape and Cultural Heritage Code;
- The improvement in the quality of the environment and life of the local populations, through support to the innovation of local planning practices, because this, once the completion of the drive to urban expansion has been recognised, takes a clear approach towards recovering consolidated municipal fabrics, requalifying the deteriorated areas and reclaiming the polluted areas;
- The simplification of the process for forming and verifying local territorial governance choices, promoting and supporting provincial and vast area planning, so that this can constitute a coordination framework and an opportunity for service for local planning, defining the limits and opportunities of large-scale territorial transformations and directing local planning towards the optimisation of the territory in a framework of sustainable development;
- A more efficient, sustainable infrastructural equipment, promoting virtuous relations between territorial planning and infrastructural planning, defining the contents and methods for a harmonic development of the settlements and their setting up with equipment and infrastructural and restoration of the fundamental rules of good urban and infrastructural design;
- The guarantee of a rapid implementation of the choices of territorial governance through the more general construction of synergic relations between the territorial governance system and the environmental protection and development planning initiatives.

Regional air quality plan (“PRQA”)

Through the Air quality restoration plan, the Region of Apulia, under Italian Legislative Decree no. 155/2010 and Italian Legislative Decree no. 152/2006, prepares the actions and interventions necessary to guarantee compliance with the values of air quality, paying particularly close attention to the territorial scopes characterised by concentration levels of one or more pollutants that exceed the legal limit values. For the remainder of the territory, it will establish principles aimed at preserving air quality and maintaining the value of pollutants below the limit values.

The main aim of the PRQA is:

- The achievement of respect of the legal limits for those pollutants (PM10, NO_2, O_3) for which an exceeding of said limit has been recorded;
- To spark a virtuous mechanism that involves the largest possible segments of the population;
- To enable an inclusive approach to the problem of atmospheric pollution.

Regional water protection plan (“PTA”)

By resolution of the Regional Council no. 883 of 19 June 2007, the adoption was ruled, in accordance with and pursuant to Art. 121 of Italian Legislative Decree no. 152/2006 of the draft Water protection plan of the Region of Apulia. Thereafter, by Resolution no. 1441 of 04/08/2009, the Regional Council approved the supplements and changes to the PTA.

The PTA represents an Extract Sector Plan of the Basin Plan, by virtue of Italian Legislative Decree no. 152/99, Italian Legislative Decree no. 152/06 and Directive 2000/60/EC; it is the instrument envisaged by sector legislation by which to reach or maintain environmental quality objectives and identify the measures necessary to the qualitative and quantitative protection of the water system.

The qualitative and quantitative protection of the surface, marine coastal and underground water is assured through the pursuit of the following objectives:

- To prevent and reduce pollution and implement the recovery of polluted water bodies;
- To successfully improve the condition of water and suitable protection of that intended for specific uses;
- To pursue sustainable, lasting uses of water resources, prioritising drinking water;
- To maintain the natural capacity for self-purification of the water bodies and the capacity to support extensive, diversified animal and plant communities;
- To mitigate the effects of flooding and drought;
- To prevent further deterioration and protect and enhance the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems.

Hydrogeological Structure Plan (“HSP”)

The Apulia Basin Authority, competent on the regional hydrographic systems and inter-regional basin of Ofanto, was established by Regional Law no. 19/2002.

The Apulia Basin Plan - Extract of Hydrogeological Structure, in adopting the policy guidelines offered by Italian Legislative Decree no. 152/2006, defines the morphological, geological and hydrogeological characteristics.

The objectives are as follows:

- Arrangement, conservation and recovery of the soil in the hydrographic basins;
- Defence and consolidation of the banks and unstable areas;
- Reorganisation of the hydrogeological restriction;
- Defence, arrangement and regulation of water courses;
- Functional implementation of hydraulic policy services, full and ready intervention and plant management.

Territorial themed urban plan (“PUTT”)

The “Landscape” territorial themed urban plan, in accordance with the provisions of Italian Law no. 431 of 08/08/1985 and Regional Law no. 56 of 31/05/1980 regulates the processes of physical transformation and use of the territory, guiding the analysis to historic, social, cultural and environmental aspects of the territory.

The objectives are as follows:

- To protect the historic and cultural identity, to make the quality of the landscape, its environmental components and social use compatible;
- To promote the safeguarding and optimisation of territorial resources.

Flood risk management plan for the southern Apennines (Apulia, Campania, Basilicata) (“PGRA”)

The territory in question comes under the scope of the Southern Apennines Hydrographic District. As mentioned for the Region of Campania, the District of the Southern Apennines is one of the eight districts into which the Italian State territory is divided.

The Floods Risk Management Plan, approved by Decree of the President of the Council of Ministers of 27 October 2016, according to European Directives 2007/60/EC and 2007/60/EC; Italian Legislative Decrees 49/2010; 219/2010; 152/2006 aims to establish a coordinated framework for the assessment and management of the floods risk, with the most extensive involvement of the public and parties concerned, through the following objectives:

- General objective for the safeguarding of life and human health, through: reduction of risks to health and life; mitigation of damages to works necessary for life, such as electricity grids, water supplies, drains structures; defence of strategic systems and their operation as hospitals, schools, barracks; reduction of the negative effects on the population, deriving from pollution caused by a possible spread of hazardous substances in the event of flooding;
- General objective of the environmental protection: reduction of negative impacts linked to the ecological status of water bodies and protected areas, due to pollution caused by a possible spread of dangerous substances in the event of flooding; promotion of the conservation of the nature of environmental heritage and river and coastal habitats; reduction of possible negative effects on protected areas deriving from the implementation of protection measures and structural interventions;
- General objective of the protection of cultural heritage through: promotion of the conservation of historic and cultural heritage of significant interest; mitigation of possible damages to the existing cultural heritage and the landscape system;

- General objective of the defence of economic activities through: mitigation of possible damages to the primary infrastructural network, like rail and motorways; mitigation of the possible damages to the economic and production system; mitigation of possible damages to systems that enable the maintenance of economic activities, such as electricity grids and water supplies.

REGION OF SICILY

The University of Palermo hosts the experimental reactor AGN 201.

The geographic area is involved by the following environmental landscape heritage and restrictions present in municipal territory, which have been grouped in the PUG into four categories: historic, environmental, anthropic and infrastructural.

The environmental and landscape restrictions are described:

- Natural and artificial forest areas with the related buffer strips, prepared in accordance with Regional Laws 16/96 and 13/99, according to the Forestry Agricultural Study approved by Municipal Council Resolution no. 35 of 02/03/2000 and adjusted to comply with the latest legislative references, Provincial Decree of 28/06/2000 and Regional Law no. 06/01;

- Perimeter of the nature reserves of the city in accordance with Regional Law 14/88, according to the limits supplied by the decrees instituting the reserves and, specifically:
  - Mount Pellegrino instituted by Authorisation Decree no. 610 of 06/10/1995,
  - Mount Gallo instituted by Authorisation Decree no. 438 of 21/06/2001,
  - Grotta Conza instituted by Authorisation Decree no. 529 of 11/08/1995,
  - Grotta Molara, identified by Authorisation Decree no. 970 of 10/06/1991 (under the safeguarding regime);

- Perimeter of the nature reserves of the city in accordance with Regional Law 14/88, according to the limits supplied by the decrees instituting the reserves and, specifically Sites of Community Importance pursuant to Italian Presidential Decree no. 356 of 08/09/1997, sent by the Regional Councillor for the Territory and the Environment, by note prot. no. 75 of 16/05/2002 and specifically:
  - Capo Gallo;
  - Valley of the river Oreto;
  - Mount Pellegrino;
  - Raffo Rosso, Mount Cuccio and Vallone Sagona;
  - Mount Grifone.

Below is an analysis of the territorial plans and related objectives of the area in question.

<u>Sicily regional waste management plan (“PRGR”)</u>

The Special Waste Plan of the Region of Sicily was adopted by Italian Presidential Decree no. 10 of 21 April 2017 and published in the Ordinary Supplement of the Official Journal of the Region of Sicily on 01 June 2017. The municipal waste plan was approved by Decree of the Ministry of the Environment and Territory and Sea on 11 July 2012 and was thereafter adapted by Regional Government Decree no. 2 of 18 January 2016. This Plan is required to contain, in accordance with Directive 2006/12/EC, quantities and sources of waste produced within a territory, as well as that likely to be delivered to and from national territory, thereby also envisaging the future evolution of waste flows with the definition of the “current state” of waste management in the territory; assessments regarding the need for new collection systems, the closure of existing plants, additional infrastructures necessary in accordance with the standards of self-sufficiency and proximity, and any related investments.

The objectives are as follows:

- To prevent the production of waste and reduce its danger level;
- To promote the design of products and packaging such as to reduce the production of waste at source, particularly where not able to be recycled, also adopting the necessary forms of incentives;
- To promote the information and participation of citizens;
- To promote the reuse, recycling and recovery of municipal and special waste;
- To promote the separate waste collection of municipal solid waste and that comparable to municipal waste;
- To increase the implementation of low environmental impact systems technologies;
- To reduce the movement of waste through the optimisation of disposal in plants near the place of production;
- To favour the reduction of disposal in landfills;
- To recognise the role of the municipalities as parties responsible for the service supplied to its citizens;
- to optimise the participation of citizens with specific reference to forms of economic incentive;
- To make the economic balance of the integrated waste management service compatible.

Regional environmental energy plan (“PEAR”)

The Sicily Regional environmental energy plan adopted in 2009 aims to achieve the following objectives:

- to contribute towards sustainable development of the regional territory through the adoption of efficient systems for converting and using energy in production, services and residential systems;
- to promote a strong energy saving policy in all sectors, in particular in construction, organising an active involvement of entities, businesses and citizens;
- to promote a diversification of energy sources, in particular in the electrical segment, with the decentralised production and decarbonisation;
- to promote the development of renewable energy sources and similar, both on the island of Sicily and the minor islands, to develop the energy technology for its exploitation;
- to foster the take-off of industrial chains, the settlements of industries of production of new energy technology and competitive growth;
- to foster conditions for the safety of procurement and the development of a free energy market;
- to promote technological innovation with the introduction of cleaner technologies (Clean Technologies - Best Available) in high energy intensive industries and supporting dissemination in SMEs;
- to ensure the optimisation of regional hydrocarbon resources, fostering research, production and use with environmentally compatible methods, in line with national energy policy objectives contained in Italian Law no. 239 of 23.08.2004 and guaranteeing suitable economic returns for the territory of Sicily;

- to foster the restructuring of basic thermoelectric power plants, considering the programmes coordinated on a national level, so as to respect the limits of environmental impact compatible with the regulations consequent to the Kyoto Protocol and issued by the EU and incorporated by Italy;
- to foster an implementation of the energy infrastructures, with specific regards to major electricity transmission grids;
- to support the completion of works to supply natural gas to the major urban centres, the industrial areas and the important greenhouse sectors;
- to create, in accordance with the EU strategies, the conditions for a forthcoming development of the use of hydrogen and its applications in fuel cells, today currently undergoing research and development for their dissemination, including by means of the development of renewable hybrid/hydrogen systems;
- to carry out major interventions in the transport sector (biofuels, natural gas in public buses, reduction of vehicle traffic in cities, strengthening of goods transport on rail and by means of cabotage).

Water protection plan ("PTA")

The Water protection plan ("PTA"), in compliance with the provisions of Italian Legislative Decree no. 152/06 as subsequently amended and supplemented and European Directive 2000/60 (Water Framework Directive) is the regional tool aimed at achieving the environmental quality Objectives of internal (surface and underground) and coastal water in the Region of Sicily and guaranteeing a sustainable water supply in the long-term. The PTA was approved by order no. 333 of 24/12/2008 of the Appointed Commissioner for Reclamation emergency and the protection of water in Sicily.

The PTA identifies the measures aimed at the maintenance and achievement:

- of environmental quality objectives for significant surface and underground water bodies;
- of quality objectives for specific purpose;
- of the qualitative and quantitative protection of the water system.

The general objectives pursued are:

- to prevent and reduce pollution and implement the recovery of polluted water bodies;
- to successfully improve the condition of water and suitable protection of that intended for specific uses;
- to pursue sustainable, lasting uses of water resources, prioritising drinking water;
- to maintain the capacity of water bodies to self-purify and support extensive, well diversified animal and plant communities.

Hydrogeological Structure Plan ("HSP")

The Extract Plan for the Hydrogeological Structure, hereinafter termed the Extract Plan or Plan or HSP, prepared in accordance with Art. 17, paragraph 6 ter of Italian Law no. 183/89, Art. 1, paragraph 1 of Italian Decree Law 180/98, converted, with amendments, by Italian Law no. 267/98 and Art. 1 bis of Italian Decree Law 279/2000, converted, with amendments, by Italian Law no. 365/2000 has the value of a Territorial Sector Plan and is the knowledge, regulatory and technical-operative instrument by means of which the actions, interventions and rules of use regarding the defence against the hydrogeological risk of the Sicilian territory, are planned and programmed.

- The general objective is to prepare a series of actions and interventions aimed at attenuating the disruption, limiting the natural evolution of phenomena within levels such as to be able to guarantee the development of society.

In 2017, numerous updates were approved to the Extract plan for the hydrogeological structure:

- update to the Extract Basin Plan for the Hydrogeological Structure (HSP) - 064 River Platani and Fosso delle Canne - 065 Basin of Fosso delle Canne - 066 Area between the Basins of Fosso delle Canne and River San Leone - Municipalities of Montallegro and Siculiana;
- update to the Extract Basin Plan for the HSP - (054) River Arena Basin-(055) Area of the River Arena and River Modione Basins-(056) River Modione Basin and the Basins of the River Modione and River Belice - Municipality of Campobello di Mazara (TP);
- update to the Extract Basin Plan for the HSP - (097) Area between the River Alcantara and Fiumara d'Agrò - (098) Basin of Fiumara d'Agrò and Area of Fiumara d'Agrò and Torrente Savoca, Municipality of Letojanni (ME);
- 15-MAY-2017 - update to the Extract Basin Plan for the HSP Basins: (050) - (051) - (052) - (053) - (053A) - (054) - (055) - (056) - Municipality of Mazara del Vallo (TP);
- update to the Extract Basin Plan for the HSP - (095) Basins of the River Simeto and River Alcantara - Municipalities of Aci Catena, Misterbianco, Valverde and Zafferana Etnea;
- update to the Extract Basin Plan for the Hydrogeological Structure (HSP) - (094) River Simeto - (094A) Area between the basins of the River Simeto and the River San Leonardo - (094B) Lake of Pergusa - (094C) Lake of Maletto - Municipality of Assoro (EN);
- 11-MAY-2017 - update to the Extract Basin Plan for the HSP - (057) of the Hydrographic Basin of River Belice - Municipality of Campofiorito (PA);
- 11-MAY-2017 - update to the Extract Basin Plan for the HSP - (058) Territorial area between the Hydrographic basin of the River Carboj and the Basin of the River Belice - (059) Basin of the River Carboj - Municipality of Sciacca (AG);
- 09-MAY-2017 - update to the Extract Basin Plan for the HSP - (096) of the Hydrographic Basin of River Alcantara - Municipality of Francavilla di Sicilia (ME);
- 09-MAY-2017 - update to the Extract Basin Plan for the HSP - (060) Basin or the River Verdura and Basin of the River Carboj (060) - Municipality of Sciacca (AG);
- 09-MAY-2017 - update to the Extract Basin Plan for the HSP - (061) River Verdura - (061a) Area between the Basins of the River Verdura and the River Magazzolo - Municipality of Sciacca (AG);
- 21-APR-2017 - update to the Extract Basin Plan for the HSP - (095) Basins of the River Simeto and River Alcantara - Municipalities of Aci Catena, Misterbianco, Valverde and Zafferana Etnea (CT);
- 21-APR-2017 - update to the Extract Basin Plan for the HSP - (093) of the River San Leonardo - Municipality of Carlentini (SR);
- 06-APR-2017 - update to the Extract Basin Plan for the HSP - (037) of the River Eleuterio - (038) Area between the Basins of the River Eleuterio and the River Oreto - Municipality of Marineo (PA).

3.3 Summary of the action strategies envisaged for the achievement of the objectives

Radioactive waste is such whereby there is no provision for reuse and it contains radionuclides at levels that exceed "distancing levels"[8]. In Italy, this waste is produced from the decommissioning of nuclear plants and from medical, industrial and research activities.

The general objective of the NP is to describe how safe management of spent fuel is to be guaranteed and of all radioactive waste (liquid and solid) currently present on national territory, as well as that to be produced throughout the reference time frame of current programming.

The instruments that the NP identifies by which to achieve this general objective can essentially be identified as action strategies implemented for waste and fuel management from generation through to disposal.

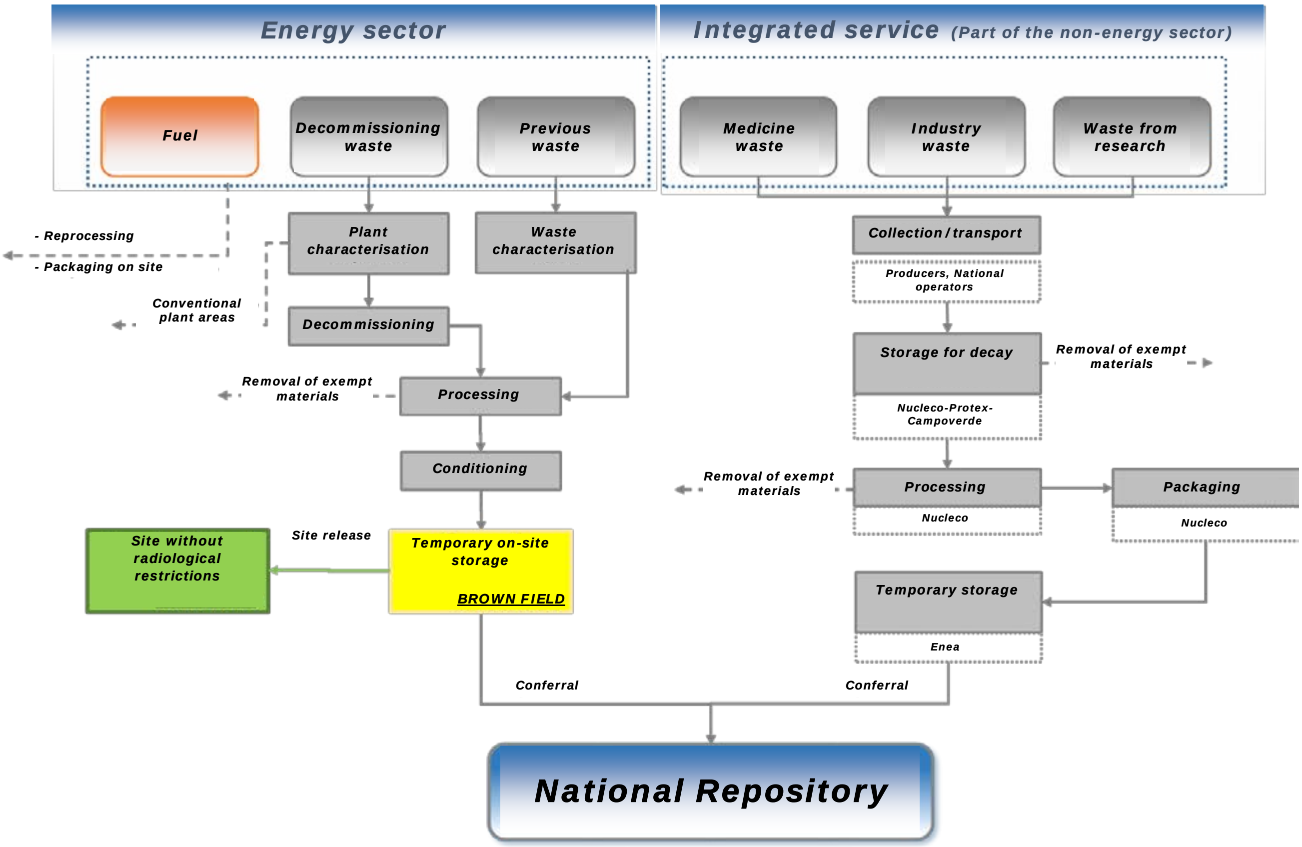


Figure 3.3-1: Action strategies for the management of NP objectives

[8] Distancing levels: values expressed in terms of the concentration of activities or total activities of certain radionuclides, below which a radioactive material can be managed as conventional waste.

3.3.1 Radioactive waste management strategies for the energy segment

In implementation of the provisions of Italian Legislative Decree no. 79 of 16 March 1999, “Implementation of Directive 96/62/EC, setting out common rules for the domestic electricity market”, ENEL SpA established SOGIN SpA - the nuclear plant management company, to which, as from 01.11.1999, all assets and contracts necessary to guarantee the decommissioning of the abandoned electronuclear plants and the closure of the nuclear fuel cycle, were conferred.

On 03 November 2000, again in compliance with the provisions of said Decree, the shares of SOGIN were transferred from ENEL S.p.A. to the Ministry of the Treasury. In August 2003, SOGIN was also appointed to manage the research plants on the ENEA nuclear fuel cycle: the Saluggia EUREX plant, the Rotondella ITREC plant, the OPEC and IPU plants of Casaccia (Rome). In 2005, the manufacturing plant of nuclear fuel of Bosco Marento was also purchased.

Under the scope of its institutional mandate, SOGIN, on the basis of government guidelines[9], develops the decommissioning and making-safe activities of plants, with the safe management of waste produced from previous plant operation, and that deriving from keeping them safe and decommissioning activities[10].

In order to identify the various levels that can be imagined in the decommissioning of a plant, reference is normally made to a scale proposed by IAEA, the United Nations Agency dedicated to nuclear energy problems, which identifies three different levels or stages:

- **stage 1** – the plant is set to conservation with the absolute minimum level of decommissioning necessary to simply make it safe;
- **stage 2** – extensive decommissioning continues of the least contaminated parts or conventional parts of the plant. The heart of the plant (the nuclear island) is vice versa set for conservation;
- **stage 3** – the plant is completely demolished.

With reference to the IAEA scale, against a time frame of activities, a complete framework is obtained of the possible strategies:

- DECON - proceedings take place immediately, after plant downtime, to stage 3;
- SAFESTOR - after downtime, stage from 1 to 2 is pursued and this stage lasts for 30-60 years, whilst awaiting for the radioactivity to drop to more acceptable levels for the decommissioning operations, after which the DECON strategy is adopted;
- ENTOMB - like SAFESTORE, but for periods of 100-300 years. The radioactive parts of the plant are confined whilst awaiting the deterioration to more acceptable levels for decommissioning operations.

At present, no definitive choice has been made in favour of an alternative of the DECON or SAFESTORE strategy, whilst the ENTOMB strategy has only been chosen for specific plants of relatively small sizes.

Over the years, subsequent to the cessation of the production of electricity from nuclear sources, Italy has altered its strategy for energy segment plants, going from passive protective custody to accelerated deactivation, with a view to releasing sites without radiological restrictions.

[9] MICA Decree of 14 December 1999 *“Strategic guidelines for the management of the results of nuclear”* - MICA Decree of 07 May 2001 - *“Strategic and operative guidelines for SOGIN”.*

[10] The decommissioning of a nuclear power plant is the last phase of its life cycle. This activity involves keeping the plants safe, removing spent nuclear fuel, decontamination and decommissioning of the nuclear installations and management and making safe of radioactive waste, whilst awaiting its transfer to the National Repository

To this end, the Deactivation applications have been prepared (pursuant to Art. 55 of Italian Legislative Decree no. 230/95) containing a detailed description of the action to be taken for the decommissioning of nuclear sites, essentially due to the following macro operative phases:

- **Management of preliminary activities prior to decommissioning** (radiological characterisation of the nuclear site; processing of previous waste produced during operation);
- **Decommissioning** of systems and buildings present on sites, including processing aimed at confining all radioactivity present into waste packages ready for provisional storage (at the waste management facility;
- **Management of temporary depots**, guaranteeing the structural integrity of the buildings and the control of the integrity of all waste packages contained therein (Brown Field);
- **Definitive disposal** (low and intermediate level) and **provisional storage** (other activities) to the National Repository;
- **Site release** without radiological restrictions, after conferral of the waste packages packaged to the National Repository (Green Field).

In the event of decommissioning of reactors, for power or research, the first action to be planned is the removal of spent fuel, hence the management strategies refer to paragraph 3.3.3.

The example diagram given below shows the logical flow and time sequence of the various phases into which the decommissioning project is structured. As can be seen, the safe management of previous radioactive waste or that produced from keeping it safe and decommissioning it, constitutes part of the reclamation process.

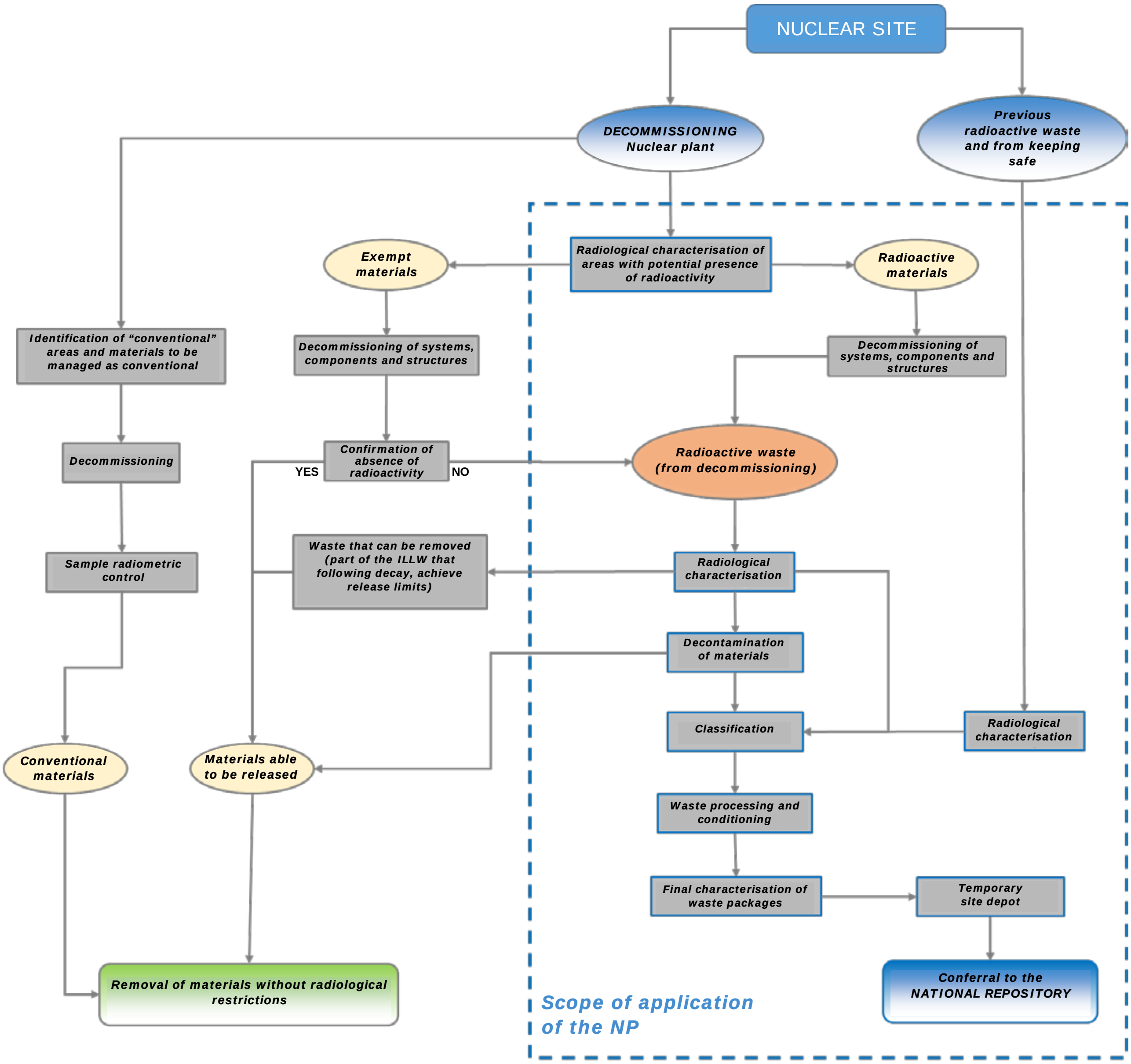


Figure 3.3-2: Phases involved in the decommissioning of a nuclear site[11]

[11] **Conventional materials**: materials whose origin means that they have never directly or indirectly come into contact with potential radioactivity and which are therefore managed in compliance with the provisions pursuant to Italian Legislative Decree no. 152/2006 as subsequently amended and supplemented.
Exempt materials: materials that meet the conditions established under Art. 154, paragraph 2 of Italian Legislative Decree no. 230/1995, i.e. materials containing radionuclides with a half life lower than 75 days and activity concentration below the values defined pursuant to art. 1, paragraph 2 of Italian Legislative Decree no. 230/1995. This category includes materials that can be released by the installations insofar as they meet the distancing levels established in accordance with Art. 30 and Art. 154, paragraph 3-bis of said Italian Legislative Decree; the subsequent management of these materials must take place in compliance with the provisions pursuant to Italian Legislative Decree 152/2006 as subsequently amended and supplemented.
Materials able to be released: materials whose origin or decontamination processes undergone mean that the activities are below the distancing levels assigned by the national nuclear safety authority (ISPRA). These materials may be declared as exempt from radiological restrictions and therefore removed as materials not subject to the provisions of law on radioprotection; the subsequent management of said materials must take place in compliance with the provisions pursuant to Italian Law no. 152/2006 as subsequently amended and supplemented.

In consideration of the specific purposes and objectives of the National Programme, all activities carried out on materials, structures and plants without radiological restrictions or which are declared such following decontamination performed, will not be analysed and assessed by this environmental study. The management of conventional materials produced by the decommissioning, in fact, does not depend on the strategic guidelines of the National Programme, but rather meets the more general provisions of the Italian order in environmental matters (Italian Legislative Decree no. 152/2006 as subsequently amended and supplemented).

3.3.2 Radioactive waste management strategies pertaining to the Integrated Service (non-energy segment)

The Integrated Service (IS) guarantees a capillary, uniform collection of radioactive waste generated by the various producers, of the non-energy segment, on national territory. Conferral takes place under contracts stipulated with an operators of the IS, prepared and authorised for the collection of waste.

The national operators shall:

- collect waste from the individual producers;
- ensure its transport and temporary storage in their depots;
- dispose of any waste that, for reasons of deterioration, may be reclassified as hazardous waste;
- confer to NUCLECO, the radioactive waste requiring processing and packaging, which will thereafter, after temporary storage at the ENEA depots (Casaccia), be conferred to the National Repository.

The temporary depots of the IS operators operate, within the limits laid down by the licences containing provisions on the approximate activities that can be stored and in relation to the time spent by the waste in the depots, before conferral to NUCLECO.

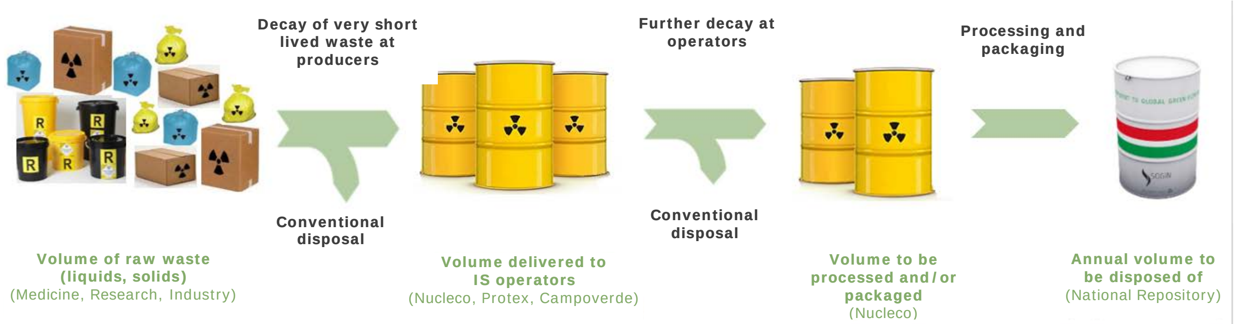


Figure 3.3-3: Management chain of the radioactive waste managed by the integrated service

By CIPE resolution of 20 March 1986, it was established that "intermediate an low level waste from industrial and healthcare activities, the Ministry of Industry, Trade and Crafts, on the basis of the indications given by ENEA and the technical assessments of the DISP (today ISPRA), identifies one or more sites for the storage of conditioned waste. The collection of waste, the development and management of the depot will be carried out under the responsibility of ENEA".

By resolution of the BoD passed on 04 June 1986, ENEA established the Integrated Service for the management of low and medium activity waste and radioactive sources, dedicated to producers or installations not in possession of specific nuclear authorisations (e.g. research laboratories, nuclear medicine structures, industries). The Manager of the Integrated Service is ENEA itself, which guides and supervises the whole of the segment of the collection and management of waste in question, both through the definition of national reference technical specifications on the related activities and through the regular verification and monitoring of their effective application, issuing a Certificate of compliance as a certificate of the assessment.

ENEA has appointed the subsidiary NUCLECO, by Convention, to ensure the centralised execution, on a national level, of the management, processing (volume reduction) and packaging of radioactive waste, with development and subsequent temporary storage of final waste packages, ready for definitive conferral to the future National Repository.

The service is implemented through various operative figures, such as:

1. **Producers** – are all the operators of “practices” that, in connection with the Licences issued in reference to Italian Legislative Decree no. 230/95 as subsequently amended and supplemented - Chapter VI produce radioactive waste and cannot, on their own behalf, provide for the complete waste management cycle. In addition to these, we need to include “occasional producers” represented by those businesses or operators that, although not holding a licence to hold or use radioactive may, on occasion, produce radioactive waste.
2. **Operators** – these are the businesses authorised[12] to collect radioactive waste produced by third parties with a view to conferring it to installations for handling, processing, packaging or storage, holders of authorisations in accordance with Art. 28 or 29 of Italian Legislative Decree no. 230/1995 as subsequently amended and supplemented or to proceed with the disposal of waste in accordance with Article 30 of the same Decree.

More specifically, Integrated Service operators include:

- **Campoverde and Protex** that collect radioactive waste throughout national territory and operate pre-treatment and depot plants, on the basis of authorisations granted pursuant to Art. 29 of Italian Legislative Decree no. 230/1995.
- **NUCLECO** where all radioactive waste flows collected on national territory, which has not been disposed of following storage for deterioration (VSLW). NUCLECO is effectively the main IS operator insofar as, in addition to also collecting radioactive waste on national territory, it is the only operator, nationwide, which, in accordance with an authorisation granted pursuant to Art. 28 of Italian Legislative Decree no. 230/1995, processes and packages waste. NUCLECO also stores the waste packages thus generated in temporary depots, managed on behalf of ENEA, whilst awaiting conferral to the National Repository.
- **MITNucleare**, which acts as Authorised Carrier on behalf of third parties throughout national territory.

According to the convention stipulated with NUCLECO, ENEA, following packaging, acquires ownership of radioactive waste, consequently accepting responsibility for its safe custody.

[12] In accordance with Art. 31 of Italian Legislative Decree no. 230/1995

Much of the waste managed under the scope of the Integrated Service is waste containing radionuclides with a short or very short average life. As such, it can be stored for a period of just a few years, before the levels of radioactive fall below the release limits[13]. For this waste, temporary storage can be assured by national operators, but also directly by the producers themselves. Some hospitals, in fact, have depots that are specifically authorised for the direct management of said waste.

All waste that cannot be released in a conventional manner within a reasonable period of time, is managed as radioactive waste and therefore conferred to NUCLECO.

3.3.3 Spent fuel management strategies

Activities prior to the most complex decommissioning operations is the removal of the spent nuclear fuel plant through its sending to the reprocessing plant or through its dry storage.

Reprocessing of fuel enables the separation of materials that can be reused from final waste and to package the latter in a form that considerably reduces their volume and guarantees the safe, long-term storage during their radioactive deterioration.

This process successfully reduces the volume of higher radioactive waste to 5% of the original volume of the fuel.

The current strategic guidelines adopted on the management of spent fuel, as issued by the Ministry of Economic Development to SOGIN, are:

Decree by the Ministry for Production of 02 December 2004 "*Strategic ad operative guidelines for SOGIN - Società gestione impianti nucleari S.p.a., in accordance with Article 13, paragraph 4 of Italian Legislative Decree no. 79 of 16 March 1999*";

"*Directive setting out strategic and operative guidelines for SOGIN Spa for the processing and reprocessing abroad of irradiated nuclear fuel from decommissioned nuclear power plants*". Ministry of Production, 28 March 2006.

Point 1.a) of the 2006 Directive establishes that spent fuel of Italian nuclear power plants (Caorso, Trino, Latina and Garigliano) shall be assigned to reprocessing, where such is technically and economically feasible.

Point 2 of the same Directive establishes that radioactive waste will be disposed of in the long-term at the National Repository.

"*Agreement between the Government of the Italian Republic and the Government of the French Republic on the processing of 235 tonnes of Italian spent nuclear fuel*", Lucca, 24 November 2006;

"*Directive setting out strategic and operative guidelines for the company SOGIN Spa for the return to Italy from the United Kingdom of residues produced from the reprocessing of Italian fuel - Replacement of low and intermediate level waste*" of the Ministry of Economic Development of 10 August 2009.

The past year of the Italian nuclear power plants and the ENEA research activities have generated approximately 1,860 tHM irradiated nuclear fuel.

[13] Limits for which a refusal can no longer be classified as radioactive and can be disposed of as conventional waste

This fuel (only that relating to nuclear power plants) was partly transferred to England to be reprocessed in accordance with contracts stipulated by ENEL and BNFL (today NDA) in the 1960s. A portion of this fuel, approximately 678 tHM was sent, in accordance with contracts stipulated in 1979 and 1980 and that, differently to the previous ones, envisage the return of waste.

In order to complete the above contracts, in the period running from 2003 to 2005, 259 items of irradiated fuel were transferred to England from the Garigliano Plant (53.48 tHM).

In April 2007, by means of an intergovernmental agreement between Italy and the French company Areva for the transport and reprocessing of 235 tHM of fuel to the French plant of La Hague. Having completed the transport of the fuel stored in the Trino Plant pool, 99% of the spent fuel produced during the operation of Italian nuclear power plants was sent abroad for reprocessing at English and French plants. The transfer is currently in progress of the remaining 1%, with the sending to France of the 64 elements present in the Avogadro depot (1 from the Trino Plant and 63 from the Garigliano Plant).

The above contracts envisage the return to Italy of the uranium and plutonium deriving from the reprocessing of the irradiated fuel. As no future use is envisaged in Italy of said materials, there is the strategic approach to transfer them to other operators. If they should return, they will be considered and managed as radioactive waste type III, former category GT 26 (High Level Waste as per the new classification of Ministerial Decree of 07 August 2015).

Finally, Italy will also need to manage the irradiated fuel stored in the ITREC plants of Rotondella and Opec-1 in Casaccia, which, for its specific characteristics cannot be reprocessed and will therefore be processed as HAW radioactive waste.

The radioactivity of the spent fuel reduces over time, first quickly and then more gradually. This is why, before sending the element of fuel to the reprocessing plant for the recovery of fissile material or interim deposit whilst awaiting definitive disposal, the element of fuel is kept in cooling pools. In this way, the activity and, above all, the consequent generation of heat reduce and make the movement, transport and processing of elements somewhat easier. The radioactivity of the irradiated uranium oxide in the light water reactor after forty years, averages out as ten times less than the level reached after just one year of storage outside the reactor. The management of spent fuel therefore takes the form of an activity that is increasingly less demanding and costly as the period of time increases, between the unloading of the fuel from the reactor and the processing for definitive disposal.

At present, the structures hosting pools containing spent fuel in Italy are the ITREC plant, the Avogadro depot and the Ispra JRC.

In the medium-term, the greatest danger is due to Plutonium. After 300 years, it determines 80% of the activity, 90% after 500 years. In addition to the plutonium isotopes and its deterioration products, a high risk also consists of the minor actinides, whose toxicity is approximately a thousand times greater than the remaining fission products. As a first estimation, in any case, fission products remain dangerous for approximation 300 years, actinides for approximation 10,000 years and plutonium for 250,000 years.

The other strategy adopted for the management of spent fuel internationally is dry storage. In this case, the spent fuel, after having spent a certain number of years in a pool to allow for the radioactive deterioration and its cooling, is packaged into specific shielded casks from which the water is eliminated. The casks thus prepared are then housed in specific storage areas in the plants or depots and left there for several decades.

In Italy, the only spent fuel that will be sent for dry storage is the uranium-thorium of the Elk River of Trisaia and the small quantities of irradiated fuel that are found at the SOGIN Casaccia site, which have not been transferred to other operators.

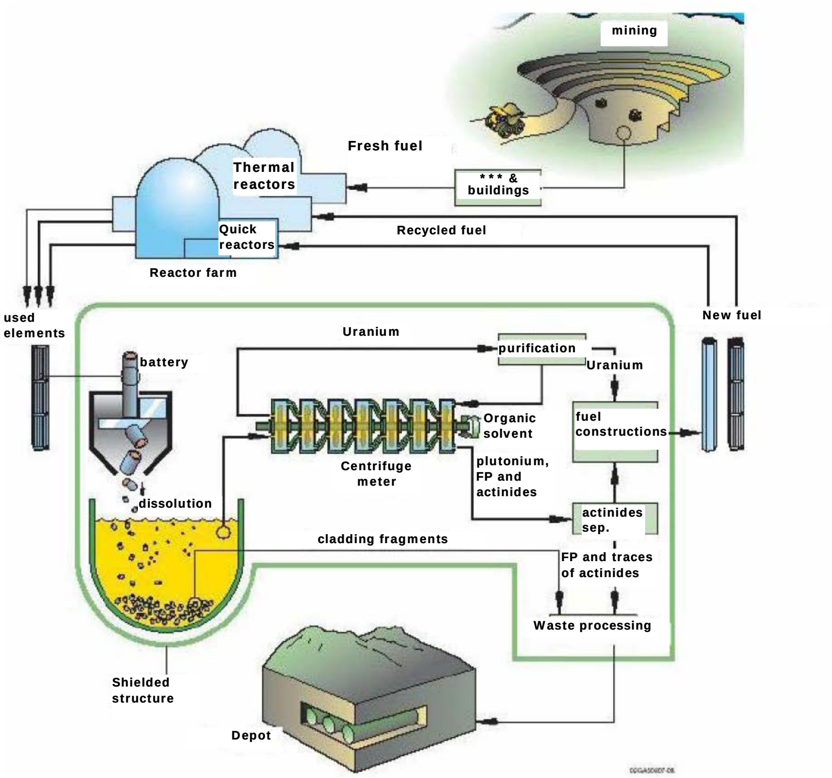


Figure 3.3-4: Methods for the processing of radioactive waste (source: University of Pisa - 27/DIPIA/2004)

3.3.4 Strategies for the disposal of radioactive waste

The National Repository is an integral part and significant element of the comprehensive life cycle management strategy of present and future radioactive waste in our country.

The NR will consist of two main surface structures, designed on the basis of the best international experience and according to the latest IAEA (International Atomic Energy Agency) standards: a depot for "final disposal" of low and medium activity waste and a depot for the "long-term provisional" storage of "high level waste" (terminology taken from Italian Legislative Decree no. 31/2010) called the ILW-HLW storage complex whilst awaiting definitive assignment to a geological depot.

Its development and therefore the transfer of radioactive waste to a single site will allow for decommissioning to be completed on nuclear power plants (green field) and the safe, efficient, rational management of all radioactive waste, including that generated from past and future nuclear, industrial and research medicine activities.

Depot for the disposal of low and medium activity waste

Low and medium activity waste is waste that essentially contains short-lived radionuclides, that is which halve their radioactive load in less than 30 years, such as, for example, Cobalt 60, Caesium 137 and Strontium 90.

This type of waste accounts for more than 90% of waste produced by the typical nuclear activities of an industrialised country: production of nuclear energy, diagnostic and therapeutic medical activities, industrial and research activities.

The strategy adopted worldwide for the definitive arrangement of this type of waste is disposal near the surface in depots developed with concrete engineering barriers. These structures, together with the natural barrier consisting of the geological and environmental conditions of the site, ensure the safe isolation of radionuclide from the environmental for sufficient time to allow for the deterioration of their radioactivity down to levels equal to a fraction of the natural base and, therefore, such as to have negligible impacts on man and the environment.

The NR also envisages adopting this approach, with an isolation and confinement system for the waste, achieved through engineering and natural barriers ("multi-barrier" system).

Safety will thus be guaranteed throughout the operative life of the depot, i.e.

- during the *Operating phase* (approximately 40 years), when the conditioned waste (waste packages) will be received by the depot, controlled, accepted and arranged definitively;
- during the *Closure phase (5/10 years)*, when the depot, having received all the waste packages envisaged, is closed and protected by means of a multi-layer impermeable cover, which, together with the other barriers, will prevent any contact by rainwater with the waste throughout the isolation period (Institutional Control);
- during the *Surveillance phase (300 years*[14] *- Institutional Control)*, when the depot, closed and covered by the multi-layer cover, is monitored and controlled to confirm the efficiency and isolation capacity of the barriers, and to prevent any undesired human intervention.

[14] Today, we assume that this period will last for approximately 300 years, in line with international practice. 300 years correspond to 10 half-lifes of Caesium 137, which of the short-lived radionuclides has the longest half-life; this allows for a reduction of the radionuclide load to less than 1/1000 the original.

At the end of the Institutional Control phase, the radioactivity of the waste will thus have dropped to negligible levels for man and the environment and therefore the depot can be released without radiological restrictions for conventional uses (*Unconditional release*).

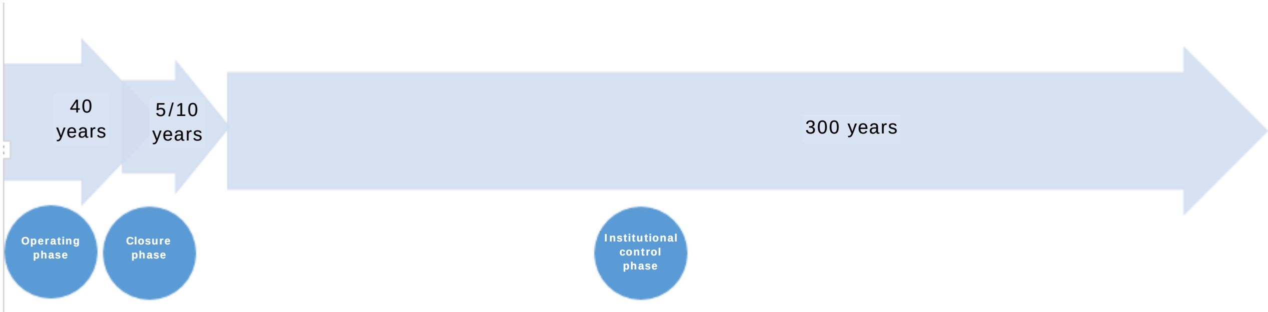


Figure 3.3-5: Phases of the operative life of the National Repository

In addition to these phases, there are the preliminary previous phases of *construction* of the depot structures and *PRE-construction* (siting/licensing/design/communication), which are today taking place.

The engineering barriers of the NR

The engineering barriers of the NR that isolate low and medium activity waste from the environment, are:

i. the waste package, consisting of the container and matrix of the waste
ii. the reinforced concrete module and grout that immobilises the waste packages
iii. the reinforced concrete disposal vault holding the modules
iv. the multi-layer cover that protects the disposal vaults.

First barrier: Waste package

Low and medium activity waste are conditioned in compliance with the regulatory requirements and in line with the depot acceptance criteria[15]. The waste package consists of the waste, a container, which may be a cylinder or prism, and the solid matrix used to immobilise the radionuclides.

[15] The technical characteristics of the waste packages containing radioactive waste, in order to be accepted by the NR, are defined in accordance with the objectives and safety criteria established by the competent regulatory authority in accordance with 26, paragraph 1, letter e-bis) of Italian Legislative Decree 31/2010

Second barrier: Module

The module, a parallelepiped shaped structure in special concrete, represents the second barrier of the NR: inside, the waste packages are positioned, immobilised by special grout. The modules are developed within the NR area, in a specific plant. Each module can contain, depending on geometry and size, from 1 to 8 waste packages.

The insertion of the waste packages in the module, their immobilisation and the closure and sealing of the module, are carried out in a dedicated plant, from which the module is then transferred, by shuttle, to within the next barrier, for definitive arrangement.

The module thus packaged guarantees both the mechanical properties of structural resistance and the containment of the radionuclides.

Third barrier: Cell

The cell is a box structure, partially buried, with walls and floor foundations in reinforced concrete, within which 240 modules are deposited, on 5 levels. The cell constitutes the third engineering barrier confining radioactive waste.

During the operative stage of filling with the modules, the cell will be protected from atmospheric agents by means of a mobile cover on rails, developed using metal pylons and panels.

At the end of filling, the cell will be closed and sealed with a reinforce concrete cover that is one with the actual cell body. Additionally, a drainage pipe system underneath each cell ensures the collection and control of any seepage or possible condensation throughout all phases of the Repository operation life.

Multi-layer cover

The multi-layer cover, the fourth barrier of the National Repository, is an artificial structure arranged to cover the cells. It is created using layers of different inert materials, for a total thickness of a few metres, with specific functions, such as to prevent the entrance of water into the depot, drain rainwater, isolate the waste from the environment and improve the visual impact of the structure.

The external part of the multi-layer cover consists of a grassy layer to foster harmonisation with the environmental context.

Figure 3.3-6: The engineering barriers of the National Repository

Temporary depot for the storage of high level waste

High activity waste, whilst awaiting the availability of the geological depot for disposal, will be temporarily stored in the ILW-HLW storage complex in the same site as the National Repository, designed to have a useful life of 50 years.[16]

During the transitional period for which the high activity waste will remain in the ILW-HLW storage complex, the most suitable solution will be identified for its disposal in a geological depot, also considering the opportunities offered up by possible international agreements that may be stipulated in the meantime.

High activity waste to be stored in this plant essentially consists of waste from the operation and decommissioning of former nuclear power plants, irradiated fuel that cannot be reprocessed, residues deriving from the reprocessing of the irradiated fuel, a large portion of the sources decommissioned and present in Italy, and waste produced by previous and future activities in the medical-industrial-research field.

The fuel and reprocessing residues will be stored directly in casks, screened, highly-resistant metal containers used to transport and confer them to the Temporary depot, suitable, therefore, for the safe storage of highly-radioactive materials.

The other level waste will be contained in specific types of containers, always metal, prismatic or cylindrical, specifically designed and qualified.

The containers and storage structures envisaged for the storage in the ILW-HLW storage complex will guarantee the confinement of radioactivity in all normal and incidental conditions that can be envisaged and for the entire duration of the waste envisaged before sending it for definitive assignment in a geological formation depot.

3.4 External consistency analysis

In this paragraph, in order to verify and, if applicable, redirect the choices of the National Programme for the management of radioactive waste and spent, the consistency is assessed between the objectives expressed by the Programme with respect to the objectives and criteria of environmental protection through the examination of applicable legislation and territorial planning and programming instruments.

3.4.1 Method for analysing the level of coherence

The external consistency analysis has been structured into two different phases:

- "vertical" consistency: consistency between the objectives of the plan considered and the objectives/principles of environmental protection seen from relevant supranational and national regulations;
- "horizontal" consistency: consistency between the objectives of the plan considered and the objectives/principles of environmental protection defined in territorial planning, in relation to the areas of interest.

[16] Whilst awaiting the definition, by the competent regulatory authority, of safety criteria for long-term storage and in line with Italian technical regulations, as well as with international experience, it was considered pertinent to assume a design life of 50 years of the ILW-HLW storage complex, also with reference to nuclear safety requirements with which the structures and systems must comply. This choice does not preclude the extension of the useful life of the structures and systems for additional time.

For the verification, the following 4 levels of judgement were used:

(green)	**direct consistency**: the objective of environmental protection and the objective of the NP pursue integrated purposes;
(yellow)	**indirect consistency**: the objective of environmental protection and the objective of the NP pursue synergic purposes;
(white)	**indifference**: the objective of environmental protection and the objective of the NP pursue unrelated purposes;
(red)	**inconsistency**: the objective of environmental protection and the objective of the NP pursue juxtaposed purposes.

The objectives relating to the regulations envisaging similar purposes to the respective objectives of the Programme or which are integrated with the latter under the scope of the more extensive environmental sustainability objectives, have been assessed as directly consistent. Indirect consistency was instead considered when the different objectives of the Programme or some actions envisaged to achieve them, envisage management and operative methods that have an indirect positive impact on the objectives set by the regulations examined.

Programme objectives were assessed as indifferent when they had no connection with the environmental purposes or objectives covered by the regulations analysed, whilst the assessment of inconsistency was attributed to objectives in clear conflict with the principles of the standards examined.

Moreover, as regards the Programme objectives regarding the National Repository, the assessment of the consistency of the objectives was carried out by assessing the consistency of the criteria for the Depot siting (exclusion/investigation) pursuant to Technical Guide ISPRA no. 29 of 2014, with the objectives of the various standards examined.

Finally, in the “vertical” consistency analysis, further detailed assessments were performed between the Programme objectives and the specific sector regulations, in order to highlight the perfect alignment of the specifications objectives or any presence of misalignment or information shortcomings in the Programme.

Annex 2 shows the tables respectively relating to the verification of “vertical” consistency and “horizontal” consistency.

3.4.2 Results of the consistency analysis

Below are the results of the external “vertical” consistency verification of the NP:

1) Directive 2000/60/EC (WATER) - Directive 2006/118/EC (Protection of groundwater)

Indirect external consistency

Objective 1 (waste processing): consistency due to the controlled management of radioactive discharges in respect of the discharge formula, as envisaged by current Plant authorisations; conventional discharges are subject to authorisation and related regular self-controls. Also, Plants subject to EIA are specifically monitored as regards surface and underground water, and technical managerial steps taken to reduce possible interactions with such.

Objectives 4 - 5 - 6 (siting, development, operation of the NR, disposal to NR of waste and fuel storage): consistency is assessed in connection with the exclusion criteria and the investigations established for the siting of the NR as per Technical Guide 29, insofar as the presence of an exclusion criterion that considers the distance of the NR from surface and/or underground water bodies, indirectly guarantees preventive action in connection with possible water pollution and, therefore, a synergic action with the objectives set by legislation; more specifically, the following criteria were considered:

- Exclusion criterion CE4 (areas EC4 - characterised by geomorphological and/or hydraulic risk and/or danger of any degree and river areas);
- Exclusion criterion EC8 (areas up to a distance of 5km from the current coast line or situated at a further distance but at an altitude of less than 20m above sea level);
- Exclusion criterion EC10 (areas characterised by near surface piezometric levels and which, in any case, may interfere with the foundation structures of the repository);
- Investigation criterion CA4 (areas with presence of surrounding water catchment basins);
- Investigation criterion CA8 (hydrogeological parameters such as:
    - distance of the piezometric levels from the field level and the depot foundation structures and their periodic seasonal and non-seasonal fluctuations;
    - distance from sources and other points of water collection;
    - hydraulic conductivity of aquifers, including the height of roofs and beds of aquifers and aquicludes, their lateral extension and permeability and storage coefficients;
    - average area hydraulic gradient and underground flow speed;
    - effective infiltration value;
    - extension of the surfaces for the recharging of aquifers and their distance from the area under assessment;
    - use of water for purposes linked to direct or indirect human nutrition.

2) Directive 2008/50/EC (ambient air quality) - Italian Legislative Decree no. 155/2010 (ambient air quality)

Indirect external consistency

Objective 1 (waste treatment): The processing and packaging of waste takes place in confined environments and with filtration systems suitable to the limitation of emissions within the limits set by the discharge formulas for airborne effluents, envisaged by sector legislation and plant authorisations. Moreover, the Plants for which Decrees of environmental compatibility have been issued, envisage steps that can limit the emissions into the atmosphere due to decommissioning and specific monitoring activities.

Objectives 4 - 5 - 6 (siting, development, operation of the NR, disposal to NR of waste and fuel storage): The construction and operation of the NR will be subject to Environmental Impact Assessment; in that area, the actions aimed at limiting emissions into the atmosphere, in line with sector legislation.

3) Proposed Soil Framework Directive (Soil Protection)

Indirect external consistency

Objective 4 (siting, development of the NR): In the definition of the exclusion/investigation criteria of Technical Guide 29, some aspects were considered linked to the use of soil, which respect the principles laid down by European Community guidance, in particular, consideration was taken of:

- geological, geomorphological and hydraulic stability of the area;
- confinement of radioactive waste using natural barriers offered by the hydrogeological and chemical characteristics of the land, suitable to fight the possible transfer of radionuclides into the biosphere;
- compatibility of the development of the depot with the regulatory restrictions protecting the territory;
- isolation of the depot from natural resources of the subsoil;
- protection of the depot from extreme weather conditions.

4) Directive 2007/60/EC (floods)

Indirect external consistency

Objective 4 (siting, development of the NR): In the definition of the exclusion/investigation criteria of Technical Guide 29, some aspects were considered linked to the hydraulic risk, which respect the principles laid down by European Community guidance, in particular, reference was made to:

- Exclusion criterion CE4: areas characterised by geomorphological and/or hydraulic risk and/or danger of any degree and river areas. To assess the risk of mudslides and flooding, (for exclusion), consideration must be taken of the areas at geomorphological and/or hydraulic risk and/or danger of any degree (from moderate to very high) and river areas A, B and C indicated in the Hydrogeological Structure Plan (HSP) and the areas classified in the Inventory of mudslide phenomena in Italy (IMPI);
- Exclusion criterion EC5: areas characterised by the presence of alluvial deposits of the Holocene age. These areas are characterised by the presence of flood depots implemented by the river dynamic during the Holocene period. The exclusion of these areas is another precaution by which to minimise the hydraulic risk;

- Investigation criterion CA4: areas with presence of surrounding water catchment basins. These closed basins do not have emissions and constitute a point of convergence for the drainage of the surface hydrographic network. Following intense, prolonged rainfall, the most depressed parts of the surrounding basin may be subject to the stagnation of water. Reference is made to phenomena not already shown in the application of criterion CE4.

5) Directive 92/43/EEC (Habitat) - Directive 2009/147/EU (Birds)

Indirect external consistency

Objective 1 (waste processing and conditioning): indirect consistency is determined by the fact that the processing of radioactive waste is carried out, where envisaged, in compliance with environmental compatibility decrees and the related provisions and, according to the type of intervention and restrictions present in the area of interest, are subject to natural impact assessment.

Objectives 3 - 4 - 5 - 6 (siting, development, operation of the NR, disposal to NR of waste and fuel storage): consistency was assessed in connection with the exclusion and investigation criteria established for the siting of the NR as per Technical Guide 29. More specifically, Criterion CE11, relative to the protected natural areas identified in accordance with current legislation envisages the exclusion of any areas where there are landscapes, habitats and protected animal and plant species: national, regional and inter-regional parks, state and regional nature reserves, natural oasis, geoparks, Sites of Community Importance (SCIs), Special Protection Areas (SPAs) and wetlands identified in importance of the Ramsar Convention. The above is in line with that required by the legislation; the objectives in question therefore make an indirect contribution towards achieving the objectives of the sector standard.

6) Directive 2008/98/EC as subsequently amended and supplemented (Waste) - Directive 1999/31/EC as subsequently amended and supplemented (Waste - landfills)

Direct/indirect external consistency

Objective 1 – 3 – 4 – 5 – 6 – 7 – 8 (Waste processing - siting and development of the NR - disposal of waste in the NR - fuel storage in the NR): direct consistency was considered insofar as the objective of the National Programme and those of conventional waste legislation pursue purposes that are integrated aiming to ensure the safe management of waste and the minimisation of the related environmental impacts.

Objective 2 - 9 (inventory update - research and development aimed at ensuring the safe management of spent fuel and radioactive waste): for these objectives, indirect consistency was considered insofar as they envisage the development of preliminary activities required prior to the management of radioactive waste and spent that help improve safety and environmental protection.

7) Directive 2002/49/EC (Noise)

Direct/indirect external consistency

Objective 1 (waste processing and conditioning): indirect consistency is determined by the fact that the processing of radioactive waste is carried out within buildings and, where envisaged, in compliance with environmental compatibility decrees and the related provisions. Moreover, in said Plants, steps are envisaged to limit noise emissions due to decommissioning and specific monitoring activities.

Objective 4 (siting, development of the NR): the construction and operation of the NR will be subject to Environmental Impact Assessment; in that area, the actions aimed at limiting acoustic emissions, in line with sector legislation.

8) European Commission Communication 2006/C 323/01 (Research and development)

Indirect external consistency

Objective 9 (research and development exclusively aimed at ensuring the safe management of spent fuel and radioactive waste)**:** direct consistency is determined by the fact that the research and development carried out for the safe management of spent fuel and radioactive waste, envisaged by the National programme, are perfectly in line with the strategic indications established by sector legislation.

9) Directive 2012/18/EU (Seveso III)

Indirect external consistency

Objective 4 (siting, development of the NR): consistency was assessed in connection with the exclusion and investigation criteria established for the siting of the NR as per Technical Guide 29. More specifically, Criterion CE15 relative to the exclusion of areas characterised by the presence of industrial activities at risk of significant incident, dams and artificial hydraulic bars, airports or military operative firing ranges, specifically envisages that the NR may not be developed in areas where there are plants at risk of major incident, as defined in the Directive in question, thereby indirectly contributing to reducing the risks for human health and the environment.

Objective 1 - 3 - 5 - (Waste processing - disposal of waste to the NR)**:** indirect consistency due to the action taken to make radioactive waste safe, carried out through the processing, packaging, temporary storage in authorised depots and disposal to the National Repository, which synergically help reduce the risk of any consequences for human health and the environment, due to the presence, in the area of potential influence, of certain installations (Bosco Marengo plant) of plants at risk of major incident.

10) UNESCO SITES census, instituted and proposed

Indirect external consistency

Objective 4 (siting, development of the NR): consistency was assessed in connection with the exclusion and investigation criteria established for the siting of the NR as per Technical Guide 29. More specifically, Criterion CA11 envisages that during the siting, the areas characterised by the presence of particular quality and types of agricultural produce will need to be assessed, as well as places of archaeological and historic interest, including in order to safeguard the cultural heritage acknowledged as heritage of humanity.

11) Italian Legislative Decree no. 230 of 17 MARCH 1995 as subsequently amended and supplemented (Ionising radiations)

Direct external consistency

Objectives from 1 to 9 (Waste processing - siting and development of the NR - disposal of waste to the NR - storage of fuel in the NR - research and development activities): the objectives of the National Programme are in line with the general principles established by the legislation.

12) Italian Legislative Decree no. 31 of 15 February 2010 as subsequently amended and supplemented (Radioactive waste - temporary depot)

Direct external consistency

Objectives 4, 9 and 10 (Siting and development of the NR - research and development activities - information and communication): the National Programme objectives are in line with the general principles of the reference standard.

13) Italian Legislative Decree 45/14 (Radioactive waste-nuclear fuel) - Implementation of Directive 2011/70/EURATOM, establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste

Direct external consistency

All objectives of the National Programme are consistent with the general principles of the reference legislation.

14) Italian Legislative Decree no. 42/04 (Landscape and Cultural heritage code)

Direct/indirect external consistency

Objective 1 (waste processing and conditioning): direct consistency is determined by the fact that, during implementation of the radioactive waste management programme, the nuclear power plants and nuclear fuel cycle plants will be decommissioned, with subsequent restoration of the areas that can be recovered to the original function of the locations, with positive effects on the landscape, thereby helping pursue the objectives established by sector legislation.

Objective 4 (siting, development of the NR): indirect consistency was assessed in connection with the exclusion and investigation criteria established for the siting of the NR as per Technical Guide 29. More specifically:

- Criterion CA11 envisages that during the siting, the areas characterised by the presence of particular quality and types of agricultural produce will need to be assessed, as well as places of archaeological and historic interest, including in order to safeguard the cultural heritage acknowledged as heritage of humanity.
- Criterion CE11, relative to the protected natural areas identified in accordance with current legislation envisages the exclusion of any areas where there are landscapes, habitats and protected animal and plant species: national, regional and inter-regional parks, state and regional nature reserves, natural oasis, geoparks, Sites of Community Importance (SCIs), Special Protection Areas (SPAs) and wetlands identified in importance of the Ramsar Convention.

Moreover, the project of the NR will be subjected to Environmental Impact Assessment and, under this scope, the possible impacts will be assessed on the landscape component and all mitigation measures necessary to minimise them will be defined and adopted, as fixed by reference legislation.

15) Italian Legislative Decree 152/06 “Environmental standards”

Direct/indirect external consistency

Objectives from 1 to 9 (Waste processing - siting and development of the NR - waste disposal to the NR - fuel storage in the NR - research and development activities): the objectives of the National Programme are indirectly consistent with the general principles of the legislation (Promotion of the quality levels of human life, to be developed through the safeguarding and improvement of environmental conditions and the careful, rational use of natural resources, as well as the prevention of atmospheric pollution) whilst, in a similar fashion to that assessed under point (6), direct consistency has been considered with the objectives relative to conventional waste management.

Conclusions

On the basis of the assessments performed, as regards the verification of “vertical” consistency, the Programme objective were as a general rule, found to be directly consistent with sector regulations and with those regarding conventional waste management and environmental assessment, whilst for some objectives indirect consistency was seen with the main rules regarding the components of Air, Water, Noise, Biodiversity, Cultural and Landscape heritage. For the objective linked to the siting and development of the Depot, indirect consistency was also noted with the rules considered for the definition of the exclusion or investigation criteria reported in ISPRA Technical Guide no. 29.

The examination carried out, as regards general aspects, did not reveal any inconsistency between the Programme objectives and general objectives associated with regulations considered as pertinent (Annex 2 - Table 1).

External “horizontal” consistency aims to compare the objectives of the national programme with the objectives of the territorial plans of eight regions of Italy considered as sites involved by the presence of radioactive materials (Piedmont, Lombardy, Emilia Romagna, Lazio, Campania, Apulia, Basilicata and Sicily).

The criterion used for this analysis was qualitative, i.e. aiming to include all plans in the analysis that have the objective of ensuring sector environmental protection.

In order to maintain consistency with the “vertical” consistency assessment performed, the same criteria were used as summarised in the key given below:

direct consistency: the objective of environmental protection and the objective of the NP pursue integrated purposes;

indirect consistency: the objective of environmental protection and the objective of the NP pursue synergic purposes;

indifference: the objective of environmental protection and the objective of the NP pursue unrelated purposes;

inconsistency: the objective of environmental protection and the objective of the NP pursue juxtaposed purposes;

The assessment considered the regional level territorial plans in order to show that the objectives of the national programme do not pursue purposes that are juxtaposed with those of the plans analysed.

As a rule, in fact, integrated purposes were found between the national programme objectives and the territorial plan objectives, where the latter were general in nature (see, for example, the objectives of health and environmental protection of the Flood risk management plan (**FRMP**)). As instead regards the objectives that pursue synergic purposes, on a regional level, no general rule was found to exist.

Territorial plans were also considered whose objectives pursue purposes that were considered as indifferent or not related to the national programme objectives, see for example the HSP Hydrogeological Structure Plan of the Region of Apulia.

For an in-depth analysis, reference is made to the consultation of Table 2 of Annex 2.

Starting out from the environmental protection objectives of the National Programme and assessing their consistency with the territorial plan objectives of the eight Italian regions examined, the following guidelines were identified that can be considered as transversal:

1. **Objectives 1 – 3 – 5 – 6 – 7 of the NP** (*1) To safely process and package all liquid and solid radioactive waste deposited on the sites in order to transform it into certified waste packages, temporarily stored on the production site, ready for transfer to the National Repository; 3) To safely dispose of radioactive waste generated in Italy, by way of priority, in national territory, as established by Directive 2011/70/Euratom; 5) To dispose in the National Repository of low and medium activity waste, deriving from industrial activities, research and medical-healthcare activities and previous management of nuclear plants, when they derive from civilian activities; 6) To store, on a long-term provisional basis, in said National Repository, the high activity waste and spent fuel from the previous management of nuclear plants, when deriving from civilian activities. For the disposal of the latter, the solution that is currently most accepted worldwide by specialists, is that of disposal in geological formations. In the Italian case, considering that the quantity of high activity waste (including spent fuel) to be disposed of is modest, the solution of developing a geological depot in national territory is somewhat oversized, as well as infeasible economically. Therefore, possible international initiatives must be assessed, aimed at achieving an agreement for the geological disposal site that can be used by several countries; 7) To transport abroad the spent nuclear fuel still present on national territory, for it to be processed and reprocessed, in accordance with specific directives/government agreements, without prejudice to special cases which in any case will be correctly managed in line with the above standards of the Directive 2011/70/Euratom. Upon completion of processing, to return to Italy the radioactive waste deriving from the specific contracts/agreements for the reprocessing of spent nuclear fuel)* regard the safe management of all types of spent fuel and radioactive waste subject to national jurisdiction, throughout all the phases of the life cycle of said waste, from generation through to disposal. Table 2 of Annex 2 shows a general homogeneity in the classifications of consistency/indifference assigned.

2. Given the specificity of **objective 2 of the NP** *(To update the national inventory of radioactive waste and spent fuel once a year)*, a general indifference is noted with respect to the environmental protection objective in the territorial plans examined.

3. **Objective 4 of the NP** (*To site, construct and run the National Repository intended to hold radioactive waste generated in national territory, from industrial activities, research and the medical-healthcare sector and previous management of nuclear plants, when deriving from civilian activities, including a Technology Park including a Study and experiments centre, as specifically regulated by Article 27 of Italian Legislative Decree no. 31 of 15 February 2010*) regarding the National Repository was analysed according to the criteria laid down by ISPRA Technical Guide no. 29 of 2014. By virtue of the level of detail and extent of the matter discussed by said guide, a certain level of direct or indirect consistency was noted with the environmental protection objectives pursued by the territorial plans.

4. Considering the unique nature of **objective 8 of the NP** *(To guarantee fulfilment of the commitments made between the Italian Republic and the European Atomic Energy Community (EURATOM) on the management of radioactive waste at the site of the Ispra Research Centre)*, a general indifference is noted with the environmental protection objective pursued by the territorial plans examined.

5. **Objective 9 of the NP** *(To develop a programme for research and development exclusively aimed at the safe management of spent fuel and radioactive waste, in line with the contents of the National Programme)* is substantially indifferent to the other environmental protection objectives of the territorial plans analysed. However, as it is specifically linked to research, it tends to be in line with objective 4 on the activities of the NR Technology Park.

6. **Objective 10 of the NP** (*By way of priority, in order to achieve the previous objectives, to implement a correct, objective, timely form of information, so as to guarantee transparency and the effective participation of the public in the decision-making processes concerning the management of spent and radioactive waste)* is, in most cases, indifferent to the other environmental protection objective of the territorial plans considered, as it is linked to the specific sector of information.

In conclusion, also as regards the "horizontal" consistency verification (Annex 2 - Table 2), no inconsistencies were seen between the Programme objectives and the objectives of the territorial Programmes and Plans relative to the regions considered.

3.5 Internal consistency analysis

3.5.1 Method for analysing the level of coherence

Internal consistency aims to verify the operative link between actions and objectives of the Programme, in order to highlight any critical issues in the actions envisaged for the implementation of the Programme, with respect to the strategic objectives to be pursued.

As regards the analysis of internal consistency, the following 5 levels of judgement were used:

Full consistency: when substantial consistency is noted between the guidelines of the Programme and the action proposed;

Partial consistency: when there is consistency between the guidelines of the Programme and the action envisaged that is only partial or, although potential, cannot be defined from the outset;

Not pertinent: when an action is believed not to be pertinent and/or within the action, with respect to the objective considered;

Inconsistency: the action and objective of the Programme pursue juxtaposed purposes.

Internal consistency assessment was performed by dividing the National Programme up into two main subjects: management of radioactive waste and management of spent fuel. For each of these, the various strategies envisaged by the Programme with the related actions have been listed; finally, the above actions have been compared with the objectives envisaged by the Programme, assessing their consistency.

If an action or activities envisaged by the action only partially comply with the objectives of the Programme, the assets was of partial consistency, whilst if the information available to define the operating procedures of an action were not fully identified in the Programme, the result of the assets points out that the specific action is not discussed and that, therefore, there is a lack of information.

Figure 3.5-1 shows the results of the assessments performed.

3.5.2 Results of the consistency analysis

The results of the analysis performed shows substantial consistency between the actions and Programme objectives, both as regards the energy segment, for which the management of radioactive waste and spent fuel is established by the decommissioning strategy of the nuclear power plants and the nuclear fuel cycle plants, and for the non-energy segment, for which the waste management strategy is implemented through the methods defined in the Integrated Service.

NATIONAL PROGRAMME OBJECTIVES

THEME	ACTION STRATEGY	ACTION LINE	To process and condition all liquid and solid radioactive waste deposited on the sites, in order to transform them into certified waste packages, temporarily stored at the production site, ready for transfer to the National Repository	To update the national inventory of radioactive waste and spent fuel once a year	To safely dispose of the radioactive waste generated in Italy, by way of a priority, in national territory, as established by Directive 2011/70/EURATOM	To site, construct and run the National Repository intended to hold radioactive waste generated in national territory, from industrial activities, research and the medical-healthcare sector and previous management of nuclear plants, when deriving from civilian activities, including a Technology Park including a Study and experiments centre, as specifically regulated by Article 27 of Italian Legislative Decree no. 31 of 15 February 2010	To dispose, in the National Repository, the low and medium activity waste deriving from industrial operations, research and the medical-healthcare field and from previous management of nuclear plants, when deriving from civilian activities	To store, on a long-term provisional basis (50 years), in the same National Repository, high activity waste and spent fuel obtained from the previous management of nuclear power plants, when deriving from civilian activities. For the disposal of the latter, the solution that is currently most accepted worldwide by specialists, is that of disposal in geological formations. In the Italian case, considering that the quantity of high activity waste (including spent fuel) to be disposed of is modest, the solution of developing a geological depot in national territory is somewhat oversized, as well as infeasible economically. Therefore, during the transitional period for which the high activity waste will remain in the National Repository, the most suitable solution will be identified for its disposal in a geological depot, also considering the opportunities offered up by possible international agreements that may be stipulated in the meantime.	To transport abroad the spent nuclear fuel still present on national territory, for it to be processed and reprocessed, in accordance with specific directives/government agreements, without prejudice to special cases which in any case will be correctly managed in line with the above standards of the Directive 2011/70/Euratom. Upon completion of processing, to return to Italy the radioactive waste deriving from the specific contracts/agreements for the reprocessing of spent nuclear fuel	To guarantee fulfilment of the commitments made between the Italian Republic and the European Atomic Energy Community (EURATOM) on the management of radioactive waste at the site of the Ispra (VA) Research Centre	To develop a programme for research and development exclusively aimed at the safe management of spent fuel and radioactive waste, in line with the contents of the National Programme	By way of priority, in order to achieve the previous objectives, to implement a correct, objective, timely form of information, so as to guarantee transparency and the effective participation of the public in the decision-making processes concerning the management of spent and radioactive waste
RADIOACTIVE WASTE MANAGEMENT	**DECOMMISSIONING (Energy segment)**	Processing and packaging of solid radioactive materials										
		Processing and packaging of liquid radioactive materials										
		Processing and packaging of specific currents and decommissioned sources										
		Temporary storage										
		Disposal in NR										
		Temporary storage of high level waste in NR										
		Disposal of high level waste in geological formation										

RADIOACTIVE WASTE MANAGEMENT	**INTEGRATED SYSTEM (non-energy segment)**	Processing and packaging of solid radioactive materials										
		Processing and packaging of liquid radioactive materials										
		Processing and packaging of specific currents and decommissioned sources										
		Temporary storage										
		Disposal in NR										
		Temporary storage of high level waste in NR										
		Disposal of high level waste in geological formation										
NUCLEAR FUEL MANAGEMENT	**DECOMMISSIONING (Energy segment)**	Processing and packaging										
		Storage in temporary depots										
		Temporary storage in the NR										
		Disposal in geological formation										

Figure 3.5-1 Verification of internal coherence

4 Technical solutions for the management of radioactive waste and spent fuel

4.1 Radioactive waste management

Radioactive waste management is the series of administrative and operational activities that must be performed on radioactive waste during all the phases of life: characterisation, treatment, conditioning, storage, disposal. All operations must be performed in compliance with the safety and radioprotection prerequisites.

PHASES OF RADIOACTIVE WASTE MANAGEMENT				
CHARACTERISATION	TREATMENT	PACKAGING	STORAGE	DISPOSAL
Analysis/measurement aimed at determining the chemical/physical/radiological propteries of waste with the purpose of classifying it and defining the subsequent management phases up to disposal	Application of processes mainly aimed at reducing the volume of waste	Encapsulation of the waste in a waste package suitable for handling, transport, temporary storage and/or disposal. It can be carried out with an authorized solid matrix (for example, cement) or with special containers	Storage and safe maintenance of radioactive waste in a suitable temporary depot with the intention of later recovering it to be sent for disposal in a permanent depot	Placement of the waste in a permanent depot with no intention of recovering it

Figure 4.1-1. Phases of radioactive waste management

The waste undergoes specific chemical and physical treatments that change its physical form and/or chemical composition. The main aim is to reduce its volume or make it chemically suitable for the subsequent conditioning phase. Irrespective of the production sector (energy, medical, research etc.), the treatment processes the waste may undergo basically depend on its characteristics (physical and geometric form, material type) and the radiological content. The list of processes currently used for radioactive waste management in Italy is given below.

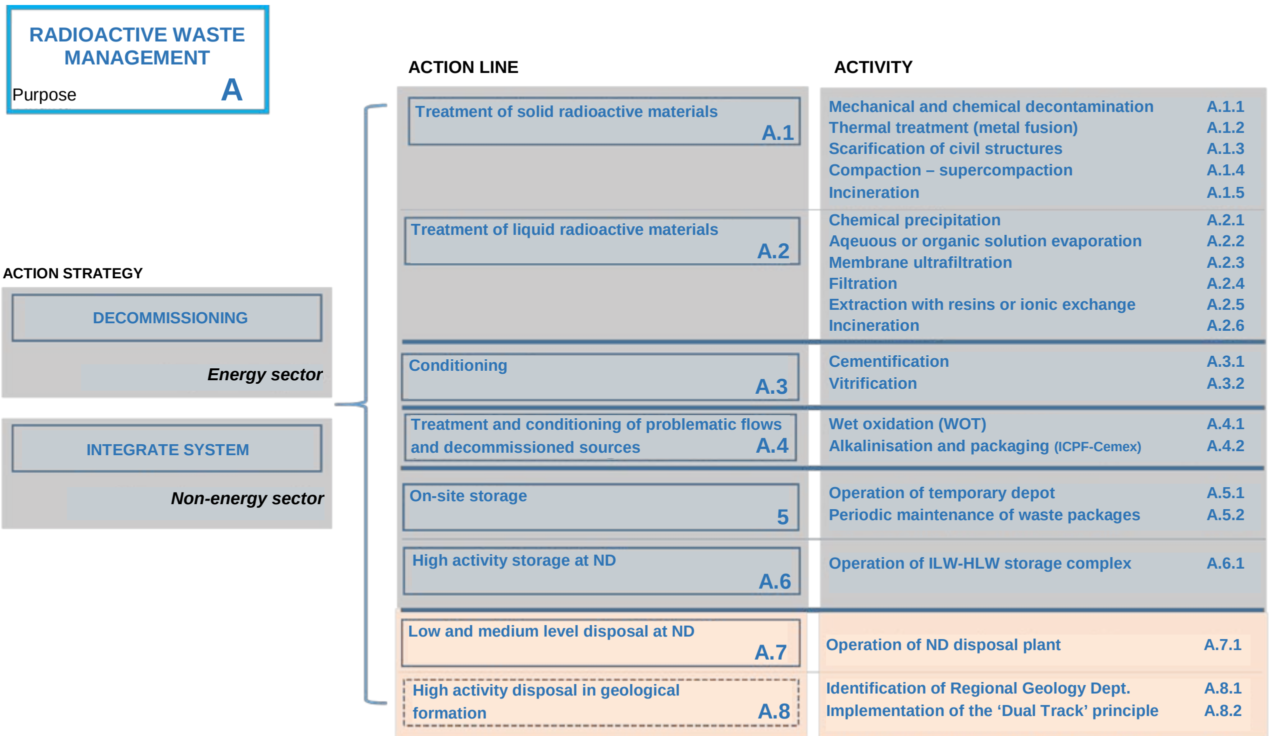


Figure 4.1-2: Action strategy for radioactive waste management

In Italy, there are five nuclear research centres operating in the field of medical, physical and radiochemical sciences. All the radioactive waste produced by research activity is managed in compliance with the procedures laid down by Legislative Decree 230/1995 by the Integrated Service.

To date, apart from the RB3 reactor (the Montecuccolino Nuclear Engineering Laboratory of Bologna University, for which decommissioning activities are coming to end, authorised in 2010), no authorisation for deactivation has been released for any of the plants.

4.1.1 Characterisation/Classification of radioactive waste

Radioactive waste is generally classified in various categories depending on the radioactive content. In Italy, radioactive waste has historically been classified in accordance with the Technical Guide no. 26 of ENEA-DISP, which lays down three specific categories: category I, II and III in ascending order of radioactivity.

The Ministerial Decree of 7 August 2015 established a new classification of radioactive waste. This classification, in line with international standards[17], is based on five categories: Very Short-Lived Waste, Very Low Activity Waste, Low Activity Waste, Medium Activity Waste, High Activity Waste.

In the following table, the new classification is compared with its predecessor and the specific disposal solution is given for each category.

GT Classification no. 26	New classification
First Category	Very short-lived radioactive waste
Second Category	Very low activity radioactive waste
	Low activity radioactive waste
Third Category	Medium activity radioactive waste
	High activity radioactive waste

Figure 4.1-3: Correlation between the classification of the T.G. no. 26 and the new classification of Ministerial Decree of 7 August 2015

[17] At the international level, the classification of radioactive waste is laid down by the IAEA. This has evolved in the course of the years and its latest version outlines the categories on the basis of the specific waste solutions.

Characterisation is the first phase of radioactive waste management. It consists of a series of analyses/measures aimed at determining the chemical/physical/radiological characteristics of the waste and its purpose is to classify waste in order to then define the subsequent processes of treatment and conditioning.

The characterisation of radioactive waste can be carried out directly on plant components or the waste. Various methods can be used, from the application of measuring techniques to the use of semi-empirical methods or calculation codes. Specifically, the measuring techniques can be "non-destructive", involving the direct measurement of the material to be characterised, or "destructive" which require the taking of a representative sample (radiochemistry).

4.1.2 Treatment of solid radioactive waste

MAIN PHYSICAL OR CHEMICAL TREATMENT PROCESSES				
Action line	**ID**	**Type of process**	**Name of process**	**Purpose of process**
Solid waste treatment	A.1.1	Physical	Mechanical decontamination	Elimination of removable contamination from the surface of a material, for example by means of sanding with compressed air
		Chemical	Chemical decontamination	Elimination of removable contamination from the surface of a material by means of chemical agents
	A.1.2	Physical	Fusion	Fusion of metal materials and recovery of the contamination in reduced volumes of residues
	A.1.3	Physical	Scarification of public buildings	Elimination of removable contamination from the surface of large structures by means of scarification
	A.1.4	Physical	Supercompaction	Crushing of solid waste containers under moderate pressure in order to then insert into overpacks to significantly reduce the number of waste packages
		Physical	Compaction	Crushing of solid waste under moderate pressure in the containers in order to then subject it to supercompaction
	A.1.5	Chemical-physical	Incineration	Burning of waste with the consequent concentration of the radioactivity contained in the ashes produced by combustion

Figure 4.1-4: Main treatment processes of solid radioactive waste

Mechanical and chemical decontamination – A.1.1

Superficial decontamination is a pre-treatment process that is implemented on materials, mostly metals, the surfaces of which display removable radionuclide contamination. The radionuclides are not fixed in the metal's crystalline structure and can, therefore, be removed with mechanical methods, such as the use of suitable sandblasters, that is, machines that subject the component to be decontaminated to strong flows of material made up of little metal spheres that, flung against the surface, exert an abrasive action on the most superficial layer of the material. The elimination of the most superficial layers can also be achieved with the chemical method through the use of solvents and acids. The purpose of decontamination is to reduce the radiological load of contaminated material or to be able to release it as material free of radioactivity that can be handled like conventional material.

Fusion – A.1.2

The purpose of this process is to reduce the volumes of metallic radioactive waste through fusion. In Italy, no plant exists that can implement this treatment. The process involves the separation of the original radioactive contamination from the rest of the metal. The first part (residue of the fusion) is recovered (with significant reduction of the original volumes) and managed as radioactive waste. The cleaned metallic part can be recycled.

Scarification of civil structures – A.1.3

Scarification of the civil structures is a more thorough decontamination process than use of a sandblaster or acids. With this process, a large quantity of cement material is eliminated from the contaminated surfaces of certain civil engineering structures. This process is implemented on site, that is, at the nuclear plants or laboratories that have been contaminated with radioactivity.

Compaction – Supercompaction – A.1.4

Compaction and supercompaction of waste are typical treatments that radioactive waste may undergo for the purpose of obtaining a reduction in their initial volume by pressing. The substantial difference between the two processes is the amount of pressure exerted. For supercompaction in particular, very large presses are used that are housed in a specific plant (supercompaction plant).

Incineration – A.1.5

Incineration is a thermal destruction technique of waste through its combustion that enables conversion to chemical form and the reduction of the initial volume of the treated radioactive waste, producing an inert residue. It can be used both for liquid and solid waste. It is commonly used to eliminate the organic component in radioactive waste.

Through this process, the organic portion of the waste is completely oxidised at high temperature and in the presence of excess oxygen. The final products are therefore constituted of oxidised gaseous fractions (the main components are $C0_2$ e H_20) and a solid residue of a purely inorganic kind (various metal oxides contained in the waste, silica, carbonates, various salts). The “ash” from the combustion of the organic component of the waste can be supercompacted and/or immobilised in cement matrices. The abatement systems of the products of combustion are fundamental for controlling and limiting discharges in the environment. An incineration plant can, however, produce secondary waste.

In Italy, no centralised plant exists that can implement this treatment.

4.1.3 Treatment of liquid radioactive waste

MAIN PHYSICAL OR CHEMICAL TREATMENT PROCESSES				
Action line	**ID**	**Type of process**	**Name of process**	**Purpose of process**
Liquid waste treatment	**A.2.1**	Chemical	Precipitation	Addition of a reactant that insolubilizes the radioactive component, separating it from the aqueous solution and making it precipitate
	A.2.2	Chemical-physical	Evaporation	To concentrate the radioactivity in the residue of the evaporation
	A.2.3 **A.2.4**	Physical	Filtration / ultrafiltration	To separate the radioactivity contained in the solid body
	A.2.5	Chemical	Extraction with resins	Extraction of the radioactive component through the ionic exchange resin filtration system
	A.2.6	Chemical-physical	Incineration	Burning of waste with the consequent concentration of the radioactivity contained in the ashes produced by combustion

Figure 4.1-5: Main treatment processes of liquid radioactive waste

Precipitation – A.2.1

In chemistry, the term “precipitation” is the phenomenon of the separation in solid form of a solute (known as precipitate) that is found in a solution at a greater concentration than its solubility limit. Supersaturation and therefore separation can be favoured chemically by means of a reagent that can increase the concentration of solute inside the solution or lower the solubility limit, thereby favouring precipitation, or physically, for example, by temperature variation.

Evaporation – A.2.2

Evaporation is the passage from liquid to gaseous state (gas or vapour), which only involves the surface of the liquid. Liquid waste is introduced, usually automatically, from the tanks that contain it in appropriate plants and is evaporated in the evaporation stages. The result of evaporation is the concentration of the activity of the radionuclides from the original solution in the residue of the evaporation. The process then consists of bringing the contaminated mixture to boiling point and then recovering the solute in solid form.

Filtration – A.2.3

Filtration consists of forcibly passing the mixture (waste + liquid solvent) through a porous medium that retains the particles of solute (waste) and only lets the liquid part through.

Ultrafiltration – A.2.4

Ultrafiltration (UF) is a more thorough filtration process through a semipermeable membrane characterised by pores with a diameter of around 1-100 nm, smaller than the pores of the materials used for filtration. Smaller particles are therefore recovered.

Extraction with resins – A.2.5

Ionic exchange is a process by which ions of a given kind, present in a given solution, are “exchanged” with other ions, chemically similar, present on an insoluble support material made up of resin (ionic exchange resin). The solution to be treated is “freed” of the ions originally present and accumulated in the resin.

In the nuclear field, the process is commonly used for the treatment of the operating and process water of nuclear plants (see purification of the cooling water of a reactor).

Incineration – A.2.6

Incineration is a thermal destruction technique of waste through its combustion that enables conversion to chemical form and the reduction of the initial volume of the treated radioactive waste, producing an inert residue. It can be used both for liquid and solid waste. It is commonly used to eliminate the organic component in radioactive waste.

Through this process, the organic portion of the waste is completely oxidised at high temperature and in the presence of excess oxygen. The final products are therefore constituted of oxidised gaseous fractions (the main components are $C0_2$ e H_20) and a solid residue of a purely inorganic kind (various metal oxides contained in waste, silica, carbonates, various salts). The "ash" from the combustion of the organic component of the waste can be supercompacted and/or immobilised in cement matrices. The abatement systems of the products of combustion are fundamental for controlling and limiting discharges in the environment. An incineration plant can, however, produce secondary waste.

In Italy, no centralised plant exists that can implement this treatment.

4.1.4 Conditioning

The main aim of the conditioning process of waste is to immobilise, with the greatest reduction of volume possible, the radioactive residue from treatment processes in a solid product, packaged in appropriate ways and containers with the following prerequisites:

- physical-chemical compatibility between the radioactive residue and immobilising matrix;
- homogeneity of the cement matrix;
- reduced solubility and permeability to aqueous liquids;
- mechanical resistance;
- resistance to external agents (physical, chemical, biological);
- resistance to heat, thermal cycles, flames;
- resistance to radiation;
- stability over time in the storage depot.

The attainment of the maximum reduction of the volume of radioactive waste, in addition to the reduction of the risk of dispersal of radioactivity, enables improved management of the packaged products (transport, temporary storage, disposal etc.).

Because the radioactive waste differs in type and level of radioactivity, two separate processes are used for conditioning:

- Vitrification, generally used for conditioning the residues from the reprocessing of spent fuel and high activity waste, especially liquids;
- Cementation, generally used for conditioning radioactive waste of low and medium activity.

Cementation – A.3.1

The radioactive waste, after being treated, is packaged or incorporated in a cement matrix within a suitable container that ensures its confinement from the environment. Both the conditioning matrix and the container must meet specific prerequisites of physical, chemical and mechanical resistance. Cementation enables an artefact to be produced that is mechanically, chemically and physically stable, suitable for transport, temporary storage and disposal.

The cement mortars used for cementation are appropriately authorised on the basis of the specific characteristics of the waste to be packaged. The radioactive residuals are inserted in the container in which the cementation takes place. The drum, positioned on a vibrating surface, is continuously agitated to prevent unevenness in the mixture. The mixture is left to rest for around 24 hours to ensure the cement solidifies. The drum is then sealed with a metal lid. Before leaving the plant, the drums containing packaged radioactive residues are decontaminated with jets of water and then monitored before being sent to the depot.

Vitrification – A.3.2

For the highest level waste with the longest decay times, the conditioning takes place by means of vitrification. Glass perfectly meets the requirements and, moreover, enables a reduction of the volume of residues by 1/3 of their initial volume. The waste is placed in appropriate thermal plants together with the appropriate additives required to optimise the vitrification process. High activity liquid is placed in a calcinator (a stainless steel pipe inclined upwards and rotating inside an electrical resistance furnace) where liquid waste evaporates and is partially denitrated. The powder produced in this way, together with the raw materials making up the glass (Boron, Silicon etc.), are unloaded by gravity inside a fuser where the glass melts and the calcine is dissolved creating a melted mixture of glass and fission products (vitrified waste). The mixture is then poured into containers placed below the fuser that are then cooled, furnished with a lid and sealed with fusion welding. The residues packaged in this way are placed in appropriate temporary depots in which they are cooled by air through natural convection.

In Italy, there are no plants for the vitrification of radioactive waste.

4.2 Treatment and conditioning of specific flows and decommissioned sources

4.2.1 WOT Plant – SiCoMor – A.4.1

The WOT treatment for spent resins produced during service and during the decontamination operations of steam generators in the Trino power station (around 100 m^3) consists of the wet oxidation (WOX) to convert organic matter into water and carbon dioxide and the inorganic matter into a residue composed of insoluble oxides and soluble salts. The main operating condition of the process basically consists of the exothermic oxidation reaction, at high pressure and temperature of the liquid suspension of the resin mixture (homogenised from the chemical and radiological point of view).

The wet oxidation process is conducted in an aqueous environment at high temperature (150–350 °C) and pressure (0.5-20 MPa). In other words, it can be understood as a thermal and oxygenation process in which organic and inorganic compounds decompose at high temperatures and pressures by inserting oxygen in their structure. This technology is often used for the treatment of hazardous, toxic and/or non-biodegradable waste using pure oxygen (Wet Oxidation, WO) as the reaction gas.

The residues in aqueous solution with precipitates, produced by the process of treating resins of the WOT plant, will then be packaged in cement matrices inside the SiCoMoR (Modular Conditioning System for Radioactive Waste) conditioning plant.

The SiCoMoR plant is made up of a modular structure, the installation of which does not involve the construction of fixed civil works, with the exception of the support platform of the process modules. These paired modules constitute a confined process area that ensures both a static and dynamic barrier to the spread of the contamination. Moreover, the SiCoMor plant is additionally contained inside a structure of confinement that enables the operating area of the plant to be maintained at a lower pressure compared to the outside environment. Outside the confinement structure, which marks out the operating area of the plant, the service modules (control room, electrical panels, preparation of the capping mortar) and the cement powder storage silos are located.

The conditioning process consists of mixing the radioactive waste with dry cement powder (and any additives) in order to obtain the immobilisation of radionuclides in a compact cement matrix with suitable mechanical and physical characteristics. The mixing is done directly inside stainless steel drums equipped with disposable rotors (in drum mixing and cementation). During the waste conditioning operations, the cemented drums (artefacts) are housed inside appropriate shielded overpacks to limit the external leakage. The artefact/overpack assembly can be transported as it is to the ND, once the latter is available.

The WOT – SiCoMor treatment plant, designed for the treatment and conditioning of the spent resins of the Trino Power Station was excluded from the Environmental Impact Assessment by the Ministry of the Environment and the Protection of Land and Sea on 7 June 2016.

4.2.2 ICPF Plant – A.4.2

In 2010, the design was approved by ISPRA for the construction of a plant for the cementation of around 3 cubic metres of uranium-thorium liquid solution, called the finished product, arising from the experimental fuel reprocessing activities (ICPF plant). In awaiting transfer to the National Repository, the artefacts, once cemented, will be stored in the adjacent temporary depot, already provided in the design.

The ICPF plant process is made up of two main phases: the neutralisation/alkalisation of the solution to be cemented and the subsequent cementation with the technique of "in-drum mixing". The finished product cementation process (ICPF plant) provides a pre-treatment phase of the "Finished Product" (3324 l), that is, an acid solution of Uranium and Thorium nitrates, highly radioactive due to the presence of actinides and fission products. The chemical process to be carried out before cementation consists of the neutralisation and adjustment of the radioactive solution for cementation with sodium hydroxide (NaOH).

During the operating phase of the process plant, the production and management of the following types of secondary waste are envisaged:

- Liquid waste due to any leaks from the primary and/or washing containment (tanks, head-on cell or mixture cell). This waste can then be sent to ICPF in order to be packaged with the cementation process adopted.
- Gaseous waste made up of off-gas of the tanks that will be sent to the existing treatment system in the ITREC plant and those arising from the process operations (drum mixing, mixture setting etc.) that are channelled in the cell ventilation system and, after filtering, from there to the chimney of the ITREC plant.

Discharges of liquids during the operating phase are not envisaged (radioactive residual transfer and conditioning process), nor are gaseous radiological discharges, with the exception of the flows from the ventilation and air-conditioning system of the buildings that are sent to the plant's chimney.

In March 2011, the ICPF plant design obtained the decree of Environmental Compatibility from the Ministry of the Environment and Protection of Land and Sea and the Ministry of Cultural Heritage. At the end of 2014, work on the construction of the Plant began.

4.2.3 CEMEX Plant – A.4.2

The Cemex plant will enable the cementing and conditioning of around 260 m^3 of liquid radioactive waste on the site from the reprocessing of elements of MRR and CANDU fuel, as well as those produced during the decommissioning of the Eurex Plant. The adjacent temporary D3 depot will enable high activity solidified liquid waste to be stored for later transfer to the National Repository.

As with the ICPF Plant, the process of the CEMEX plant is made up of two main phases: the neutralisation/alkalisation of the solution to be cemented and the subsequent cementation with the technique of "in-drum mixing". The alkalisation process of radioactive liquid consists in adding the chemical reagent (NaOH "soda") before adding the solution to be alkalised, thereby ensuring the maintenance of base conditions for the entire neutralisation phase. The plant is also equipped with an evaporation/concentration section of the solutions containing nitric acid ($HN0_3$), used for washing and decontamination operations of the CEMEX process building, the tanks of Zone 800 and NPS, as well as the equipment, tanks and process pipes of the plant, with the dual aim of minimising the volume of the liquid effluents produced during the operating phase of the plant, and therefore the final volume of artefacts produced, and concentrating the radioactive liquid waste from the decontamination phase.

The liquid effluents produced that are discharged in the waste pond of EUREX are those arising from the double concentration of the secondary waste from washing the off-gas, washing/decontamination of active process equipments used in the analytical laboratory.

The gaseous effluents produced during the operation of CEMEX are those from air lift, air ejectors, gang valves of the steam ejectors, tank agitation systems, level and purge density measuring instruments and the MOWA head. All the effluents are sent to the off-gas system.

In 2008, the Ministry of the Environment and the Protection of Land and Sea, in concert with the Ministry for Cultural Heritage, issued the decree of environmental compatibility (Environmental Impact Assessment) for the construction of the CEMEX complex, currently under construction.

4.2.4 Decommissioned sources

A “Source” is a radioactive material (generally made up of a single radionuclide) at a high concentration that emits radiation outside its casing. Radioactive sources are produced by various production and research sectors (medicine, industry, agriculture, research etc.).

Sources that are decommissioned without planned reuse or transfer to the producer must be managed as radioactive waste and subject to specific processes of conditioning, temporary storage and disposal, depending on their classification.

Currently, most of the sources on national territory regard the Integrated Service and come from previous research activities by ENEA. In any case, almost all the sources are the property of ENEA.

Currently, the sources are managed according to established practices, for which reason they are packaged by means of cementation inside containers of the same type used for other radioactive waste.

In the case of large sources, these are safely stored to await a decision on a suitable process of conditioning.

The artefacts currently in the depots of Casaccia will be subject to the respective analyses, once the management instructions are known, dictated by the Technical Guide and the WAC (Waste Acceptance Criteria) that will be defined for acceptance at the National Repository.

These analyses will enable the source artefacts to be classified and a decision to be made with regard to their potential suitability for transfer to ND or the option of withdrawing them.

The artefacts deemed suitable (including after appropriate safety analyses) for disposal at the National Repository will be transferred.

For artefacts that are not deemed suitable for surface disposal, the possibility of placing them in high integrity containers for transfer to long-term temporary storage must be assessed.

For the sources produced in future that cannot be transferred to ND for disposal purposes, it will be necessary to assess the possibility of conditioning these in high integrity containers. These containers do not require conditioning with cement matrix and enable future recovery of the sources for the purpose of more suitable conditioning, before transfer to the geological disposal depot.

In any case, as with radioactive waste, all decommissioned sources on national territory will be transferred to the National Repository for:

1. Disposal: if the sources can be classified as “very low activity” or “low activity” waste (classification in accordance with Ministerial Decree 7 August 2015);
2. Storage: temporary, if the sources can be classified as “medium level” waste (classification in accordance with Ministerial Decree 7 August 2015).

The general flow diagram of decommissioned sources management is given below.

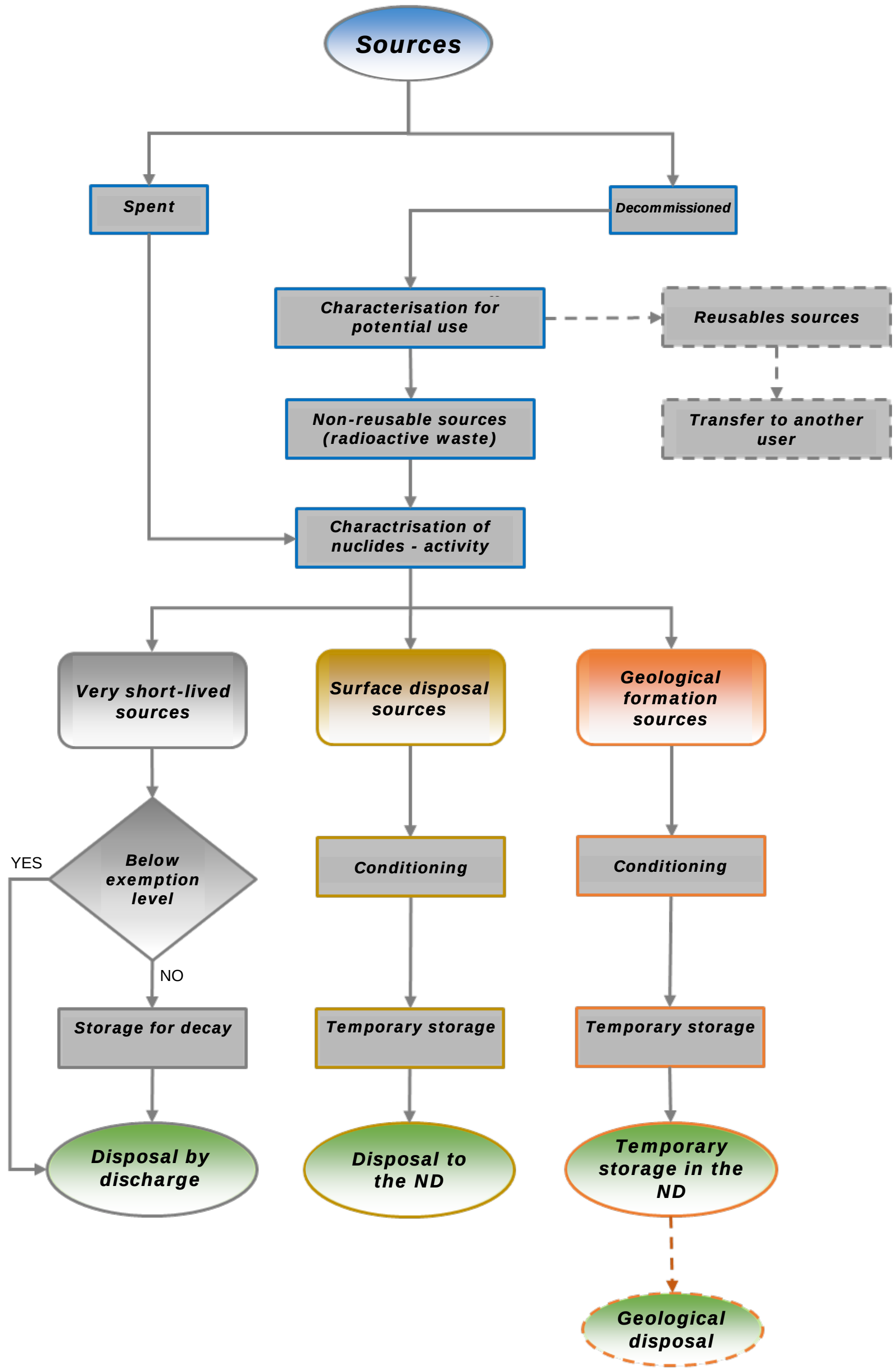


Figure 4.2-1: Flow diagram of decommissioned sources management

4.2.5 "Historic" waste

In the nuclear installations on Italian territory, the flows of waste produced in the previous activities conducted in these installations are stored.

Some of these flows have already been treated and packaged in accordance with the best current practices at the time of their production.

In particular, in certain installations, parts of the waste already packaged do not comply with current conditioning practices and therefore are not suitable for transfer, as such, to DN.

For this reason, the process is already underway to define specific recovery and reprocessing solutions for each of these flows, in order to produce artefacts compatible with the acceptability criteria at DN.

In addition to these waste flows, there are types of untreated waste for which, given their specific behaviour for the purpose of long-term safety, studies and research[18] are underway at the international level for the identification, from among those already described in the previous paragraphs, of the most suitable physical-chemical treatment processes for the purpose of making them suitable for disposal.

4.3 Temporary storage and final disposal

4.3.1 Storage on site – A.5.2 – A.5.3

Once treated and packaged, the waste is stored in appropriate temporary depots (generally at the site in which it was created or at a centralised depot) for final transfer to a disposal depot.

In the storage phase, the waste is kept in absolute isolation from the external environment, guaranteeing the total safety of the operators and the population. Very short-lived waste is stored until the radioactivity has been reached levels lower than the release limits, following natural decay. Once these levels have been reached, the waste can be recycled or disposed of as conventional waste.

For waste with higher radiological content, it is not possible to grant the release and so it is stored on site temporarily with the aim of later transfer to the National Repository or the surface depot or the temporary depot to await the final placement in geological formation[19].

During storage in the temporary on-site depot, the artefacts are either in the final condition, that is, ready to be transferred to ND, or in an interim configuration awaiting subsequent treatment.

All the treatments carried out are aimed at creating a final artefact that fully respects the acceptance criteria (Waste Acceptance Criteria – WAC) that will be defined for transfer to the National Repository.

All the on-site storage depots are subject to a control and monitoring plan that provides periodic inspections aimed at verifying that there is no damage that could prejudice the confinement of radioactivity. If the inspections reveal deterioration of the artefact, appropriate maintenance activities shall be carried out to ensure the state of preservation over time.

Once loading of the radioactive waste in the temporary depot has begun, in addition to the activity of monitoring the artefacts gradually stored in it, an environmental monitoring plan is implemented in the areas surrounding the building with the purpose of checking there has been no undue release of radioactivity. The radiological monitoring in question, which supplements the existing monitoring

[18] These studies may also concern the waste flows that will be produced by the future decommissioning activities of nuclear installations.

[19] Depots for the disposal of low and medium activity waste are operating or planned in all countries that hold radioactive waste of this type. The most modern and advanced are found in France, Spain, Sweden, Japan and the Czech Republic. Major projects are in an advanced state of development in Belgium, Germany and in some East European countries. More than 100 depots are operating in the member countries of the IAEA (International Atomic Energy Agency).

network for the site overall, involves the execution of measures on various environmental matrices at points of the surrounding areas identified as “critical” following potential releases.

4.3.2 High activity storage at ND – A.6.1

The National Repository will house a surface infrastructure (ILW-HLW storage complex) for the long-term temporary storage of high activity radioactive waste (in accordance with the terminology of Legislative Decree 31/2010) generated by the operation and dismantling of the nuclear power stations, the nuclear fuel cycle plants, the nuclear research plants and by the nuclear medicine, industrial and research activities, conducted in the past or that will be conducted in the future.

The waste shall be transferred to this infrastructure only in the form of artefacts that comply with suitable acceptance criteria (WAC – Waste Acceptance Criteria).

The ILW-HLW storage complex areas are organised in separate “aisles”, each for mainly housing a single type of waste and each with specific instrumentation and management and control methods.

The processes, plants and equipment used inside the ILW-HLW storage complex are defined in order to enable safe management of the various types of artefact, either by remote methods or with the direct action of the operator.

It is not envisaged that the waste will undergo treatments in the ILW-HLW storage complex; the only activities envisaged are those necessary for the purpose of maintaining the conditions of isolation and safety of the waste in the storage configuration provided and for the entire duration of stay at DN.

To this end, the structures of ILW-HLW storage complex include, in addition to the storage ‘aisles’, certain zones and equipment dedicated to the conduct of these maintenance activities on the artefacts with specific processes and technologies for the various types of artefact (for example, shielded cells).

4.3.3 Low and medium activity disposal at ND – A.7.1

The depots for disposal have very different characteristics from those of temporary depots since they must confine the waste from the environment for very long timescales (hundreds of years for low and medium activity waste and hundreds of thousands of years for high activity waste). To this end, they are constructed on the surface and at gradually increasing depths depending on the level of radioactivity of the waste.

The phase of life of ND will basically consist of its construction, operation, closure and institutional control. The institutional control, lasting around 300 years, will be concluded downstream of a long-term safety analysis (Safety Assessment – SA), which will assess the effective radiological relevance, enabling the release of the site without radiological constraints and to assign the site to the uses that shall be allowed by law.

In the depot construction phase, lasting around 4/5 years, the construction is envisaged of part of the cells and the main buildings connected to its operation; in the course of its operating life, with a duration of around 40 years, in addition to the disposal of the artefacts gradually accepted by the depot, the construction activities of cells will continue as they become necessary.

In the operating phase, the multi-barrier depot provided for the disposal of low and medium activity waste will receive the already packaged artefacts in full compliance with the acceptance criteria (WAC), having confirmed the physical, mechanical and chemical stability and that they do not require further treatments at DN.

In order to enable the final placement in the structures and the disposal configuration provided, the transferred artefacts will be placed and immobilised inside the second engineering barrier, the module, and then arranged within the third barrier, that is, the disposal vault; no maintenance activity on the artefacts is therefore envisaged on the National Repository site.

To create the disposal configuration, it will therefore be necessary to create in the ND certain structures and plants necessary to conduct the following main activities:

- Construction of the modules
- Construction of the cells
- Acceptance controls of the transferred artefacts (WAC):
    - Non-destructive analyses
    - Destructive analyses
- Conditioning of the modules
- Running and maintaining of the structures, plants and components

Once all the artefacts laid down by the transfer plan have been disposed of, the activities given above will no longer required to be carried out and therefore the plants and structures dedicated to them will be dismantled.

Finally, after dismantling plants that are no longer necessary, the final cover will be constructed (hill or multilayered cover) in the depot closure phase and the period of institutional control will begin.

A suitable environmental monitoring network will also be created for the ND, which will make it possible to verify all the points of potential release of radioactivity outside the site, in all phases of its life: environmental matrices of various kinds will constantly be monitored for the purpose of confirming the absence of radiological impact on mankind and the environment of waste preserved in the infrastructure.

4.3.4 High activity disposal in geological formation – A.8.1 – A.8.2

The geological depot is a structure for the final placement of high activity radioactive waste, constructed in the subsoil at significant depths (usually several hundred metres) in a stable geological formation (clay, granite, halite). This enables the isolation of the radionuclides from the environment for very long periods of time (up to hundreds of thousands of years).

The only depot of this type in operation is the WIPP (Waste Isolation Pilot Plant) in Carlsbad (New Mexico – USA), which houses high activity waste of military origin. In Europe, Sweden and Finland have already identified the sites (in the municipalities of Östhammar and Olkiluoto respectively) for deep geological depots, while France, Germany, United Kingdom, the Czech Republic, Switzerland and Hungary have already started the process of siting and are at various stages of implementation.

In consideration of the high costs of construction of a depot of this type, some European countries with limited quantities of high activity waste are assessing the option of constructing one or more joint deep depots (Regional depot), as presented by the Directive 2011/70.

For the disposal of high activity waste, the solution that is currently finding the greatest consensus at the international level among specialists is that of disposal in geological formations. In the case of Italy, given that the quantity of high activity radioactive waste to be disposed of is small, the solution of constructing a geological depot on national territory appears unnecessary, as well as not feasible economically. Therefore, during the temporary period of storage of the high activity radioactive waste in the National Repository, the most suitable solution for its disposal shall be identified in a geological depot, also taking account of the opportunities offered in the framework of possible international agreements that may be reached in the course of the aforementioned period.

4.4 The management of spent fuel

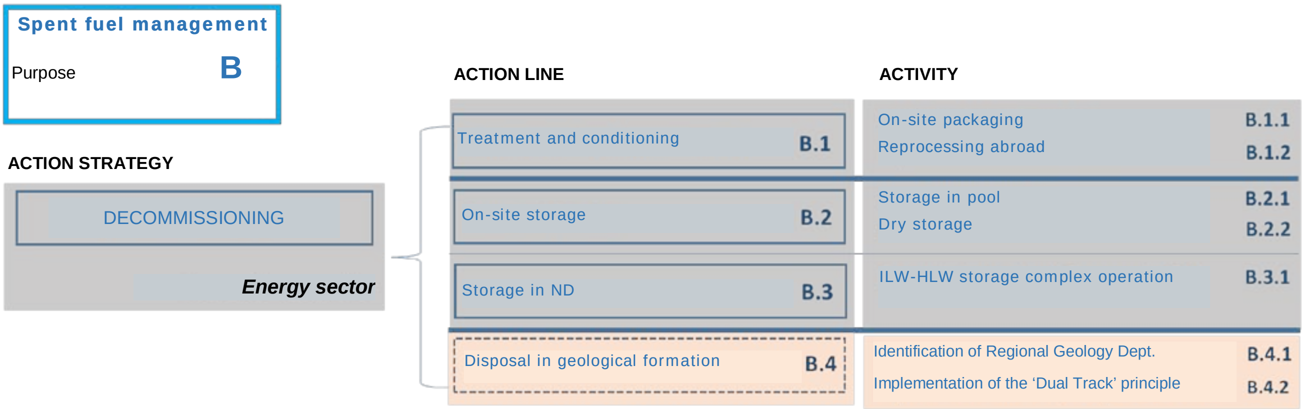


Figure 4.4-1: Action strategies for spent fuel

In Italy, there are five nuclear research centres operating in the field of medical, physical and radiochemical sciences. All the radioactive waste produced by research activity is managed in compliance with the procedures laid down by Legislative Decree 230/1995 by the Integrated Service.

To date, apart from the RB3 reactor (the Montecuccolino Nuclear Engineering Laboratory of Bologna University, for which decommissioning activities are coming to end, authorised in 2010), no authorisation for deactivation has been released for any of the plants.

SPENT FUEL TREATMENTS		
Action line	**Process name**	**Purpose of the process**
Treatment and packaging	On-site packaging (for fuel that cannot be reprocessed)	Converting the irradiated fuel into a suitable form (mechanical/physical/chemical stabilisation) for the subsequent temporary storage, transport and disposal.
	Reprocessing abroad	The reprocessing (re-treatment) of the irradiated fuel is a chemical treatment technique of the field that consists of separating its main constituents; the products of fission (which made up the residues to be managed as radioactive waste) and the residual fissile elements (Uranium and Plutonium), which can be reused for making new fuel.
Temporary storage	Storage in pool	To guarantee the safe storage of irradiated fuel elements, under jets of water for the protection against radiation and dissipation of the residual heat.
	Dry storage on site	To guarantee the safe storage of irradiated fuel elements that cannot be reprocessed.
	Dry storage in ND	Storage of fuel elements/bars/unprocessed irradiated pieces from the residues arising from the reprocessing of the fuel abroad (both vitrified and compacted) inside suitable casks for transport and temporary storage (dual purpose). The storage will be carried out in a dedicated area of the ILW-HLW storage complex of the National Repository (ND).

Figure 4.4-2: Action strategies for spent fuel

4.4.1 On-site conditioning – B.1.1

Conditioning fuel elements/bars/irradiated pieces on site means the operations carried out for recovery from the dry storage areas (for example, containers, as for the Casaccia site, wells, as for the CCR Ispra site) or from the pools (for example, Trisaia and CCR Ispra) in which they are currently located, and subsequent replacement in high-resistance metal containers ("dual purpose" casks). The casks have structural characteristics designed to ensure the shielding and confinement of fuel in all the normal and incidental scenarios possible during all the management phases (transport and storage).

In particular, the conditioning operations in the pool shall take place under water jets and, in brief, regard the transfer of fuel elements from the current containers to others suitable for subsequent loading in the casks. Conversely, the conditioning of fuel elements in dry storage will be in confined rooms called "Hot cells" and the activity will be similar to that previously described: transfer to suitable containers, where necessary, and then loading in the casks.

For the energy fuel currently stored in the pool of the Avogadro Depot, the conditioning will be limited only to the loading of the casks, which will take place as part of the transfer operations to foreign reprocessing plant.

4.4.2 Reprocessing abroad – B.1.2

The spent nuclear fuel used in Italian nuclear power stations has been sent abroad to international operators in the sector (Sellafield in England and La Hague in France) to be reprocessed. Reprocessing is one of the last phases of the so-called "closed cycle" of the fuel. It is carried out in complex plants in which the fuel elements are subject to specific chemical processes that, following the dissolving of these elements, enable the separation of the various components in the solution. It is possible to recover the materials that make up the residue, which it is necessary to manage as highly radioactive waste, differentiating them from the "valuable" materials that can be reused in the production cycle of nuclear fuel. The purpose of reprocessing is that of recovering fissile material to be reused but also reducing the volumes of material to be managed as radioactive waste.

The residues from the reprocessing are high activity waste containing fission products packaged in vitreous matrices inside stainless steel containers and medium activity metal waste (structural parts of fuel elements) compacted and packaged in canisters similar to those in glass.

4.4.3 Storage in pools – B.2.1

The material, as raw fuel or in containers, is placed on suitable racks for storage under water jets. The radioactivity of spent fuel diminishes over time, first rapidly, then more gradually. For this reason, before sending the fuel element for reprocessing or to the interim depot to await final disposal, the fuel element is stored inside cooling pools. In this way, the activity and, above all, the consequent generation of heat are diminished and this makes handling, transport and treatment of the elements easier.

4.4.4 Storage – B.2.2

For spent fuel that cannot be reprocessed for technical reasons (for example, a poor level of enrichment, elements of Uranium-Thorium, fuel not covered by international agreements for reprocessing etc.), dry storage is provided in "dual purpose" casks confined in appropriate areas of temporary storage.

4.4.5 ILW-HLW storage complex – B.3.1

Waste made up of fuel elements/bars/irradiated pieces that have not been reprocessed, from the residues of fuel reprocessing carried out abroad, will be transferred to the ND for the purpose of the temporary storage envisaged at the ILW-HLW storage complex. The transfer will take place through casks, that is, metal containers with sufficient structural characteristics to ensure the shielding and confinement of fuel in all possible normal and incidental scenarios during the storage phase.

The casks will be dry stored in aisles dedicated to the ILW-HLW storage complex and will be arranged on the ground in accordance with a predefined configuration in a vertical position. There will be sufficient gaps between them to enable thermal dissipation by natural convection of the heat from decay. In addition to the normal systems of environmental monitoring, a system of continuous monitoring is also provided of the seals of the cask closure system.

4.4.6 Disposal in geological formation – B.4

For the disposal of spent fuel, the solution that is currently finding the greatest consensus at the international level among specialists is that of disposal in geological formations. In the case of Italy, the solution of constructing a geological depot on national territory appears unnecessary, as well as not feasible economically. Therefore, the most suitable solution of disposal in a geological depot will be identified, also taking account of the opportunities offered in the framework of possible international agreements that may be reached.

4.5 Identification of potential interference with the environment

4.5.1 Radioactive waste treatment (Action lines A.1 and A.2)

With reference to the descriptions of the action lines A.1 and A.2, the disturbance factors caused by activities connected to the treatment of radioactive waste are:

- the generation of noise
- release of gaseous effluents
- release of liquid effluents
- irradiation due to the presence of radioactive waste to be subject to treatment, secondary process waste, as well as the solid radioactive waste produced.

Action line A.1 – Solid radioactive waste treatment

ID	Process name	Disturbance factor	
A.1.1	Mechanical decontamination	Secondary waste Gaseous effluents	RAD
		None	CON
	Chemical decontamination	Secondary waste Liquid effluents (PHADEC)	RAD
		Gaseous effluents (chemical reagents)	CON
A.1.2	Fusion	None (activity carried out in foreign plant)	
A.1.3	Scarification of public buildings	Secondary waste (scarified material)	RAD
		None	CON
A.1.4	Supercompaction Compaction	Liquid effluents (mixtures) Solid waste (pallet)	RAD
		Noise generation	CON
A.1.5	Incineration	None (activity carried out in foreign plant)	

Action line A.3 – Liquid radioactive waste treatment

ID	Process name	Disturbance factor	
4.21	Precipitation	Liquid effluents Radioactive waste to be packaged	RAD
		Liquid effluents *	CON
A.2.2	Evaporation	Gaseous effluents Radioactive waste to be packaged	RAD
		Gaseous effluents*	CON
A.2.3 4.2.4	Filtration / ultrafiltration	Liquid effluents Spent filters	RAD
		Liquid effluents *	CON
A.2.6	Incineration	None (activity carried out in foreign plant)	
A.2.5	Extraction with resins	Liquid effluents Spent resins to be treated and packaged	RAD
		Liquid effluents *	CON

*Depending on the chemical of the radioactive waste flow to be treated

Figure 4.5-1: Summary matrix of potential disturbance factors for the environment

4.5.2 Conditioning (Action line A.3)

With reference to the descriptions of the action line A.3, the disturbance factors caused by activities connected to the conditioning of radioactive waste are:

- release of gaseous effluent
- release of liquid effluents
- consumption of water resources
- irradiation due to the presence of waste to be packaged and the artefacts produced

ID	Process name	Disturbance factor	
A.3.1	Cementation	Gaseous effluents Liquid effluents Waste package	RAD
		Gaseous effluents Water resource consumption	CON
A.3.2	Vitrification	None (activity carried out in foreign plant)	

Figure 4.5-2: Summary matrix of potential disturbance factors for the environment

4.5.3 Treatment and conditioning of specific flows (Action line A.4)

With reference to the descriptions of the action line A.4, the disturbance factors caused by activities connected to the treatment and conditioning of specific flows are:

- Release of gaseous effluent
- Release of liquid effluents
- Irradiation due to the presence of radioactive waste to be treated and packaged artefacts
- The generation of noise
- Release of gaseous effluents
- Consumption of water resources
- Above ground volume

ID	Process name	Disturbance factor	
A.4.1	Wet oxidation (WOT)	Release of gaseous effluents Release of liquid effluents Irradiation due to the presence of radioactive waste to be treated and waste packages	RAD
		Noise generation Release of gaseous effluents Consumption of water resources Above ground volume	CON
A.4.2	Cemex - ICPF	Release of gaseous effluents Release of liquid effluents Irradiation due to the presence of radioactive waste to be treated and waste packages	RAD
		Noise generation Release of gaseous effluents Consumption of water resources Above ground volume	CON

Figure 4.5-3: Summary matrix of potential factors of disturbance for the environment

4.5.4 Conditioning of spent fuel (Action line B.1.1)

With reference to the description of action line B.1.1, as regards the on-site packaging of the irradiated fuel, currently stored dry or in pools, the processes will always be conducted in a confined environment and include the insertion of elements (whole or in pieces) inside new shielded containers and their subsequent insertion in casks.

For the activity in question, it is possible to identify the following potential disturbance factors:

- Irradiation due to the presence of spent fuel in casks that are to be packaged.
- Release of gaseous effluents: release of gas due to the manipulation of fuel elements, channelled into the atmosphere by the dedicated expulsion system in compliance with the discharge formula.
- Release of liquid effluents: in the case of irradiated fuel stored in pools, any release of contaminated particles, following the handling of bars, is removed by the plant's filtration system. The treated liquid effluent will be discharged in the environment in compliance with the authorised limits.

ID	Process name	Disturbance factor	
B.1.1	On-site packaging	Irradiation due to the presence of loaded casks Release of gaseous effluents Release of liquid effluents	RAD

Figure 4.5-4: Summary matrix of potential disturbance factors for the environment

4.5.5 On-site storage (Action line A.5)

With reference to the description of action line A.5, the disturbance factors cause by the activities connected to storage are:

- Gaseous effluents (ventilation of previous waste storage depots);

- Irradiation due to the presence of packaged artefacts ready for transfer to ND
- The generation of noise
- Above ground volume

ID	Process name	Disturbance factor	
A.5	On-site storage	Release of gaseous effluents Irradiation due to the presence of packaged radioactive waste	RAD
		Noise generation Above ground volume	CON

Figure 4.5-5: Summary matrix of potential disturbance factors for the environment

4.5.6 On-site storage (in pools or dry) of spent fuel (Action line B.2)

With reference to the description of action line B.2, the disturbance factors cause by the activities connected to storage are:

- Irradiation due to the presence of spent fuel
- Release of gaseous effluents (limited to dry storage)
- The generation of noise (limited to dry storage)

ID	Process name	Disturbance factor	
B.2	On-site fuel storage (in pool or dry)	Irradiation due to the presence of gaseous effluents Release of gaseous effluents	RAD
		Noise generation	CON

Figure 4.5-6: Summary matrix of potential disturbance factors for the environment

4.5.7 Storage at ND (Action lines A.6 – B.3)

Since the site has not yet been localised and, as a consequence, there being no definitive design, as a preliminary, with reference to the descriptions of the action lines A.6 – B.3, the disturbance factors caused by the activities connected to the storage at CSM could be:

- Irradiation due to the presence of artefacts and casks
- Release of gaseous effluents
- Release of liquid effluents
- Consumption of water resources
- Soil consumption
- Production of earth from excavation
- The generation of noise
- Above ground volume

ID	Process name	Disturbance factor	
A.6.1 B.3.1	ILW-HLW storage complex operation (construction, loading)	Irradiation due to the presence of waste packages and casks	RAD
		Gaseous effluents Liquid effluents Water resource consumption Soil consumption Excavated earth production Noise generation Above ground volume	CON

Figure 4.5-7: Summary matrix of potential disturbance factors for the environment, gaseous additions

4.5.8 Disposal at ND (Action line A.7)

Since the site has not yet been localised and, as a consequence, there being no definitive design, with reference to the descriptions of the action line A.7, the disturbance factors that could be caused by the activities connected to the construction, operation and closure of the ND.

Construction

- Release of gaseous effluents
- Release of liquid effluents
- Consumption of water resources
- Soil consumption
- Production of earth from excavation
- The generation of noise

Operation

- Irradiation due to the presence of artefacts
- Release of gaseous effluents
- Release of liquid effluents
- Consumption of water resources
- Soil consumption
- Production of earth from excavation
- The generation of noise
- Above ground volume

Closure

- Release of gaseous effluents
- Release of liquid effluents
- Consumption of water resources
- Earth movement for the creation of the cover
- The generation of noise

ID	Process name		Disturbance factor	
A.7.1	ND disposal plant operation	Construction	Release of gaseous effluents Release of liquid effluents Water resources consumption Soil consumption Excavated earth production Noise generation	CON
		Operation	Irradiation due to the presence of waste packages Release of gaseous effluents	RAD
			Release of gaseous effluents Release of liquid effluents Soil consumption Excavated earth production Noise generation Above ground volume	CON
		Closure	Release of gaseous effluents	RAD
			Release of gaseous effluents Release of liquid effluents Water resources consumption Earth movement for cover creation Noise generation	CON

Fig. 4.5-8: Summary matrix of potential disturbance factors for the environment

4.5.9 Disposal in geological formation (Action lines A.8 – B.4)

The NP does not currently contemplate the construction of a geological depot on national territory and it is not therefore possible to associate potential disturbance factors with this action line.

5 Perimeter of the potential sphere of influence of the NP

According to the specifications of the Guidelines of ISPRA[20], the potential sphere of influence, on which to draw up the environmental assessments of the strategic environmental assessment, must include all the areas affected by the potential effects produced by the P/P on the basis of a conservative estimate consistent with the level of definition of the contents of the planning.

Starting from these indications, this study analysed the Action Lines and the Activities defined (consistent with the level of knowledge currently available) through which the aims of the National Programme (see section 4) will be pursued, defining the potential environmental disturbance factors of the scheduled activities.

In cases in which the analysis conducted did not identify the production of disturbance factors, it is reasonable to assume the absence of any change to the surrounding environment and, consequently, the lack of a potential sphere of influence to be subject to assessment.

5.1 Existing nuclear plants

5.1.1 Energy division

The Action Lines described ensure the attainment of the objectives of the NP. In a conservative approach, it is assumed that every site in the energy division will be equipped with all the facilities described[21], with the exception of the SOGIN plants located in Bosco Marengo and at the CR ENEA Casaccia due to the limited activities involved, as described in paragraph 2.1.2, without envisaging the transfer of waste (previous or from dismantlement) on national territory.

Therefore, on the basis of the respective disturbance factors generated, it is possible to associate a sphere of potential influence on which to assess the disturbances caused by the actions of the NP.

In order to define this sphere, it is necessary to conduct an analysis of the disturbance factors under the radiological and conventional profile, there being different ways of diffusion of the specific contaminants (on one hand, radionuclides, on the other, physical agents, chemical analytes, visual disturbance etc.).

Radiological Aspects

The potentially disturbing factors generated by the treatment/conditioning activities can be ascribed to the controlled release of radioactive effluents (gaseous and liquids) with the consequent alteration of the natural background radiation due to the emission of artificial radionuclides.

The discharge into the environment of radioactive effluents takes place in compliance with the daily and annual limits expressed through the discharge formulae, which define the maximum activity[22] (in terms of a reference radionuclide) that it is allowed to discharge into the environment in a given period of time (hours or year) without generating significant effects on the environment and public health (detriment to health[23]).

[20] Operating instructions in support of the assessment and drawing up of the Strategic Environmental Assessment documents – Guidelines 124/2015

[21] With the exception of cases in which it is necessary to use foreign plants (reprocessing of fuel, fusion or incineration of radioactive waste) and final transfer to DN

[22] The unit of measurement of the radioactivity is the becquerel (Bq); 1 Bq corresponds to nuclear disintegration per second.

[23] Detriment = overall damage caused to the health of an exposed group and their respective descendants as a consequence of the exposure of the group to a source of radiation.

The discharge limits are authorised in advance by the competent bodies in accordance with the Legislative Decree 230/95 and subsequent amendments and supplements, having heard the opinion of the Control Body (ISPRA).

The maximum radioactivity that can be discharged by a nuclear installation is expressed in terms of activity and is measured in becquerels (Bq), associated with a maximum percentage use of the authorised discharge formula specifically for liquid effluents and gaseous effluents.

A 100% use of the discharge formulae leads to an effective dose[24] to individuals of the population below radiological significance, that is, such as to be consider the resultant radiological impact as negligible.

Liquid effluents

Liquid effluents are collected in separate storage tanks and are treated differentially in order to reduce the radioactivity discharged into the environment to a minimum. On one hand, this allows the recovery of most of the treated liquids, on the other, the adoption of the most appropriate purification system for every type of fluid in order to limit the secondary waste produced by the treatment. After treatment, these effluents are transferred to sampling tanks, analysed, reintegrated in the process or discharged in compliance with the discharge formula.

Gaseous effluents

Gaseous effluents are basically made up of the ventilation air of buildings (reactor, turbine, radioactive waste treatment, temporary on-site depots) released into the external environment through the chimneys, subject to filtration and radiometric control. Following plant shutdowns, the discharge of the gaseous effluents is actually exclusively made up of air expelled by the ventilation systems, required to guarantee certain conditions of pressure, temperature and humidity through appropriate exchanges of air inside the rooms, while the contribution of uncondensable gasses linked to the operating phase (air, radiolythic gasses, fission gas and activation gasses extracted from the water cycle) is virtually nil. The discharge of the effluents of Italian nuclear power stations has never exceeded (even during operation) a limited percentage of the quantities allowed by the authorised discharge formulae, and, during plant shutdowns, the amount of discharges is practically zero.

On the basis of the considerations reported above, it is possible to deduce that the production of liquid and gaseous effluents generated by the activities of treatment/conditioning of radioactive waste carried out on the sites of the energy division can only be lower (in quantitative terms) than plants in operation, which, in turn, used only a limited percentage of what was authorised.

Finally, as regards the liquid and gaseous effluents produced by the irradiated fuel packaging activities (emission from gas leaks or the release of particles during the handling of the fuel elements), the probability of generation is such that the need for a specific assessment system does not arise. Consequently, the action line B.1.1 will not be subject to assessment.

Irradiation

As regards the direct irradiation disturbance factor, it can also be generated by the presence of the flows of waste to be treated/conditioned and by the fuel to be packaged for subsequent storage in the on-site depots. However, due to the limited duration times of these nuclear flows (waste and fuel) inside the respective facilities or the final artefacts (packaged drums and loaded casks), the contribution of this disturbance factor to the external environment cannot be assessed.

On the other hand, in the case of irradiation generated by the safe storage inside the on-site radioactive waste depots and, where still present, irradiated fuel, the effects on the external environment are attributable to any variation in the natural background of gamma radiations. The engineering strategies

[24] The dosimetric amount used in radioprotection to quantify the effects caused by the exposure to ionising radiations is measured in Sv. Legislative Decree 230/95 and subsequent amendments and supplements lays down the effective individual dose of 10 μSv/year as the threshold of radiological non-relevance to the population.

and the radioprotection criteria adopted, both in the construction of the depots and the storage of waste, are such as to guarantee, even during the maximum operation of the depot, reasonably low rates of dosage in contact with the external walls. This contribution does not therefore constitute any increase in the background gamma radiation measured along the site perimeter, the values of which are within the normal fluctuations in the local environmental background radiation.

The foregoing is also confirmed for the management of certain specific flows (with high radioactive content) arising from the previous operation of nuclear sites. The analysis of the radiological aspects conducted for the purpose of completing the Environmental Impact Assessment procedures regarding the construction, operation and deactivation of the ICPF, CEMEX and WOT – SiCoMor plants, aimed at the treatment/conditioning and storage of radioactive waste, enabled it to be verified that, during the normal operating conditions of the plants, the forecast radioactive discharges are fractions of the maximum authorised limit, including for this type of plant, the radiological impact on the population and the environment was assessed as irrelevant from the radiological point of view. As with direct irradiation, caused both by the flows to be treated and by the artefacts produced, it was around two orders of magnitude lower than the environmental background radiation of the sites.

It follows that, under the radiological profile, the ordinary management of radioactive waste carried out in the energy cycle plant cannot produce any significant disturbance and does not therefore lead to the definition of a valid potential sphere of influence.

In pursuing the conservative approach referred to in the ISPRA Guidelines for the provision of the Strategic Environmental Assessment documents, the Environmental Report considered the most significant critical event that could arise during the decommissioning activities and that is a nuclear incident of reference, different for each individual plant.

On the basis of the measures of Legislative Decree 230/95, the operators of the nuclear plants referred to in Heading VII (articles 36 and 37) perform a preliminary assessment of the spatial and temporal distribution of dispersed radioactive materials, as well as the potential exposure of workers and the population, in possible cases of radiological emergency. As part of these estimates, a site-specific technical report is produced containing the “Technical presuppositions of the External Emergency Plan”[25], specifically:

- the description of the assumed hazardous environmental conditions arising from reasonably possible individual nuclear incidents with regard to the structural and operational characteristics of the plant and their likely siting and development over time;
- the description of the means provided for the detection and measurement of the radioactivity in the environment surrounding the plant, in the event of an incident, and the methods of their use.

Downstream of a complex technical-administrative procedure, the considerations contained in the technical presuppositions provided by the operator, assessed by the Control Authority and the provincial Committee referred to in article 118 of Legislative Decree 230/95, converge in the External Emergency Plan (approved by the territorially competent Prefecture), containing all the safety measures to be implemented in the case of an incident. Taking account of the gradual reduction of the radiological risk, the External Emergency Plan indicates the actions to be implemented to handle the emergency[26], gauging the severity depending on the distance from the site of the incidence (graduated approach). For energy division plants, the distance within which radiological surveillance is envisaged is given below (nutritional and environmental control matrices) following the on-going incidental event.

[25] Legislative Decree 230/95, article 117

[26] Enclosed shelter of the population, iodineprophylaxis, inhibition of food consumption, radiological monitoring, etc.

Site	Radius of radiological surveillance
Trino Power Station	5 km
Caorso Power Station	3 km
Latina Power Station	3 km
Garigliano (CE) Power Station	2 km
Saluggia Nuclear Complex (SOGIN site and Avogadro Depot)	5 km
Bosco Marengo Plant	2 km
CR ENEA Casaccia – SOGIN site	6 km
Rotondella ITREC Plant	5 km

Based on the foregoing, beyond these distances, theorising cases of significant radiological fallout due to the incidental event taken as reference for each site becomes meaningless.

For the purposes of this environmental assessment, the potential area of influence under the radiological profile will coincide therefore with the radiological monitoring area indicated above[27].

Conventional Aspects

The disturbance factors potentially generated by the treatment/conditioning and storage activities are described below.

<u>The generation of noise</u>

The generation of noise is connected to the operation of very large presses (compactor and supercompactor) and the ventilation plants operating in all the facilities of the waste life cycle[28], confined in any case in dedicated buildings. The generation of this disturbance factor cannot therefore cause appreciable changes to the characteristic acoustic climate of the zone.

On the basis of the foregoing, under the acoustic profile, no potential sphere of influence arises from the actions of the NP, all of it being confined inside the industrial perimeters of the sites examined.

[27] This is in the spirit of not duplicating the evaluation processes expressly referred to in article 13, paragraph 4 of Legislative Decree 152/06 and subsequent amendments and supplements.

[28] On-site treatment, packaging and storage plants.

Release of gaseous and liquid effluents

The generation of these factors could produce changes in the quality of the receptor components due to the emission of chemical compounds produced by the treatment and conditioning of the flows of radioactive waste and the reagents used in the processes.

For the dismantling of the four power stations (Trino, Caorso, Latina and Garigliano), a plan was provided (Application for Deactivation under article 55 of Legislative Decree 230/95), which, on the basis of the previous kind of waste and the estimate (qualitative and quantitative) of what will be produced by the decommissioning activities, identified the most suitable management actions for each radioactive flow identified. The Application for Deactivation forms the plan on which the Environmental Impact Studies were drawn up, which, following detailed analysis, identified that the phase of greatest significant for the purposes of environmental interference was the demolition of buildings declared free of radioactivity (decontaminated). During the Environmental Impact Assessment procedures, these cases were deemed reasonable, confirming, under the conventional profile, the environmental insignificance of the liquid and gaseous emissions produced by the treatment/conditioning and storage activities envisaged on radioactive waste. In compliance with the specific instructions of the Environmental Impact Assessment decree, for each power station undergoing decommissioning, SOGIN has provided an Environmental Monitoring Plan with the aim of:

- acquiring data to document the development of the environmental situation with regard to the conduct of the activities;
- verifying compliance with the impact forecasts identified in the Strategic Impact Assessment;
- guaranteeing full control of the environmental situation during the course of execution of the activities in order to detect any unforeseen situations;
- assessing the evolution of the environmental situation by means of the correlation of the *ante operam* state with what is found during the work and, in the event of anomalous situations, providing and implementing the most appropriate corrective actions.

Since the radioactive waste management activities described in the Applications for Deactivation of nuclear power stations are included among the action lines of the NP described in section 4 of this Environmental Report, for the Air and Water Environment components, it is possible to assimilate the potential sphere of influence in the confined distribution area approved by the PMA.

Similar reasoning can be applied to the plants managing specific ICPF, CEMEX and WOT.SiCoMore flows located in the former ENEA sites of Saluggia, Trisaia and the Trino Power Station.

Consumption of water resources

The water needed to carry out some of the treatment processes and the conditioning of radioactive waste is assured by the water supply systems used by the nuclear plants where these activities will be carried out. These systems are designed taking account of the overall water requirement (industrial water, water for fighting fires, service water) of the entire site concerned, without this compromising the production of the effluent or derived water resource.

In the case of treatment and conditioning plants of specific flows (CEMEX, ICPF, WOT-SiCoMor), the estimated water consumption was evaluated in detail as part of the Environmental Impact Assessment procedures carried out, the analyses of which confirmed the environmental negligibility of the quantities of effluent water.

Therefore, regarding the “water consumption” disturbance factor, in consideration both of the hydrogeological/hydraulic characteristics of the bodies of water concerned, and the limited volume of water extracted, the natural water flow is capable of absorbing the slight variations caused by the treatment/conditioning activities, not therefore giving rise to an area of potential influence due to the actions of the NP.

Above ground volume

The construction of new structures above ground causes a disturbance to the landscaped produced by the physical volume of the structure in question. However, if the territorial context in which the nuclear site is located is not protected due to its historical, cultural or natural features, the disturbances produced should not be significant and so would not give rise to the need to define a potential sphere of influence for the Landscape in question. Among the energy division plants that fall into this category are the Latina Power Station and the IPU and Opec plants inside the CR ENEA Casaccia.

For the sites of Trisaia, Caorso, Trino, Saluggia and Garigliano, however, various levels of landscape protection have been found.

To ensure respect for the radioprotection objectives underpinning the radioactive waste management process, all the facilities described in section 4 will be confined and positioned in such a way as to reduce external movement of waste to a minimum. In the case of the energy plants listed above, the treatment lines will mostly be installed in existing buildings, appropriately upgraded under the structural and engineering profile. In this case, disturbance to the landscape is not generated, the volume of buildings connected to the industrial plant remaining unchanged.

If, however, the complexity of the treatment operations or the requirement for additional storage volumes on-site leads to the construction of new buildings, disturbance to the landscape may arise due to the new physical volume in a protected landscape. As mentioned above, downstream of the Environmental Impact Assessment procedures carried out on decommissioning projects, a PMA has been proposed that also includes a series of landscape monitoring points. For the Landscape component, it is therefore possible to assimilate the potential sphere of influence within the confined distribution area approved by the PMA.

In the case of treatment plants of specific flows (CEMEX, ICPF, WOT-SiCoMor), the new volumes were subject to specific landscape assessment. The potential impacts detected were subject to (approved) mitigation projects and the effects caused to the Landscape were monitored as part of the active PMAs on the sites of Saluggia, Trisaia and Trino.

As part of the radioactive waste management activities conducted in the Bosco Marengo plant, the construction of new buildings is not currently envisaged and, as a consequence, no potential sphere of influence arises for the Landscape component.

In summary, based on the foregoing, under the conventional profile, the sphere of influence within which any effects could be felt as a consequence of the actions of the NP only concerns the nuclear sites where treatment and conditioning processes are envisaged (Eurex Plant of Saluggia, Trino Power Station, Caorso Power Station, CR ENEA Casaccia – SOGIN: IPU Plant, Latina Power Station, Garigliano Power Station and the Rotondella ITREC Plant) and only those components that could potentially be disturbed (Atmosphere, Water Environment and Landscape). For the remaining plants of the energy division (Bosco Marengo, CR ENEA Casaccia – SOGIN: Opec I and Opec II Depot, as well as the Avogadro Depot) due to the activities conducted there, attributable exclusively to the storage of radioactive waste and irradiated fuel, the absence of potential disturbance factors of a conventional type allows it to be considered that no effect on the surrounding environment is theoretically possible.

The following table gives the distances within which, for the “Atmosphere and Landscape” environmental components, the control points of the PMA have been located further away from the SOGIN sites, for the assessment of any disturbance effects on the surrounding environment.

Site	Atmosphere PMA	Landscape PMA
Trino Power Station	2 km	2 km
Caorso Power Station	2 km	2.4 km
Latina Power Station	0.3 km	n.a*
Garigliano Power Station	0.8 km	3.7 km
Saluggia Nuclear complex (SOGIN site)	2 km	2 km
CR ENEA Casaccia - IPU Plant	0.8 km	n.a*
Rotondella ITREC Plant	0.5 km	1 km
* not applicable since sphere not protected under the landscape profile		

As regards the "Water Environment" component, the distance of the PMA monitoring points is substantially within a few hundred metres from the industrial discharge belonging to the various SOGIN plants, hydraulically upstream and downstream of the receiving bodies of water. An exception to this configuration is the SOGIN Casaccia-IPU Plant site, for which reason no specific monitoring network has been defined, since the on-site treatment and conditioning activities envisaged do not generate liquid effluents (as also highlighted in the Preliminary Environmental Study drawn up for the treatment and conditioning project of radioactive aqueous liquid waste, for which the procedure of verification of eligibility for Environmental Impact Assessment was conducted and concluded with a positive result). Any wastewater produced by the activities conducted in the IPU Plant is transferred to the neighbouring NUCLECO plant for any treatment and subsequent disposal.

In conclusion, for the purpose of defining a single potential sphere of influence, for each nuclear plant belonging to the energy division, it was considered prudent to use distribution areas of a greater extent, identified from among those defined for the incidental event of a nuclear type, as part of the External Emergency Plans and those coinciding with the PMA monitoring points. [29]

Site	Potential sphere of influence of the NP
Trino Power Station	5 km
Caorso Power Station	3 km
Latina Power Station	3 km
Garigliano Power Station	3.7 km
Saluggia Nuclear Complex (SOGIN site and Avogadro Depot)	5 km
Bosco Marengo Plant	2 km
CR ENEA Casaccia – SOGIN site	6 km
Rotondella ITREC Plant	5 km

For greater ease of reading, the potential effects of the actions of the NP with regard to the environmental components are summarised and represented in the figure below.

[29] The aspects concerning the determination of the sphere of influence have already been assessed as part of other administrative proceedings and, therefore, in the spirit of not duplicating the evaluation processes expressly referred to in article 13, paragraph 4 of Legislative Decree 152/06 and subsequent amendments and supplements, the consequent determinations will be used here.

Radiological aspects	Disturbance factor	Potential environmental effects	Environmental Component directly involved	
	Release of gaseous effluents	alterations of the natural background due to the emission of artificial radionuclides	Atmosphere	
	Release of liquid effluents	alterations of the natural background due to the emission of artificial radionuclides	Water environment	→ Excluding Sogin Casaccia and Bosco Marengo sites because they do not produce liquid effluents Excluding the action line regarding storage
	Irradiation	variation of the natural background due to direct irradiation due to the presence of nuclear waste to be treated and conditioned	Ionising radiation	→ Excluding the action line regarding treatment and conditioning

Conventional aspects	Disturbance factor	Potential environmental effects	Environmental Component directly involved	
	Release of gaseous effluents	variation of the air quality	Atmosphere	→ Excluding the action line regarding storage
	Release of liquid effluents	variation of the quality of the receiving body of water	Water environment	→ Excluding Sogin Casaccia and Bosco Marengo sites because they do not produce liquid effluents Excluding the action line regarding storage
	Above ground volume	temporary change of the representative character of the territory and the environment	Landscape	→ Excluding Sogin Casaccia, Latina power station and Bosco Marengo sites because the landscape is not protected.

The generation of the disturbance factors described above that could cause *direct* effects on the components Atmosphere, Water Environment and Ionising Radiations, could also cause *indirect* effects on the components Public Health and Biodiversity.

As regards the component Public Health, it is recalled that, in October 2015, the Higher Health Institute (*Istituto Superiore di Sanità*, ISS) published the results of an epidemiological study conducted on the resident populations of the Municipalities with existing nuclear plants. The study, launched in 2010, as part of a roundtable to coordinate the epidemiological survey activities in areas with nuclear facilities, assessed the state of health of the resident population and any actions to be undertaken by analysing the mortality rates for 62 groups of diseases. Particular attention was given to 24 cancers internationally acknowledged to be unequivocally connected to exposure to ionising radiation. In the entire period 1980-2008, the state of health of the resident population in the municipalities with nuclear plants can generally be superimposed over that of the general population of the regions concerned.

For a more complete treatment of the results of the study conducted by ISS, refer to the Final Report of the study, which can be obtained from the Institute's website (http://www.iss.it/pres/?lang=1&id=1579&tipo=6).

On the basis of the foregoing, it is not currently deemed practicable to define a potential sphere of influence for the Public Health component.

For the Biodiversity component, due to the type of disturbance factors, it is regarded as prudent to assimilate the potential sphere of influence of the NP within that identified by the Emergency Plans indicated above.

Radiological aspects	Disturbance factor	Potential environmental effects	Environmental Component directly involved				
	Release of gaseous effluents	alterations of the natural background due to the emission of artificial radionuclides	Atmosphere	→	Ionising radiation	→	Biodiversity
	Release of liquid effluents	alterations of the natural background due to the emission of artificial radionuclides	Water environment	→	Ionising radiation	→	Biodiversity
	Irradiation	variation of the natural background due to direct irradiation due to the presence of nuclear waste to be treated and packaged	Ionising radiation			→	Biodiversity

Conventional aspects	Disturbance factor	Potential environmental effects	Environmental Component directly involved		
	Release of gaseous effluents	variation of the air quality	Atmosphere	→	Biodiversity
	Release of liquid effluents	variation of the quality of the receiving body of water	Water environment	→	Biodiversity
	Above ground volume	temporary change of the representative character of the territory and the environment	Landscape		

5.1.2 <u>Non-energy division</u>

5.1.2.1 Integrated Service

As regards the management of previous waste and waste that will be produced by the non-energy division, the sole operator authorised for the treatment/conditioning and storage activities is the NUCLECO. The other operators of the Integrated Service (Campoverde and Protex) limit their management activities to pre-packaging, aimed at reducing the volumes, and decay-in-storage (storage times of less than 100 days).

NUCLECO S.p.A.

As regards the NUCLECO site, which is to be located inside the CR ENEA of Casaccia, with reference to the action lines of the NP (treatment, conditioning and storage of conditioned waste), the potential disturbance factors that could cause effects on the surrounding environment (both under the radiological and conventional profiles) are the same as identified for plants of the energy division.

Radiological aspects

With reference to possible alterations to the natural background radiation through the emission of artificial radionuclides following the controlled release of radioactive effluents (gaseous and liquids), as well as any variation of the natural background radioactivity due to direct irradiation as a result of the presence of packaged radioactive waste, adapting what was detailed in the previous paragraph for these facilities, the ordinary radioactive waste management does not cause any significant disturbance to the surrounding environment. A potential sphere of influence cannot therefore be defined following the application of action lines of the NP.

However, similar to the proposal for energy cycle plants, it is also thought prudent in this case to make the potential sphere of influence adopted by this report coincide with the distribution area defined in the “External Emergency Plan for Research Centre (R.C.) Casaccia of the ENEA”, which, as for the SOGIN site in Casaccia, corresponds to a distribution area with a radius of around 6 km.

Conventional Aspects

The disturbance factors potentially generated by the treatment/conditioning and storage activities are described below.

The generation of noise

As already indicated in paragraph 5.1.2, the generation of noise is connected to the operation of very large presses (compactor and supercompactor) and the ventilation plants operating in all the facilities of the waste life cycle[30], confined in any case in dedicated buildings. The generation of this disturbance factor cannot therefore cause appreciable changes to the characteristic acoustic climate of the zone.

On the basis of the foregoing, under the acoustic profile, no potential sphere of influence arises from the actions of the NP, all of it being contained inside the industrial perimeters of the sites examined.

Release of gaseous and liquid effluents

The generation of these factors could produce changes in the quality of the receptor components due to the emission of chemical compounds produced by the treatment and conditioning of the flows of radioactive waste and the reagents used in the processes.

For plants currently in operation, the regulations current at the time of their construction did not lay down that they should be subject to environmental assessment procedures, limiting the control of industrial discharges (liquid and gaseous) to the acquisition of the respective emission authorisations laid down by Legislative Decree 152/06 and subsequent amendments and supplements. For this reason, at the NUCLECO site, even though an environmental monitoring network designed to identify any alterations to the quality of the air and surface waters of a conventional nature is not active, the chemical analyses conducted on the gaseous and liquid industrial discharges have not shown any environmental criticality.

However, considering a possible incidental event in the nuclear field, it is appropriate to assume, including for the conventional aspects, a potential sphere of influence of the actions of the NP, confined to a distribution area of around 6 km, equal to that identified for the radiological aspects.

Consumption of water resources

The water requirement for the completion of the treatment and conditioning processes of solid and liquid radioactive waste is assured by the water supply system serving the entire CR ENEA operating since the period of construction of the Centre, made up of 3 deep wells that provide an annual capacity of 1,000,000 m^3 for the purpose of ensuring the availability of water both for drinking and industrial purposes.

The portion of water used by NUCLECO for its industrial activities is estimated to be in the order of around 0.1% (1,000 m^3/year) of the total supply. The low consumption of water resource by NUCLECO for industrial purposes is therefore such that a potential area of influence of the actions of the NP does not arise.

Above ground volume

On the basis of the information currently available, no requirement was found to construct new facilities.
Moreover, the landscape in which the NUCLECO stands is not part of the areas protected under the landscape profile. On the basis of the above, no potential area of influence arises for the Landscape component deriving from the actions of the NP.

In summary, the potential environmental effects can be attributed to disturbances to the following environmental components.

[30] On-site treament, packaging and storage plants.

	Disturbance factor	Potential environmental effects	Environmental Component directly involved		
Radiological aspects	Release of gaseous effluents	alterations of the natural background due to the emission of artificial radionuclides	Atmosphere		
	Release of liquid effluents	alterations of the natural background due to the emission of artificial radionuclides	Water environment	→	Excluding the action line regarding storage
	Irradiation	variation of the natural background due to direct irradiation due to the presence of nuclear waste to be treated and packaged	Ionising radiation	→	Excluding the action line regarding storage

	Disturbance factor	Potential environmental effects	Environmental Component directly involved		
Conventional aspects	Release of gaseous effluents	variation of the air quality	Atmosphere		
	Release of liquid effluents	variation of the quality of the receiving body of water	Water environment	→	Excluding the action line regarding storage

As regards the generation of the disturbance factors described above that could cause *direct* effects on the quality of the components “Atmosphere” and “Water Environment” and “Ionising Radiations”, the same assessments regarding the potential *indirect* effects on the components “Public Health” and “Biodiversity” as described for the installations in the energy division also remain valid for the plants of I.S.

	Disturbance factor	Potential environmental effects	Environmental Component directly involved				
Radiological aspects	Release of gaseous effluents	alterations of the natural background due to the emission of artificial radionuclides	Atmosphere	→	Ionising radiation	→	Biodiversity
	Release of liquid effluents	alterations of the natural background due to the emission of artificial radionuclides	Water environment	→	Ionising radiation	→	Biodiversity
	Irradiation	variation of the natural background due to direct irradiation due to the presence of nuclear waste to be treated and packaged	Ionising radiation			→	Biodiversity

	Disturbance factor	Potential environmental effects	Environmental Component directly involved		
Conventional aspects	Release of gaseous effluents	variation of the air quality	Atmosphere	→	Biodiversity
	Release of liquid effluents	variation of the quality of the receiving body of water	Water environment	→	Biodiversity

As regards the temporary depots belonging to the Integrated Service such as Protex and Campoverde, due to the type of waste stored, no variation of the background radiation is foreseen following direct irradiation.

Finally, the government’s strategy outlined for the management of the nuclear reclamation of the Cemerad Depot does not envisage the construction of on-site treatment/conditioning plants of waste in drums currently stored in Statte, only characterising the drums for the definition of the most appropriate methods of nuclear transport to an already-authorised site, to be identified as part of the Integrated Service.

In conclusion for plants in the non-energy division, due to the possible effects on the surrounding environment produced by the actions of the NP so far described, only the potential sphere of influence concerning the NUCLECO site has been considered.

5.1.2.2 Nuclear Research

In Italy, there are five nuclear research centres operating in the field of medical, physical and radiochemical sciences. All the radioactive waste produced by research activity is managed in compliance with the procedures laid down by Legislative Decree 230/1995, by the Integrated Service at the service plants (described above) and does not therefore gives rise to the definition of a potential area of influence.

To date, apart from the RB3 reactor (the Montecuccolino Nuclear Engineering Laboratory of Bologna University, for which decommissioning activities are coming to end, authorised in 2010), no authorisation for deactivation has been released for any of the plants.

Future deactivation activities will be devolved to the Integrated Service operators with the consequent transfer to them of waste products, for which the potential environmental disturbance will be included in the previous assessments conducted on the territorial areas in which the plants of the operators of the Service and, in particular, of NUCLECO are located.

5.2 Transport of radioactive waste and spent fuel

As stated for the siting of the National Repository, the potential environmental implications connected to the **transport of radioactive waste** were not considered in the definition of the scope of the study. Indeed, also in this case, all transport that may involve national territory (transfer of medical waste to the Integrated Service, transport of radioactive waste to treatment plants, future transport to the National Repository etc.) may only take place at the time it is assessed in advance under the profile of the potential radiological risk, as well as authorised by the Ministry of Economic Development, thereby ensuring the utmost safety of the population and the environment.

Conversely, under the conventional profile, the environmental impact of the transport connected to radioactive waste management cannot currently be assessed, since the overall annual number of trips cannot be compared with the traffic estimates of the national transport network.

The transport of nuclear fuel, currently planned, concerns the emptying of the pool of irradiated fuel in the Avogadro Depot in Saluggia, on the basis of a transport schedule to the La Hague (F) plant of the AREVA company, as part of the intergovernmental agreement between the Italian and French Governments, signed in Lucca on 24 November 2006.

The transport of spent nuclear fuel, which takes place partly by road and partly by rail, is only possible in compliance with the specific safety measures and the risk of incident is deemed extremely improbable considering the series of precautions envisaged and, in any event, appropriately considered.

For such transport, safety certificates must be issued by ISPRA (Institute for Environmental Protection and Research), the Technical safety certificate and the Rail safety waiver by the Ministry of Infrastructure and Transport. Every individual transport only begins after the release by ISPRA of a supplement to the aforementioned general safety certificate.

Therefore, in consideration of the high safety standards guaranteed by the design specifications of the transported containers, any radiological exposure of the population following an incident is to be considered extremely improbable, given the series of precautions envisaged. The container must be in compliance with the strict qualification criteria required by the international safety standards. For example, it can resist being dropped from 9 meters onto a hard platform and fire at a temperature of 800 degrees for half an hour. These qualification requirements envisage that, in the event of these hypothetical scenarios, the performance of the seal and radiation shielding of the container cannot be degraded.

On the basis of the foregoing, therefore, under the radiological profile, transit by road or rail of the containers and their temporary presence along the route does not give rise to any hazardous situations for the population, since the materials and construction methods of the containers are such as to guarantee the absence of health risks for the population.

5.3 National Repository

Since it is not possible to know the physical site where the National Repository[31] will be constructed, the matter cannot be taken into consideration in defining the potential influence of the National Programme. This approach, only apparently reductive, will enable certain currently definable environmental analyses to be carried out on the actions of the Programme, without imposing complex in-depth examinations on the study that, in the absence of certain confirmation of the location, would be pointless.

Although it is currently not possible to assess the significance of the impact of the work on the environmental components, which must take place meticulously at the time of the Environmental Impact Assessment (in accordance with Legislative Decree 31/2010 and Legislative Decree 152/2006 and subsequent amendments and supplements), it is appropriate to remember that the application of the Technical Guide 29 (GT29) of the ISPRA will lead to the selection of a suitable site, the prerequisites of which, together with the planned engineering barriers, will allow the isolation of radioactive waste from the biosphere and so ensure the protection of the population, the environment and the assets over time (Safety Assessment). The criteria for the siting of the ND contained in the guide, to which reference should be made for further information, take account of the following aspects:

- geological, geomorphological and hydraulic stability of the area to ensure safety and the functioning of the engineering structures to be constructed as multiple artificial barriers;
- confinement of radioactive waste by means of "natural barriers" provided by the hydrogeological and chemical characteristics of the terrain, designed to prevent the possible transfer of radionuclides to the biosphere;
- compatibility of the construction of the depot with the regulatory constraints that cannot be derogated for the protection of the territory and the conservation of the natural and cultural heritage;
- isolation of the depot from anthropic infrastructure and human activities, taking account of the reciprocal impact arising from the presence of the depot and the waste transport activities;
- isolation of the depot from the natural resources of the subsoil;
- protection of the depot from extreme meteorological conditions.

With regard to the depot for the storage of high activity waste that will be built at the ND, it is also necessary to point out that, as underlined in the explanatory report associated with the GT29, "*a site deemed suitable for the siting of a surface disposal plant for low and medium activity waste on the basis of the application of selection criteria of the chemical, physical, natural and anthropic specifications of*

[31] For a complete treatment of the actions already undertaken for the siting of the National Repository, see paragraphs 1.1. and 1.5.4

the territory such as those identified in the Technical Guide may be deemed suitable, subject to the aforementioned verifications, including for the siting of a long-term storage depot".

Considering the potential interference with the environment identified in paragraphs 4.5.7 and 4.5.8 with regard to the prerequisites of suitability that the chosen site must possess on the basis of the application of the GT29, it is possible to conduct the preliminary considerations that follow, both under the radiological and the conventional profile.

Radiological Aspects

The disturbance factors potentially generated by the operation of the ND, given that the transferred waste will already be in suitable form and no further activities of treatment and/or conditioning on the site will be necessary, could basically consist of the variation of the natural background radiation and the variation of population dose, including in consideration of the limited production of gaseous effluents connecting to the running and maintenance of the structures, plants and components of the ND. In any case, these eventualities are excluded sine it is laid down in the GT29 that the objectives of radioprotection for members of the population in the normal conditions of operation of the depot system, both for the operating phase and for the subsequent phases, will be set with respect for the criterion of radiological irrelevance laid down by national legislation.

For the incidental conditions, the radioprotection objectives will be established in such a way that any radiological impact on individuals in the population arising from the aforementioned situations is such as to exclude the adoption of any population protection action, even in the event of the most serious incidental scenarios.

Moreover, as said in the introduction, the siting criteria defined in GT29 enable areas to be selected with geological, geomorphological, hydraulic, hydrogeological and geochemical characteristics such that, together with the engineering structures, can guarantee the safety and confinement of radioactive waste.

The absence of radiological impacts must be assessed with regard to all the developing system scenarios deemed credible and for all the time phases of the depot (short and long term) by means of specific safety analysis procedures. In particular, the long-term safety analyses will be conducted through a calculation method developed in the sphere of the IAEA (International Atomic Energy Agency) and now adopted at the international level, called (Safety Assessment - SA) The purpose of the SA will be to demonstrate that the radiological impact for mankind and the environment, consequent to the release of residual radioactivity in the depot's structure, after the period of Institutional Control (several hundred years) and its return to the biosphere, through the geological environment, is not relevant from the radioprotection point of view. Only following this verification will it be possible, as mentioned in previous paragraphs, to release the site without radiological constraints and for the uses permitted by law.

Conventional Aspects

<u>Soil consumption</u>

As regards the change of land use that will certainly take place, it is probable that, notwithstanding the application of the criteria, this will lead to the choice of a site located in a territorial context currently barely anthropomorphised to be converted to industrial use, and should at the same time steer the location of the depot outside areas of protected nature and where this will not interfere with important natural resources and sites of historical and archaeological interest.

As regards the movement of earth to replenish the water tables, arising from the impermeability due to the construction of the ND, it can be stated that the lack of impermeability will not lead to a significant impact since, based on the application of the criteria, this site should not interfere with significant underground water resources.

<u>Liquid and gaseous effluents, noise generation, consumption of water resources, the production of earth from excavation and earth movements.</u>

As regards the production of liquid and gaseous effluents, noise generation, the consumption of water resources, the production of earth from excavation and earth movement, the application of the criteria partly preserves respect for the disturbance that could be caused to the nature components by excluding in advance the presence of protected areas, habitats and animal and vegetable species of importance for conservation purposes, as well as assessing the interference with them, without prejudice to the site specific assessments once the location of the ND has been defined.

As regards other components potentially involved, in the absence of knowledge of the characteristics of the site and the final design required to determine the significance of the impacts on it, refer to an analysis at the time of the environmental impact assessment.

It is considered that, as regards the assessment of the effects that these disturbance factors will have on the environment, particular care must be paid, once the site has been chosen, to the analysis of the traffic caused by the movement of waste to transfer it to the depot, also considering the possible construction of new transport infrastructures or the upgrading of the existing ones.

<u>Above ground volume</u>

As regards the above ground volume, while the change of the representative character of the territory is an aspect that strictly depends on the quality of the characteristic landscape of the site and the design, the following aspects must be taken into account:

- once fully loaded, the depot will be covered by an artificial hill, made with inert and impermeable materials, which, as well as providing additional protection, will have the function of visually harmonising the Depot with the surrounding environment by means of a lawn;
- as part of the selection of the site, an assessment will be made, as defined by the GT29, of the compatibility of the construction of the depot with the regulatory constraints that cannot be derogated for the protection of the territory and the conservation of the natural and cultural heritage.

An insignificant impact can therefore be foreseen for this component, especially in the final phase of life of the ND, without prejudice to appropriate assessments and mitigations that may be defined at the time of the Environmental Impact Assessment regarding the construction and operation phases.

6 Environmental characterisation of the potential sphere of influence

According to the specifications in the Guidelines of ISPRA[32], the characterisation of the state of the environment "must take account of the P/P and of the environmental aspects concerned in the territorial sphere of influence".

On the basis of the considerations reported in section 4.5 "Identification of potential interference with the environment" and section 5 "Perimeter of the potential sphere of influence of the NP", the framework of environmental components is reported below that, since they can be subject to interference from the activities of radioactive waste management (Action Strategy A) and spent fuel (Action Strategy B), will be adequately characterised.

Generally, for the environmental components potentially subject to the activities carried out at the sites where they could be subject to any effects consequent to the actions of the NP (Figure 6-1), useful elements have been provided for defining a framework of the current environmental context that could be the basis for the assessment and subsequent monitoring of any interference generated by the implementation of the NP. The data sources, when not given in extended form in the text, are shown in paragraph 6.3.

As regards the operation of the National Repository, since it is currently not possible to know the physical site where it will be constructed (see paragraphs 1.1, 1.5.4, 5.3), the characterisation of the environmental context in which it will be located cannot be provided here; this must be examined in detail at the time the location is decided, in accordance with the provisions of the law and the GT29 of ISPRA.

Finally, with regard to the verification between the actions of the NP and the Nature 2000 sites, refer to the methodological note attached to the Environmental Report (Attachment 3).

Site \ Environmental comp.	Atmosphere	Water environment	Biodiversity	Ionising radiation	Landscape
Trino Power Station	♦	♦	♦	♦	♦
Caorso Power Station	♦	♦	♦	♦	♦
Latina Power Station	♦	♦	♦	♦	
Garigliano Power Station	♦	♦	♦	♦	♦
Saluggia Nuclear Complex	♦	♦	♦	♦	♦
Bosco Marengo Plant	♦	♦	♦	♦	
CR ENEA Casaccia	♦	♦	♦	♦	
Rotondella ITREC Plant	♦	♦	♦	♦	♦

Figure 6-1: Environmental components characterised for each nuclear site

For some components considered, it is possible to make the general considerations that follow.

For the *Ionising Radiation component*, the assessment of the radiological effect on the environment and on the population is carried out by means of analysing the quantitative parameters expressed in percentage terms of the authorised environmental releases and the concentrations of the activity of the most significant radionuclides in the main environmental and nutritional matrices. These parameters are appropriately defined for each site, depending both on the specific type of process and the isotopic

[32] Operating instructions in support of the assessment and drawing up of the Strategic Assessment Strategy documents – Guidelines 124/2015

composition of reference, and in relation to the environmental and territorial configuration of the surrounding area[33].

They guarantee the monitoring of the discharges, that is, the quantity of radioactivity emitted in the environment by means of the controlled release of liquid and gaseous effluents, as well as the surveillance of the degree of radioactivity in the air, water and soil by means of sampling and measuring of environmental and nutritional matrices. The environmental radiological monitoring, in the last analysis, enables the estimation of the effective dose to the population, the magnitude proportional to the risk caused by exposure to ionising radiation. The information on the methods and quality of discharged radioactive effluents enables the identification, with the aid of appropriate distribution models, of the critical routes of exposure to radioactivity attributable to: *ingestion, inhalation and irradiation.*

A list is given below of the matrices divided by exposure route and that are subject to environmental monitoring on nuclear sites.

CRITICAL ROUTE	MATRIX
Irradiation	Air, Water, Soil
Inhalation	Atmospheric particulate
Ingestion	Cereals
	Meats (beef, lamb, pork, poultry)
	Milk
	Leafy vegetables
	Non-leafy vegetables
	Fruit
	Groundwater
	Fish

Figure 6-2: Nutritional and environmental matrices that may contribute to the effective dose

For the purposes of environmental monitoring of the artificial radioactivity, the major contributions are represented by irradiation, the soil and the ingestion of contaminated foodstuffs; inhalation can, on the other hand, reasonably be overlooked due to the fact that, in the absence of incidents capable of dispersing radioactivity in the atmosphere, the concentrations of radioactivity in the air are extremely low, lower than the sensitivity of the instruments.

The context and contribution indicators, as more fully detailed later in the document, which, together with the measurement of the progress of the specific process analysed, enable the assessment of the disturbance expected on the *Ionising Radiation component,* are attributable to the measurement of radioactive discharges and the progress of the concentrations of radioelements in the various environmental sectors.

[33] The radiometric data regarding both the discharges and the results of the environmental monitoring results are taken from the Reports sent by the Operators to the Control Bodies.

Monitoring of the discharges

Percentage of the discharge formula used in the calendar year of reference: the discharge into the environment of radioactive effluents is regulated by appropriate limitations that restrict the quantity of radioactivity that can be discharged in the various time periods (annual, quarterly and daily limitations). The set limitations ensure, for each site, respect for radiological insignificance for the groups of reference of the population (individual effective dose equal to 10 µSv/year).

Monitoring of environmental radioactivity

Environmental surveillance network: results of the monitoring of radioactivity in the environmental and nutritional matrices. In order to assess whether the concentrations of activity are acceptable from the radioprotection point of view, the values obtained are compared to the corresponding levels of reference adopted by each site. The reference levels were calculated taking into account the radiological insignificance and represent an operating instrument directly comparable with the concentrations of activity measured in the various matrices. In the field of environmental monitoring, the monitoring of the external irradiation is also carried out by means of the use of dosimeters that give the measurement of the gamma dose rate in air.

The foregoing can therefore be seen as a necessary instrument for assessing the contribution of radioactivity due both the emission of artificial radionuclides, and the potential variation of the background environmental radiation typical of the areas that will be characterised below, following the operation of nuclear practices. During the period of reference 2013-2015, the small amount of radioactive discharges carried out, equal to percentage fractions of the authorised annual maximum limit for each nuclear Site, ensures that nothing has changed from the radioprotection point of view as regards the presence of artificial radionuclides. Further confirmation of respect for radiological non-relevance is found in the results of the radiometric analyses carried out in the matrices of the environmental surveillance network. The activities carried out did not produce significant radiological effects such as to disturb the current condition of the component "Ionising Radiation", therefore, there are no hazards for the population and external environment.

As regards the *Landscape component*, for the nuclear sites located in areas with landscape/environmental protection constraints, since, with regard to the progress of the activities of maintenance in safety and decommissioning of the plants, the landscape configuration of these sites will be monitored by means of photographic survey campaigns, for the purpose of assessing the developing trends of the component it is deemed useful, as part of the characterisation of the context in which the NP is located, to indicate its location for the purposes of any monitoring.

6.1 Description of the environmental elements and anthropic of particular relevance

6.1.1 Trino Power Station

6.1.1.1 Territorial framework

The Trino Power Station is located in the municipality of the same name, near the border between the Provinces of Vercelli and Alessandria at a distance of around 1 km to the south of the residential centre (Figure 6.1.1-1).

The various roads near the site include the provincial Trino-Livorno (SP7) road around 1 km away, the provincial road of Monferrato (SP31bis) at around 300 metres to the north and the state road of Pontestura (SS455) at around 3 km to the east north east.

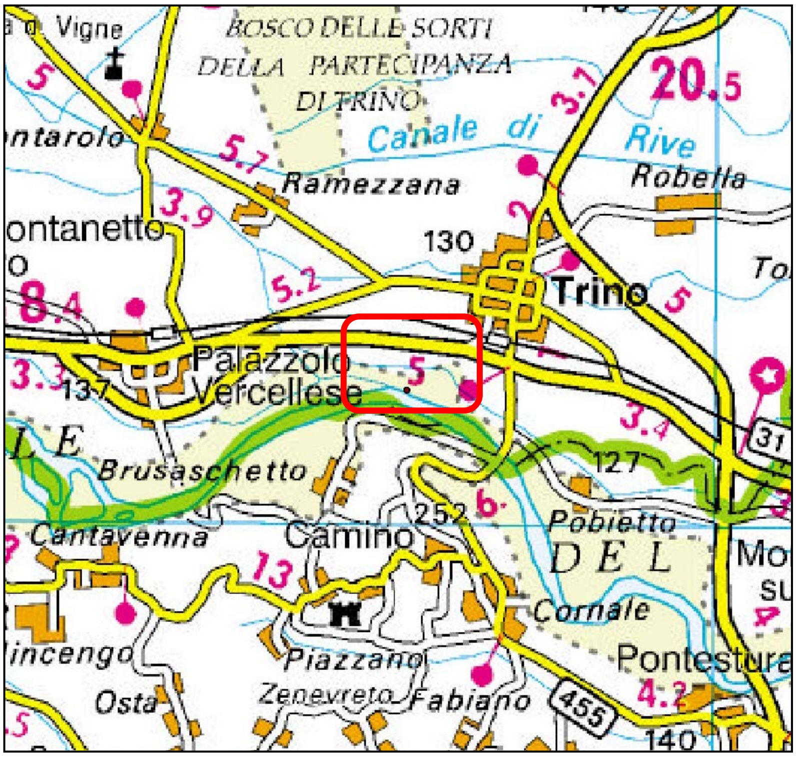


Figure 6.1.1-1: In red, the area where the Trino power station is located (De Agostini road database, resolution 1:250,000)

The plant, built on the summit of an artificial rise that reaches a height of 134.8 metres above mean sea level (height of ground level: 130 metres above mean sea level), is located in the western part of the Po Valley, between the hills of Monferrato to the south and the southern slopes of the glacial Alpine systems to the north, in a flood plain on the left bank of the River Po.

As regards the seismicity of the area and the hazards associated with it, based on the *Seismic classification of Piedmont territory* (Regional Government Decree no. 11-13058 of 19.01.2010), the municipality of Trino lies in seismic zone 4.

Anthropic aspects

The territorial complex in the south of the province of Vercelli, once the site of vast swamp areas, has gradually been reclaimed over the last five centuries that, also use to the exploitation of the local water resources, has enabled the development of rice cultivation in the territory. The site is located in the "rice plain" of Vercelli and Casale, an area where rice cultivation predominates over others, mainly made up of corn, wheat and spinach. As regards livestock, the area is mainly concerned in the breeding of cattle and pigs.

In the Trino area and in the neighbouring municipalities, the protected designated origin supply chains that could be developed based on the regulations of the individual products are: Gorgonzola, Grana Padano, Toma Piemontese, Salamini italiani alla cacciatora, rice of Baraggia Biellese e Vercellese, "Piemonte" wine. Among the protected geographical indication products, the supply chains that could be developed are: Mortadella di Bologna, Salame di Cremona, Salame Piemonte and Nocciola di Piemonte.

The countryside to the north of the Po is characterised by the presence of rural buildings, simple "family" houses and farmhouses with "courtyards". The hilly zones of Monferrato to the south area are characterised by small villages of ancient rural settlement.

The resident population in this part of the plain is mainly concentrated in the residential centres (95.5% of the total). Based on the ISTAT census data from 2011, 7,265 people live in the Municipality of Trino;

the employment rate is 42.4%. As regards the census of industry and services in the Municipality, there are 504 businesses employing 1,235 employees.

6.1.1.2 Atmosphere

From the weather and climate point of view, the area in which the Trino Power State is located displays features of the continental climate, with cold winters and often hot, dry summers, spring and winter rains. The climate is characterised by a rather uniform trend, with the prevalence of phenomena of thermal rather than dynamic origin. The region is subject to the barrier effect produced by the Alps and hills of Monferrato on bad weather both of Atlantic and Mediterranean origin and most of the territory of Piedmont, especially the plain, is characterised by a particular anemological situation in terms of the frequency of calm weather and the systematic weakness of the winds, where up to 50% of situations are without winds, especially at night in winter. Moreover, especially in winter, there are significant situations of thermal inversion with the formation of mist. The thermal trend is characterised by wide temperature ranges between summer and winter. Specifically, from the analyses of data recorded in recent years[34]:

- average annual temperature between 12.6° and 14.3°C;
- minimum average temperature in the coldest months between -5.8% and 2.7°C;
- minimum average temperature in the hottest months between 26.4% and 32.5°C;
- annual average temperature range > 20°C.

The humidity is influenced by various factors, particularly by the hydrography and especially in winter, when it rises to higher values due to the accumulation of cold air at the valley floor which enables additional humidity from the Po. In this regard, in anti-cyclonic conditions (throughout the Po Valley and especially in the Piedmont Basin), very weak air currents prevail with light breezes. These conditions in late autumn and winter favour the accumulation of cold air on the valley floor with the formation of persistent fogs and with the consequent accumulation of any pollutants; in the hot season, the same conditions are accompanied by strong convective forces that can trigger storms.

The rainfall is characterised by maximums of precipitation in spring and autumn and minimums in winter and summer, without dry periods. The rainfall displays considerable variability over the year but is contained, in the areas of the plain, almost always remaining below 1,000 mm/year (www.scia.isprambiente.it).

As regards the anemological position and the atmospheric stability, in accordance with the Pasquill–Gifford classification (Pasquill, 1961; Gifford, 1976), a high percentage emerges of stable classes (E, F, G), especially in winter, while instable classes (A, B, C) are significant only in spring and summer, even if limited. The maximum of category D, neutral, arrives in spring. Category G is at a maximum in autumn-winter when thermal inversion can occur in the first 100 metres of the atmosphere.

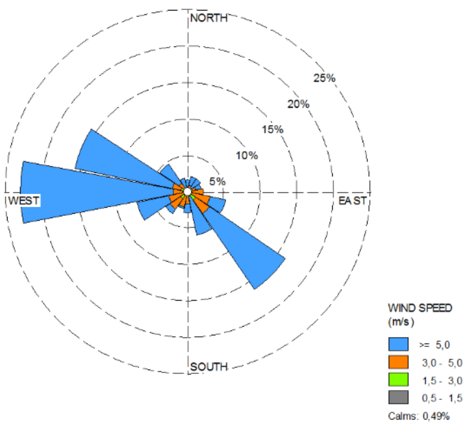
In this general context, for local detail, the most recent surveys that were conducted in the area surrounding the Power Station are reported, with two monitoring campaigns conducted in the periods September-October 2015 and November-December 2015 (SOGIN NPVA01085, 2016).

[34] Data referring to the ARPA "Tricerro" station, in the period 2001-2015 www.scia.isprambiente.it

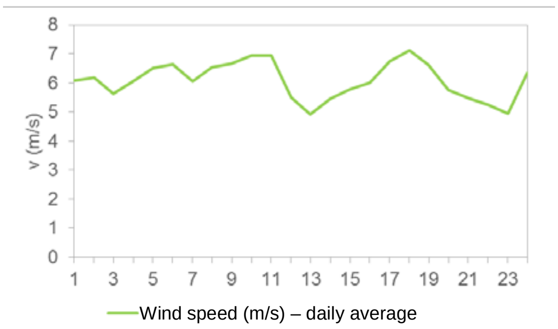
Monitoring during September-October 2015

In the period surveyed, a 10 m wind was recorded, mainly south-easterly or westerly and at a speed of between 5 and 10 m/s for around 70% of the hourly values, indicating the possible presence of winds on a synoptic scale. This is also confirmed by the average daily trend in the speed of the wind (Figure 6.1.1-2).

The period was characterised by variable conditions, mainly low pressure and the absence of rain. The average daily temperature values come within the average seasonal values and are between 11° and 16°C (Figure 6.1.1-3).

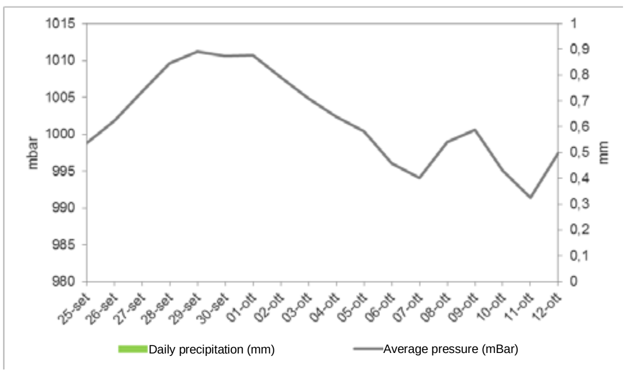


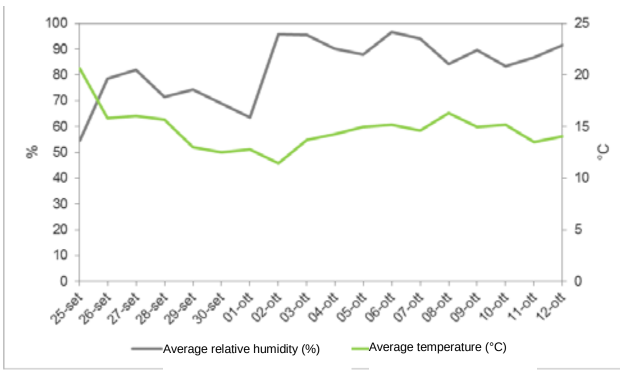
(a)



(b)

Figure 6.1.1-2: (a) Wind rose in the period in question and (b) average speed wind for typical day (SOGIN NPVA01085, 2016)



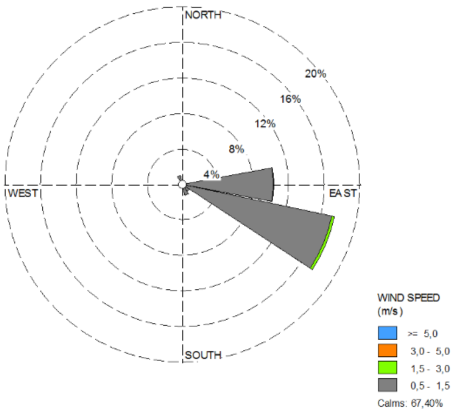


(a) (b)

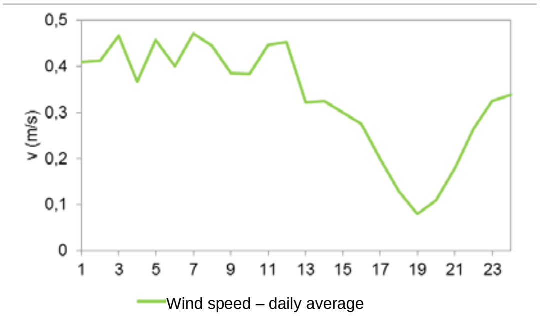
Figure 6.1.1-3. (a) Trends in atmospheric pressure superimposed on daily precipitation and (b) average daily trends in the temperature and humidity for the period (SOGIN NPVA01085, 2016)

Monitoring during November-December 2015

In the period surveyed, a wind of 10 m in a mainly east-south-easterly direction was recorded. The intensity of the wind was always low with frequent periods of calm (around 67% of the total) (Figure 6.1.1-4a). The daily trend in wind speed (Figure 6.1.1-4b) does not display phenomena of thermal origin, probably due to the mists that mark the period and that prevented the complete development of the convection boundary layer.

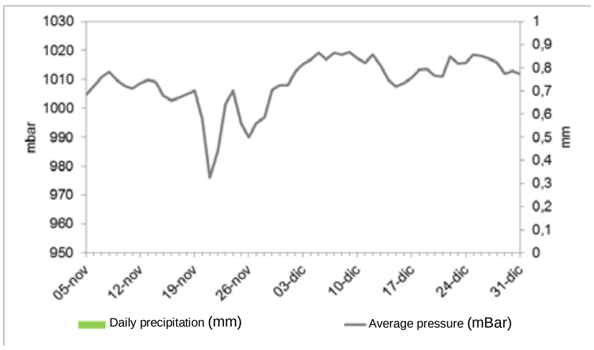


(a)

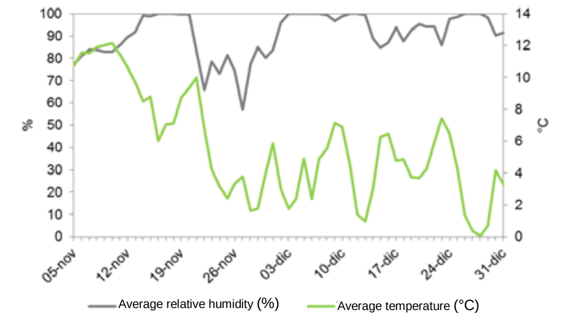


(b)

Figure 6.1.1-4: (a) Wind rose in the period in question and (b) average speed wind for typical day (SOGIN NPVA01085, 2016)



(a)



(b)

Figure 6.1.1-5. (a) Trends in atmospheric pressure superimposed on daily precipitation and (b) average daily trends in the temperature and humidity for the period (SOGIN NPVA01085, 2016)

The period surveyed was characterised by the absence of rain, high rate of relative humidity, especially in the month of December where a lowering of temperature was recorded accompanied by conditions of high pressure (Figure 6.1.1-5).

Air quality

As regards the state of air quality, the threshold limit values can be taken as reference for the concentrations regulated by Legislative Decree 13/08/2010 no. 155 in implementation of "Directive 2008/50/EC concerning ambient air quality and for cleaner air in Europe". In accordance with this regulation, the Piedmont Region, under the resolution of the regional Council no. 41-855 of 29 December 2014, adopted the following zoning and classification of the regional territory on the basis of the objectives of protecting human health from various pollutants (NO_2, SO_2, C_6H_6, CO, PM_{10}, $PM_{2,5}$, Pb, As, Cd, Ni, B(a)P):

- Agglomerate of Turin;
- Zone called *Plain*;
- Zone called *Hill*;
- Zone called *Mountain.*

The Trino power station comes within the "Plain" zone. This zone is characterised by the existence of levels above the upper assessment threshold, including for the following pollutants: NO_2, PM_{10} e $PM_{2.5}$.

6.1.1.3 Water environment

Surface waters

The Trino Power Station is located on the left bank of the River Po between the confluence of the Dora Baltea to the west and the River Sesia to the east. In this natural context lies the vast artificial hydraulic system of the so-called *Canali Demaniali Cavour,* made up of more than 800 km of internal canals.

The entire artificial water system complex of the area is fed by the canals:

- Naviglio d'Ivrea, Depretis and Rotto (the latter is undergoing work in common with the Depretis canal) with a branch from the Dora Baltea;
- Cavour and Lanza with branch from the River Po.

The body of water receiving the discharges from the Power Station is the River Po, which, near the plant, has an average annual capacity of around 200 m^3/s (SOGIN TRV0001, 2003).

As regards the quality of the surface waters, that is, the overall expression of the conditions of a body of water determined by the lower value of its ecological and chemical state, ARPA Piemonte, in the three years 2012-2104, defines the Overall State of the stretch of the River Po within the potential sphere of influence of the Trino Power Station as "Good"; this state derives from an Ecological and a Chemical State coming within the class "Good".

Finally, as regards the hydraulic hazard associated with the part of the valley where the Trino Power Station is located, this is linked to possible flooding events of the River Po. In the Extract Plan for the Hydrogeological Structure of the Po Basin Authority, the Trino residential area, as well as the Power Station, were found to be in an *area of catastrophic flooding* (Band C), which can be affected by more severe floods than those of reference.

The European Directive 2007/60/EC "Floods Directive", enacted in Italy under Legislative Decree 49/2010, led to the updating of the maps of the AdB Po regarding the danger and risk of flooding. In the new map updated in 2015 (*Map of Danger from Flooding* and *Flood Risk Map* at a scale of 1:25,000 - Table 157 NE), the area of the Power Station lies in a danger band defined by a "flooding scenario" with "low probability of flooding" (tr. 500 – L-Rara); on the basis of this danger, the area of the Power State is associated with "risk scenario" "R2 – Average risk".

Hydrogeology information

Studies conducted in the area (SOGIN TRV0001, 2003) have shown the existence of two overlapping hydrogeological complexes in the subsoil:

- The *first complex* is made up of pre-quaternary formations emerging in Monferrato and at depth below the plain, where clay-marly-arenaceous boundaries are entirely subordinate to the calcareous-conglomerates ones. As a consequence, localised groundwater can only rarely be found, sometimes under pressure and mineralised.
- the *second complex*, more superficial, is made up of the quaternary clay-sandy-gravel sediments of the plain and displays extremely variable permeability, running upwards.
  Indeed, it passes from finer marine deposits (limes and clays) with medium to low permeability, to coarser ones of continental origin (sand and gravel) with high permeability forming the superficial alluvial bed.
  In these last levels, remarkable variations of permeability are found, including horizontally, linked to the peculiar methods of solid deposition of rivers.

Due to the lithological variations found in the *second complex,* due to the Vercelli plain, it has been divided in two units, described below from the bottom up:

- *Alternation unit* – lacustrine, fluvial-lacustrine and marine deposits made up of fine sediments (limes and clays) with intercalations of gravel-sandy levels and peat layers with little lateral continuity. The permeability, extremely variable both vertically and laterally, lies between the values of $10^{-7}÷10^{-9}$ m/s for the finest granulometric bodies and $10^{-3} ÷ 10^{-5}$ m/s for the coarser ones. This unit houses a multilayer system, under pressure in stretches from less permeable level.
- *Gravel-sandy unit* – quaternary deposits of continental origin made up of gravel and sand with lenses of fine materials (lime and clay). This unit displays average permeability values of around $10^{-2} ÷ 10^{-3}$ m/s and a variable overall thickness of between 10 and 70 m. In particular, in the area of the plant, is displays a potency of around 10 m. The unit is the site of groundwater linked hydraulically with the unit of alternation and with piezometric surface located generally at 1-6 m from ground level.

6.1.1.4 Biodiversity

From a naturalistic point of view, a good part of the areas coming within the sphere of influence are extremely fragmented. Half of the territory is made up of extensive agricultural land broken up by little watercourses and canals. Some of the areas closest to the River Po display a lack of continuity and ecological connections sufficient to sustain “diffuse nature” between one patch of wood and another; a consequence of the development and spread of intensive farming typical of the local area and the territorial changes required to conduct it. In the medium to long term, the effects of this ecological discontinuity translate into a weakening of the natural formations and an impoverishment of their capacity of resistance and resilience against any sources of disturbance, both anthropic and natural, making them more fragile overall. The most obvious aspect is the degree of invasiveness of native species to which the territory in question is subject, the causes of which are only partly to be found in the fragmentation. For example, robinia has propagated to the detriment of the native broad-leafs (oak-hornbeam), due to its heliphilic properties, rapid growth and high polleniferous capacity; furthermore, robinia has been favoured by repeated cutting often carried out without the release of saplings. Among the most interesting ecosystems are the remaining tall herb woodland in the Bosco della Partecipanza and hygrophilous riparian woods. Both these systems display a structural complexity regarding the vegetation matched by a rich and diversified fauna.

The Bosco della Partecipanza (SIC/ZPS and also a Nature Park), which partially lies within the area of influence, is adjacent to the isolated relief of Montarolo at a distance of around 3 km from the Power Station. This wood constitutes a historic and ecological relict within the current panorama of the Po Valley and is made up of Turkey Oak (*Quercus cerris* L.) and monumental examples of Greater Ash

(*Fraxinus excelsior* L.) and Black Elder (*Alnus glutinosa* (L.) Gaertn., 1790) in addition to examples of English Oak (*Quercus robur* L.). The Bosco della Partecipanza is also an important element of ecological connection, since it represents a tank of biodiversity (*core area)* due to the natural areas of sufficiently large sizes to be the source of diffusion of species, which can move to neighbouring territories by using the network of canals and hedges or little semi-natural areas *(stepping stones)* nearby made up of rice fields, small basins, developing areas.

The hygrophilous riparian woods are physiologically made up of willows (*Salix* spp.) and poplars (*Populus* spp.). From the dynamic point of view, they are placed in contact with the woods of black poplar (*Populus nigra* L.) more unconstrained from the full dynamics until the first slopes of the hills of Monferrato, but neither seasonal conditions nor the surfaces are recognised, given the fragmentary nature of the community and the exploitation of the flood terraces close to the alluvial terraces near the riverbed (Ministry of the Environment and the Protection of the Territory, La Sapienza University - Department of Plant Biology, 2005).

As regards the meso-hygrophilous tall herb woods, starting from the first terraces to the southern slope of Monferrato of the Municipality of Camino, they are made up in decreasing measure by Elm (*Ulmus minor* Mill.) and English Oak *(Quercus robur* L.), Great Ash (*Fraxinus excelsior L.)* and the more sporadic white Willow (*Salix alba* L.) e Field Maple (*Acer campestre* L.). This type of wood is marked by high ecological value since it give rise to vegetation from the most mesophyllic valleys to the driest terraces.

The presence of rice fields (IBA025 Rice fields of the Vercelli area) and wetlands (Nature 2000 sites network given in figure 6.1.1-6), encourages the establishment of fauna, stationary and migratory of conservation interest (Directive 2009/147/EEC and the Habitat Directive 92/43/EEC). In particular, the avifauna consists of species with very localised nesting, such as Aredeidae (Greater White Heron, Pale Grey Heron, Red Heron, Cattle Egret, Night Heron, Dwarf Heron), Anatidae, Laridae and the Marsh Harrier (*Circus aeruginosus* (Linnaeus, 1758)), linked to strips of watercourses and concentrated along the riverbed of the Po. In the area, there are aquatic species of passage, under special protection or threatened with extinction at the national and/or European level, such as the Spoonbill and the Stilt-Plover. In addition, species under the Birds Directive in Attachment I were found, including: Brown Kite (*Milvus migrans* (Boddaert, 1783)), Marsh Harrier (*Circus aeruginosus* (Linnaeus, 1758)), Night Heron (*Nycticorax nycticorax* (Linnaeus, 1758)), Red Heron (*Ardea purpurea* Linnaeus, 1766), Dwarf Heron (*Egretta garzetta* (Linnaeus, 1766)), Spoonbill (*Platalea leucorodia* Linnaeus, 1758), Pale Grey Heron (*Ardea cinerea* Linnaeus, 1758), Squacco Heron (*Ardeola ralloides* (Scopoli, 1769)), Great White Heron (*Ardea alba* Linnaeus, 1758). There is a migratory corridor of national importance for shore birds between Crescentino, Trino, Vercelli, Formigliana and Livorno Ferraris.

The complete list is given below of protected areas with their respective distances from the Power Station, the total area and percentage cover of the area coming with the sphere of influence surveyed. It is emphasised that the Power Station lies within the *ZPS IT1180028 River Po – Vercelli-Alessandria stretch of the Area adjacent to the fluvial strip of the Po – Turin stretch* and the IBA 027 *River Po: from Dora Baltea to Scrivia.*

TYPE	CODE	NATURE 2000 SITES/PROTECTED AREAS	Approximate minimum distance from the infrastructure (km)	Total area (hectares)	Approximate coverage falling within the sphere of influence (%)
SIC/ZPS	IT1120002	Bosco della Partecipanza of Trino	3	1,075	47
SIC	IT1180005	Ghiaia Grande (River Po)	2.9	462	64
ZPS	IT1180028	River Po – Vercelli-Alessandria stretch	Infrastructure lying within	14,107	12
ZPS	IT1120029	Marshes of San Genuario and San Silvestro	3	1,248	9

TYPE	CODE	NATURE 2000 SITES/PROTECTED AREAS	Approximate minimum distance from the infrastructure (km)	Total area (hectares)	Approximate coverage falling within the sphere of influence (%)
SIC	IT1120030	River banks of Palazzolo Vercellese	1	243	81
SIC/ZPS	IT1120008	Fontana Gigante (Tricerro)	4.2	314	23
AANP	EUAP1186	Safeguarded zone of the Bosco della Partecipanza of Trino	3,1	439	49
RNR	EUAP1198	Special Nature Reserve of Fontana Gigante	4.2	310	23
PNR	EUAP0207	Natural Park of the Bosco delle Sorti della Partecipanza of Trino	2.9	581	50
Piedmont Parks	-	Area adjacent to the river strip of the Po – Vercelli/Alessandria stretch	Infrastructure lying inside	11.822	11
Piedmont Parks	-	Nature Reserve of Ghiaia Grande	2.8	462	64
IBA	IBA025	Rice Fields of Vercelli	1.3	24,650	9
IBA	IBA027	River Po: from Dora Baltea to Scrivia	Infrastructure lying inside	18,761	9

Figure 6.1.1-6: List of Nature 2000 Sites, protected areas and IBA in the sphere of influence of Trino Power Station

From the consultation of the standard Model of the aforementioned Nature 2000 Sites[35], it is clear the number of habitats (Attachment I Dir. Habitat) and the Directive species (Field 3.2) and of conservation interest (Field 3.3) listed therein, as indicated in figure 6.1.1-6. The list of the habitats and species is given in Attachment 4 to this Environmental Report.

TYPE	Code	Name	Number of community habitats (Att. I 92/43/EC)	Number of plant species (Field 3.2)	Number of animal species (Field 3.2)	Number of plant species (Field 3.3)	Number of animal species (Field 3.3)
SIC/ZPS	IT1120002	Bosco della Partecipanza of Trino	6	-	31	4	17
SIC	IT1180005	Ghiaia Grande (River Po)	9	1	50	1	9
ZPS	IT1180028	River Po – Vercelli-Alessandria stretch	12	1	187	16	31
ZPS	IT1120029	Marshes of San Genuario and San Silvestro	5	-	40	6	10
SIC	IT1120030	River banks of Palazzolo Vercellese	8	-	40	-	-
SIC/ZPS	IT1120008	Fontana Gigante (Tricerro)	5	-	41	-	6

Table 6.1.1-7: Number of Community fauna species habitats in the Nature 2000 Sites Network

35 Database of the Ministry of the Environment and the Protection of the Territory and the Sea, on the page “Cards and maps”. Website ftp://ftp.minambiente.it/PNM/Natura2000/TrasmissioneCE_2015/

6.1.1.5 *Ionising radiation*

Release conditions

The current discharge limits were laid down by the Control Authority as part of the licence for the Deactivation authorised with Ministerial Decree MiSE of 2 August 2012.

LIQUID AND GASEOUS EFFLUENTS

$$\sum_{i=1}^{n} \frac{A_i}{L_i} < \begin{cases} \text{1 in a calendar year} \\ \text{0,25 in 13 weeks} \\ \text{0,05 in 24 consecutive hours} \end{cases}$$

A_i = attività dell'i-esimo radionuclide scaricato;
L_i = attività dell'i-esimo radionuclide scaricabile singolarmente che determina all'individuo del gruppo di riferimento della popolazione i seguenti valori di dose efficace:

- effluenti aeriformi: 2 µSv/anno;
- effluenti liquidi: 8 µSv/anno.

I Valori sono indicati alla Tabella V delle Prescrizioni per la Disattivazione.

GASEOUS	
Radionuclide	L_i *(Bq)*
Am – 241	1.30E+08
C – 14	1.14E+12
Co – 60	3.01E+09
Cs – 134	2.69E+09
Cs – 137	3.41E+09
Cm – 244	2.06E+08
Eu – 152	9.80E+09
Eu – 154	7.22E+09
Fe – 55	4.25E+10
H – 3	3.77E+14
Kr – 85	9.52E+16
Mn – 54	2.33E+10
Ni – 59	3.08E+11
Ni – 63	1.27E+11
Pu – 238	1.19E+08
Pu – 239	1.08E+08
Pu – 241	6.02E+09
Sb – 125	1.40E+10
Sr – 90	6.19E+08

LIQUID	
Radionuclide	L_i *(Bq)*
Am – 241	4.22E+10
C – 14	3.48E+11
Co – 60	7.30E+11
Cs – 134	2.37E+11
Cs – 137	3.24E+11
Eu – 152	2.40E+12
Eu – 154	2.10E+12
Fe – 55	1.38E+13
H – 3	4.17E+15
Mn – 54	3.89E+12
Ni – 59	9.74E+13
Ni – 63	4.01E+13
Pu – 239	3.49E+10
Pu – 241	1.96E+12
Sb – 125	3.91E+12
Sr – 90	3.12E+11

Monitoring of radioactive waste

The figures below report the quantity of radioactivity discharged annually with liquid and gaseous effluents, as well as the percentage use of the maximum authorised limit (%FdS) for Trino Power Station regarding the three years 2013-2015[36].

Trino Power Station – liquid discharges – Annual activity [Bq]			
Year	**2013**	**2014**	**2015**
Am-241	1.33E+04	2.14E+04	7.05E+03
C-14	7.26E+05	3.18E+06	3.42E+06
Co-60	9.17E+06	8.61E+07	4.70E+06
Cs-134	3.30E+05	3.20E+05	8.04E+04
Cs-137	6.13E+06	9.34E+06	3.36E+06
Eu-152	1.28E+06	8.56E+05	3.04E+05
Eu-154	1.04E+06	4.42E+05	1.23E+05
Fe-55	2.23E+06	2.76E+06	7.42E+05
H-3	2.86E+08	1.84E+08	1.29E+07
Mn-54	3.59E+05	2.75E+05	8.34E+04
Ni-59	3.05E+06	3.05E+06	2.27E+06
Ni-63	9.40E+06	3.04E+05	8.62E+06
Pu-239	1.03E+04	9.34E+03	3.73E+03
Pu-241	6.53E+05	3.16E+06	4.58E+05
Sb-125	7.19E+05	8.43E+05	2.29E+05
Sr-90	3.03E+05	2.48E+05	9.03E+04
Total activity [Bq]	**3.21E+08**	**2.95E+08**	**3.74E+07**
%FdS	**3.90E-03**	**1.62E-02**	**2.80E-03**

Figure 6.1.1-8: Annual activity and use of discharge formula of discharged radioactive liquid effluents (2013-2015)

Trino Power Station – gaseous discharges – Annual activity [Bq]			
Year	**2013**	**2014**	**2015**
H-3	2.52E+09	1.19E+09	1.02E+09
Kr-85	< MDA[37]	< MDA	9.96E+11
Co-60	2.66E+05	< MDA	7.45E+04
Cs-134	< MDA	1.06E+04	< MDA
Cs-137	2.98E+04	< MDA	9.90E+04
Sr-90	1.36E+03	7.77E+02	2.34E+02
Pu-239	< MDA	8.09E+05	9.46E+05
Total activity [Bq]	**2.52E+09**	**1.19E+09**	**9.97E+11**
%FdS	**4.60E-02**	**1.27E+00**	**8.50E-01**

Figure 6.1.1-9: Annual activity and use of discharge formula of discharged radioactive liquid effluents (2013-2015)

Monitoring of environmental radioactivity

The following figures report the average concentrations of activity concerning the three years 2013-2015 of the main radionuclide in the most significant matrices analysed as part of the environmental surveillance of the Trino site[38].

[36] Sogin doc. TR MS 00707 rev.00 Report on environmental radioactivity (year 2013).
Sogin doc. TR MS 00836 rev.00 Report on environmental radioactivity (year 2014).
Sogin doc. TR MS 01073 rev.00 Report on environmental radioactivity (year 2015).

[37] Minimum Detectable Amount (MDA).

Concentration of average annual activity – LAND [Bq/kg]			
	2013	**2014**	**2015**
Caesium-137	14,7	21,6	21,2

Figure 6.1.1-10: Concentrations of activity in the land matrix [Bq/kg] – Trino Power Station

Concentration of average annual activity—RIVER WATER [Bq/l]			
	2013	**2014**	**2015**
Strontium-90	2.16E-04	3.01E-04	6.3E-04
Caesium-137	2.45E-04	3.06E-04	3.00E-04
Tritium	< 1.00E+00	< 1.00E+00	< 1.00E+00

Figure 6.1.1-11: Concentrations of activity in the river water matrix [Bq/l] – Trino Power Station

Concentration of average annual activity—GROUNDWATER[39] [Bq/l]			
	2013	**2014**	**2015**
Strontium-90	9,30E-04	1,59E-03	6,50E-04
Caesium-137	< 1,00E-04	< 1,50E-04	< 1,50E-04
Tritium	2,60E+00	< 1,00E+00	< 9,00E-01

Figure 6.1.1-12: Concentrations of activity in the groundwater matrix [Bq/l] – Trino Power Station

Concentration of average annual activity—MILK [Bq/l]			
	2013	**2014**	**2015**
Strontium-90	8,00E-03	1,40E-02	3,00E-02
Caesium-137	1,70E-01	2,10E-01	1,60E-01

Figure 6.1.1-13: Concentrations of activity in the milk matrix [Bq/kg] – Trino Power Station

Concentration of average annual activity – LEAFY PLANT [Bq/kg]			
	2013	**2014**	**2015**
Caesium-137	1.00E-01	< 1.00E-01	< 1.00E-01

Figure 6.1.1-14: Concentrations of activity in the leafy plant matrix [Bq/kg] – Trino Power Station

Equivalent dose rate in air (gamma dose)

The values oscillate within the usual fluctuations of the environmental background radiation with an annual average of around 0.12 µSv/h.

6.1.1.6 Landscape

The landscape that characterises the surroundings of the Power Station is made up of a vast flat area, slightly inclined to the south-south-east and mainly formed of the action of the Dora Baltea and the watercourses of the glacial Alpine system. The area is marked by intensive agricultural exploitation, the current situation being the outcome of centuries of historic processes. The exploitation for agricultural

[38] See previous note.

[39] The samples of groundwater were taken from wells outside the Power Station area.

purposes has produced a complex system of water control that, over the centuries (from the Middle Ages to 19th century works), led to the creation of a remarkable number of artificial canals.

The physical-naturalistic emergencies of the Vercelli plain are therefore the following:

- the rice fields and the system of irrigation canals;
- the Bosco delle Sorti della Partecipanza di Trino, one of the largest and most important tall herb woods remaining in the Po basin;
- the fluvial strips of the Po and the Dora lying in the System of Protected Areas of the Fluvial Strip of the Po, that constitute important, semi-natural elements rich in biodiversity.

The area of the Power Station is characterised by the presence and established interaction between traditional rural and micro-urban settlement systems and a scattering of residential or production settlements.

Figure 6.1.1-15 shows the location of the viewpoints for monitoring by means of photographic survey campaigns planned by the operator (SOGIN) as part of the implementation of the decommissioning strategy of the plants belonging to the energy sector.

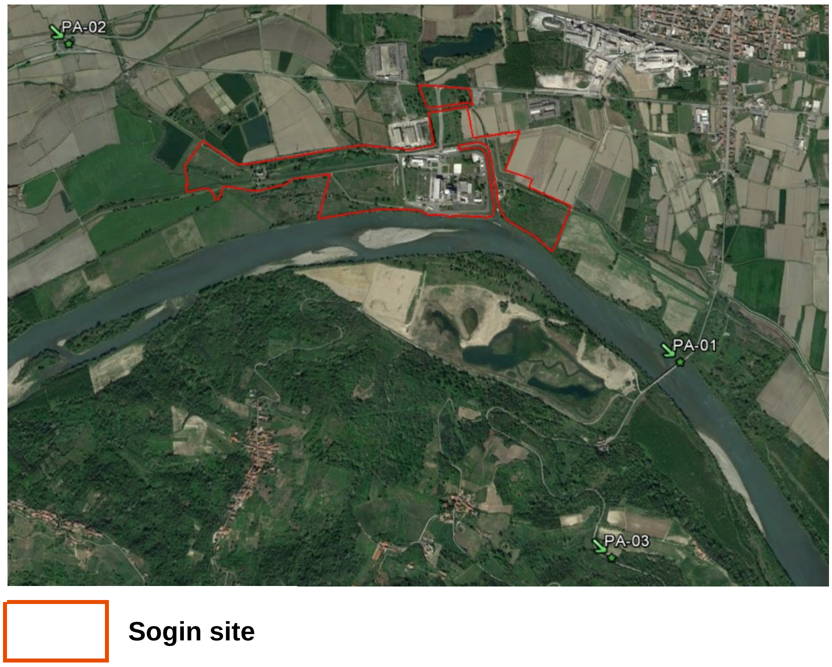


Figure 6.1-1-15: Location of the viewpoints for monitoring

<u>Constraints</u>

Legally protected areas (article 142 of Legislative Decree no. 42/2004)

According to what is reported in table P.2 of the Regional Landscape Plan of Piedmont (Figure 6.1.1-16), the area of the Power Station is subject to landscape constraints referred to in the list of article 142 of Legislative Decree 42/04 and subsequent amendments and supplements. Almost all the areas owned by SOGIN lie within the perimeter of the Fluvial Park of the Po and Orba - Vercelli/Alessandria stretch and in the adjacent areas, with the exception of all the area north of Roggione di Palazzolo.

On most of the hill of the Power Station and areas surrounding the course of the River Po, there is a restriction covering 150 metres from watercourses.

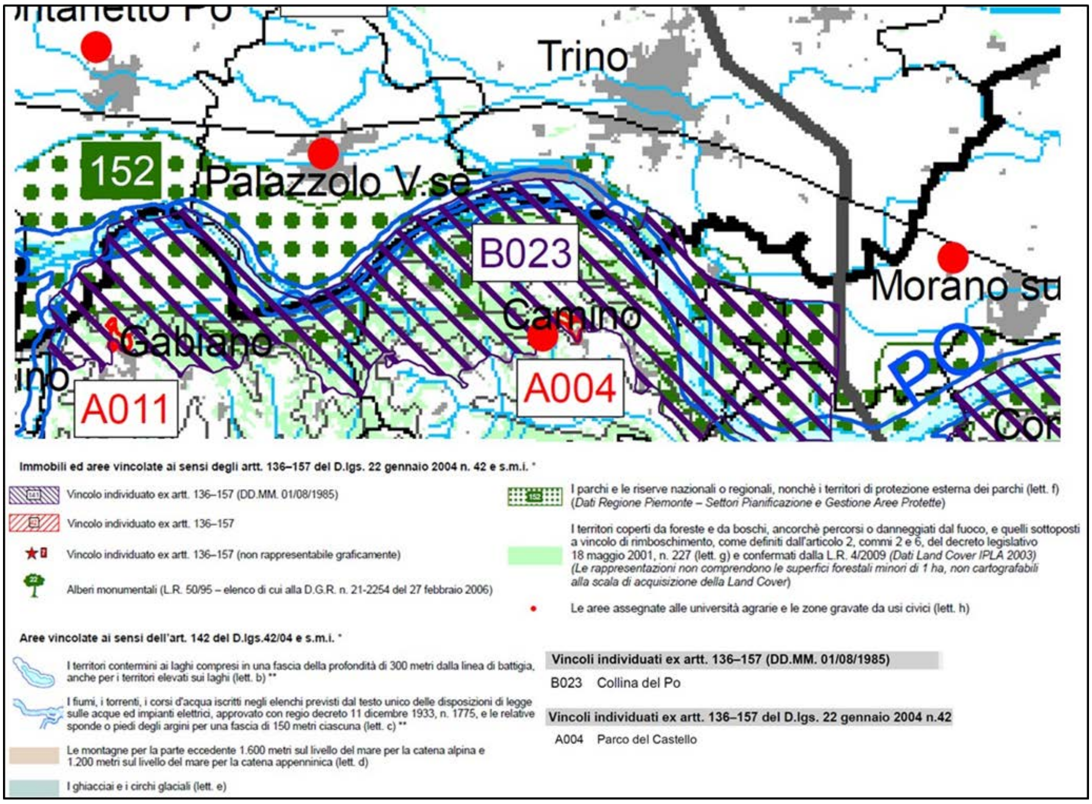


Figure 6.1.1-16: Table P2 of the Regional Plan of Piedmont – Landscape Assets

6.1.2 <u>Caorso Power Station</u>

6.1.2.1 Territorial framework

The Caorso Power Station is located in the province of Piacenza in the municipality of the same name from which it is around 1.3 km, a few hundred metres from the regional border between Emilia-Romagna and Lombardy (Figure 6.1.2-1).

The closest roads to the site are mainly the provincial road called "Lower Po" (SP10), around 1 km away to the east, the provincial road of Ziano (SP27), 2.1 km to the north-east and the Motorway of the Vines (A21) located 1.7 km to the south.

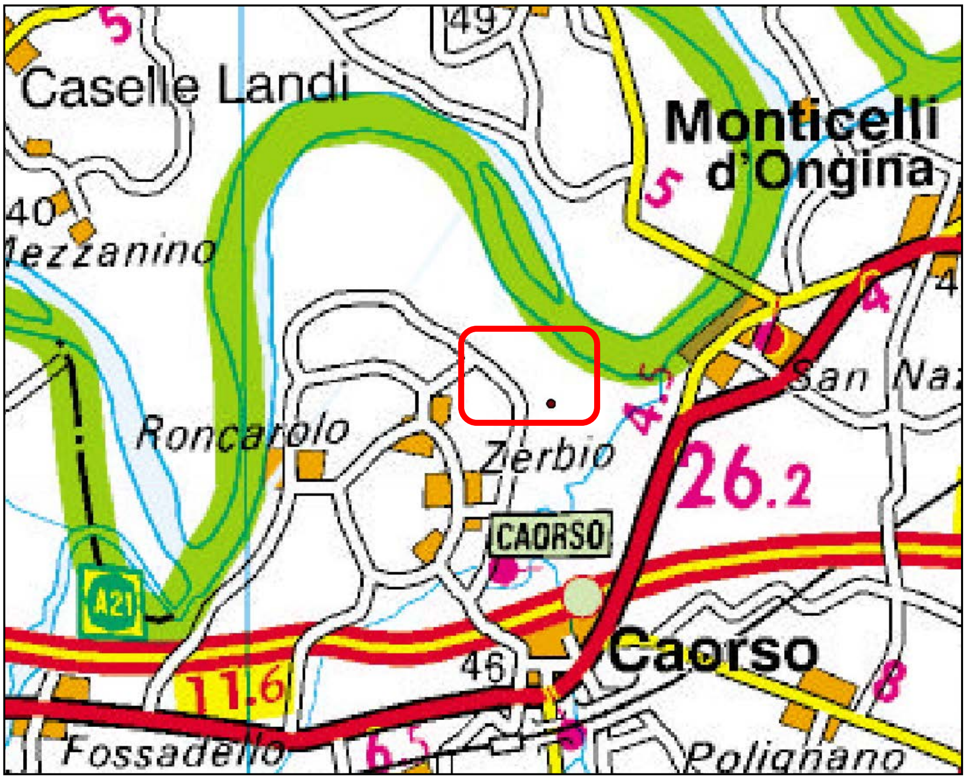


Figure 6.1.2-1: In red, the area where the Caorso power station is located (De Agostini road database, resolution 1:250,000)

The site lies in an uneven context, located on an artificial rise on the right bank of the River Po, which brings the natural height of ground level (around 42 metres above mean sea level) to 48 metres above mean sea level; the plain is bordered at around 20 km to the south by the foothills of the Apennines (Monte Santo, 679 metres above mean sea level, and metres above mean sea level.).

As regards the area's seismicity and the dangers associated with it, the Emilia Romagna Region has adopted the seismic classification of the national territory without further changes (Order of the President of the Council of Ministers no. 3274 of 20 March 2003) which places the Municipality of Caorso in seismic zone 4.

Anthropic aspects

The area displays a marked preponderance of agricultural use of the land, characterised mainly by cultivation and sowing; the areas of nature and anthropic uses (covered by building fabric) are secondary. The main crops in the area in question are cereals. There are also areas used for horticultural products (fresh pulses and vegetables) and ornamental flowers and plants. From the livestock point of view, the area is mostly concerned with breeding cattle and pigs.

In the Caorso area and the neighbouring municipalities, the protected origin supply chains that could be developed based on the regulations of the individual products are: Grana Padano, Provolone Valpadana, Coppa Piacentina, Pancetta Piacentina, Salame Piacentino and Salamini italiani alla cacciatora. Among the protected geographical indication products, the supply chains that could be developed are: Cotechino of Modena, Mortadella of Bologna, Salame of Cremona and Zampone of Modena. Producers from the supply chain of Coppa Piacentina, Pancetta Piacentina, Salame Piacentino DOP are located in the area.

The most urbanised areas near to the Power Station are the residential centres of Caorso, Castelnuovo Bocca D'Adda and Monticelli d'Ongina, however there are scattered residential centres; 80% of the population in the aforementioned area live in residential centres, 5% in the small residential areas and the remaining 15% in isolated houses. In this area, urban settlements mainly sprang up around the established historic centres. There is a clear tendency towards the “linear agglomeration" type anthropisation, especially in the new residential settlements in the territory adjacent to the state highways.

Based on the ISTAT census data from 2011, 4,830 people live in the Municipality of Caorso; the employment rate is 48.79%. As regards the census of industry and services in the Municipality, there are 308 businesses employing 1,448 employees.

6.1.2.2 Atmosphere

From the weather and climate point of view, the area in which the Caorso Power Station is located is characterised by a temperate continental climate, with severe winters and hot summers. The geographical area to which it belongs makes the climate generally uniform, mainly due to phenomena of thermal origin. These elements particularly influence the area of the plant, which lies on a completely flat zone. The thermal trend is characterised by wide temperature ranges between summer and winter. Specifically, from the analyses of data recorded in recent years[40]:

- average annual temperature between 12.6° and 14.7°C;
- minimum average temperature in the coldest months between -6.4° and 1°C;
- minimum average temperature in the hottest months between 25.5° and 36.1°C;
- annual average temperature range > 25°C.

In the area of the Piacenza plain, the total annual amount of precipitation is around 850/900 mm distributed relatively uniformly during the year on 80/85 rainy days, with the possibility of identifying two maximums, in spring and autumn, and two minimums, in summer and winter, in line with the pluviometric regime of the climatic zone of origin (OPS, 2009).

The humidity rate is high (70-80%) and winter mists are relatively common. In particular, the shielding action from the Alpine and Apennine mountain chains and the river Po make the climate generally uniform, with the prevalence of phenomena of thermal rather than dynamic origin, giving rise to persistent mists in winter and storms in summer.

The proximity of the River Po, whose course runs parallel to the north side of the Power Station also impacts on the direction of the winds, contributing to strengthening the prevalent east-west direction that generally occurs in the Po Valley.

For the analysis of the categories of characteristic stability of the zone, reference is made to the Pasquill-Gifford method (Pasquill, 1961; Gifford, 1961), which identifies, in cases of free, flat land, the stability classes of low atmosphere depending on the vertical thermal gradient: the main stability class is D (neutral) on the overall period and the individual seasonal periods, with a maximum percentage (more than 40%), followed by classes F+G (stable) with 20%. In the summer period, similar frequencies were encountered (around 20%) for the classes D and F+G (SOGIN NPVA00642, 2013).

In this context, for local detail, the most recent surveys are reported conducted in the area surrounding the Power Station, with two monitoring campaigns conducted in the periods July-August 2015 and October 2015(SOGIN NPVA01040, 2016).

Monitoring July-August 2015

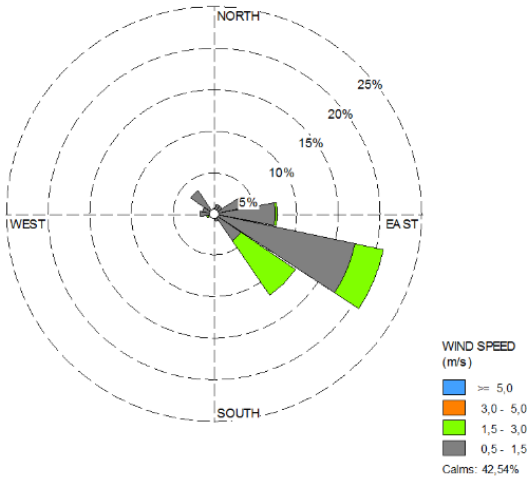
In the summer campaign, wind at 10 m was recorded mainly from the east-south-east (in the direction of the axis of circulation of the winds along the Po valley) and a speed of less than 3 m/s with frequent

[40] Data referring to the ARPA “Monticelli” station, in the period 1996-2008 www.scia.isprambiente.it

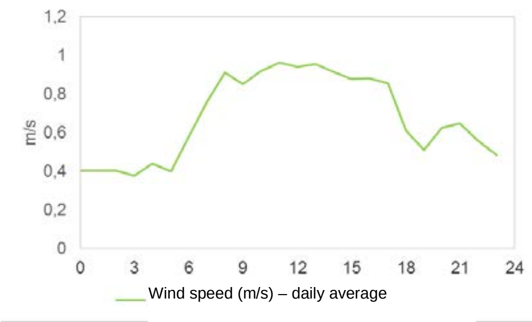
episodes of calm (around 42% of the total) (Figure 6.1.2.-2). From 29 July to 2 August, higher average values were recorded.

The daily trend is characterised by greater intensity during the hottest hours of the day.

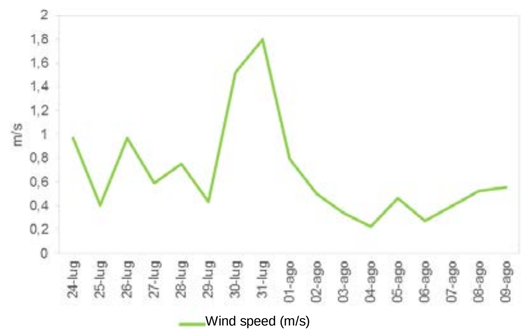
The period surveyed was characterised by a predominance of calm days and the absence of precipitation with average daily values of pressure between 998 and 1010 mBar. The average daily temperature values come within the average seasonal values and are between 19° and 29°C (Figure 6.1.2-3).



(a)

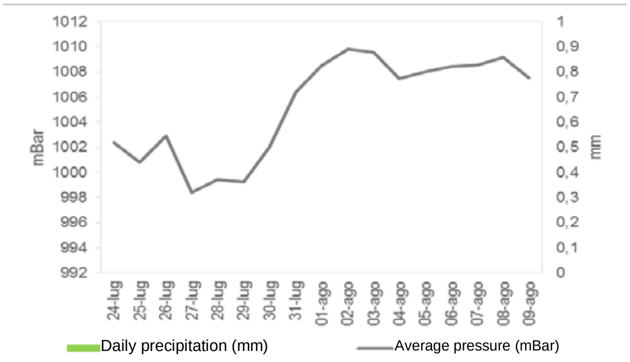


(b)

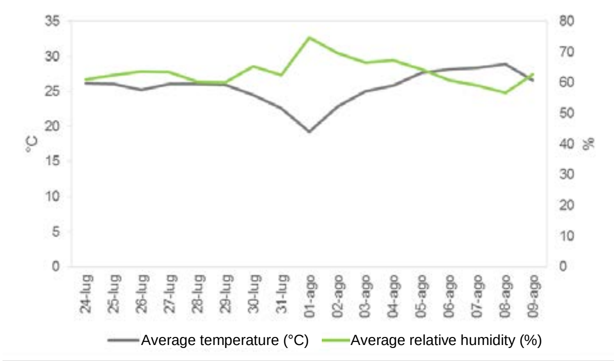


(c)

Figure 6.1.2-2: (a) Wind rose in the period in question and (b) average speed wind for typical day and (c) average daily trend in wind speed (SOGIN NPVA01040, 2016)



(a)

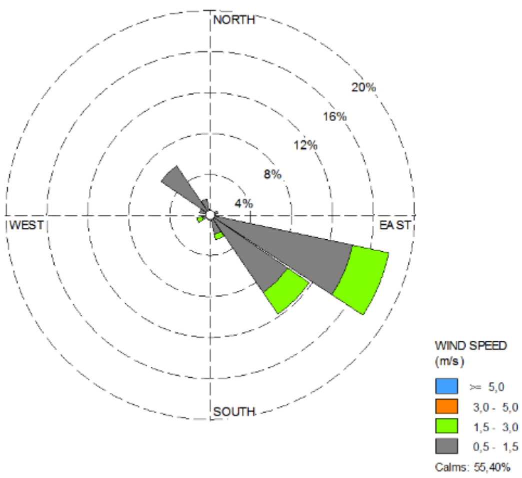


(b)

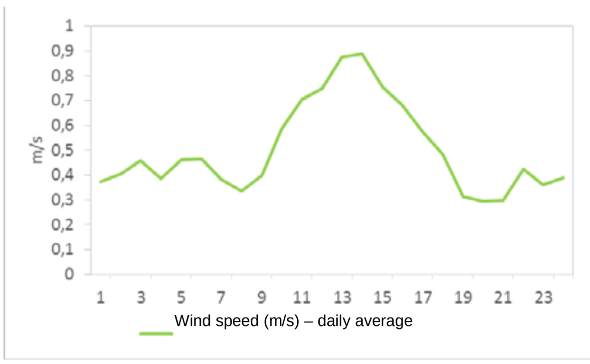
Figure 6.1.2-3. (a) Trends in atmospheric pressure superimposed on daily precipitation and (b) average daily trends in the temperature and humidity for the period (SOGIN NPVA01040, 2016)

Monitoring in October 2015

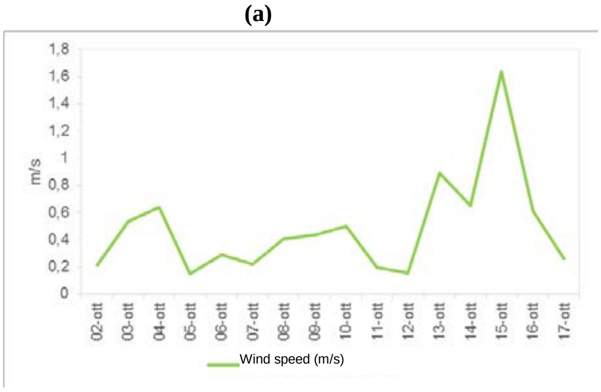
In the period surveyed, a wind at 10 m was recorded coming mainly from the south-easterly quadrant and, to a lesser degree, from the north-westerly quadrant (in the direction of the axis of circulation of the winds along the Po valley). The intensity of the wind was always low with frequent periods of calm (around 56% of the total). The last days of the period displayed greater intensity. The daily trend (Figure 6.1.2-3) confirms the prevalence of phenomena of thermal origin.



(a)



(b)



(c)

Figure 6.1.2-4: (a) Wind rose in the period in question and (b) average speed wind for typical day and (c) average daily trend in wind speed (SOGIN NPVA01040, 2016)

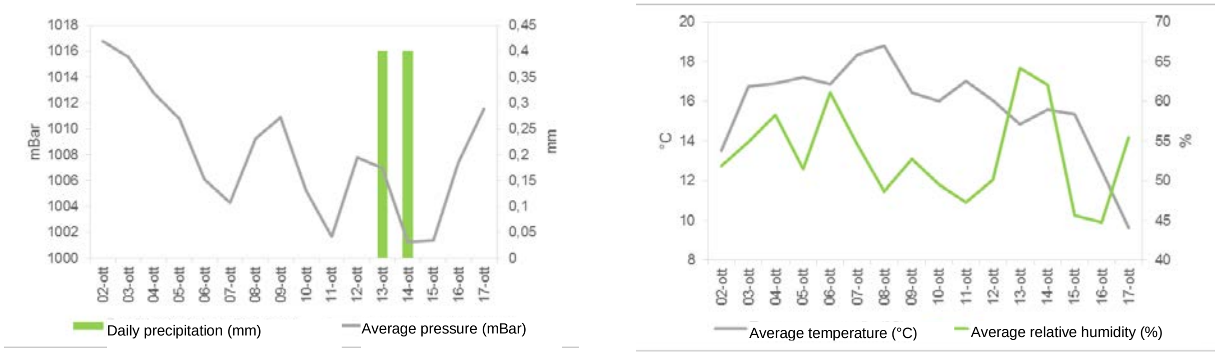


Figure 6.1.2-5. (a) Trends in atmospheric pressure superimposed on daily precipitation and (b) average daily trends in the temperature and humidity for the period surveyed (SOGIN NPVA01040, 2016)

The period surveyed was characterised by two days (13-14 October) with light rains associated with high values of relative humidity and variable conditions of atmospheric pressure. The average daily temperature values come within the average seasonal values and are between 9° and 19°C (Figure 6.1.2-5).

Air quality

As regards the state of air quality, the threshold limit values can be taken as reference for the concentrations regulated by Legislative Decree 13/08/2010 no. 155 in implementation of the "Directive 2008/50/EC concerning ambient air quality and for cleaner air in Europe". In accordance with this regulation, the Emilia Romagna Region, under the resolution of the regional Council no. 2001 of 27 December 2011, approved a new zoning of the territory:

- "Agglomerate" of Bologna;
- "Apennine" zone;
- "West Plain" zone;
- "East Plain" zone.

The Municipality of Caorso comes within the "West Plain" zone, characterised by an accumulation of pollutants in the surface layers of the atmosphere. This occurs especially in winter, characterised by a lack of sunlight, reduced thermal turbulence, low wind speed and a height of the mixed layer potentially lower than 200 metres. These conditions, accompanied by situations of no wind on a synoptic scale (high pressure and limited baric gradients) can lead to exceeding the limit values for short periods with durations from a few days to one or two weeks and simultaneously across the entire territory. The "West Plain" zone is characterised by the existence of levels above the upper assessment threshold, including for the following pollutants: NO_x, PM_{10}, $PM_{2.5}$.

6.1.2.3 *Water environment*

Surface waters

The main element in the area's hydrography is constituted by the River Po, which is a strongly characterising element of the territory in question; in this stretch, it runs in a roughly east-west direction and a meandering progress. The Caorso Power Station is located on the right bank of the Po, a little upstream from the barrier of Isola Serafini. The river, in the stretch between the sections of Piacenza and Cremona, receives the contributions of two minor subsidiaries on the right of the river, that is, the Torrente Nure and the Torrente Chiavenna, while, in the meander of Isola Serafini, on the left bank, the confluence with the River Adda is located.

The body of water receiving the discharges of the Power Station is the River Po, whose annual average capacity is around 770 m^3/s (SOGIN NPVA00585, 2013; SOGIN NPVA00772, 2014; SOGIN NPVA01040, 2016).

As regards the quality of the surface waters, the monitoring of ARPAE Emilia-Romagna in the four years 2010-2013 on the stretch of the River Po on which the Caorso Power Station lies, defines the class of the Ecological Stat class as “Sufficient” and the Chemical State as “Good”. The Torrente Chiavenna, on the other hand, is characterised by a "Poor” Ecological State and a “Good” Chemical State.

Finally, as regards the hydraulic danger of the area, this is linked to the fluvial dynamic of the River Po, which, in this stretch, follows a meandering course, with deposits on the riverbed and the formation of islands and barriers; in particular, a “valley” section is seen, around the artificial protection embankments, characterised by frequent episodes of flooding and fast morphological changes and a more external sector, of the low plain, flat and characterised by a dense network of artificial canals. As already mentioned, the site of the power station is located on an artificial rise constructed for hydraulic defence purposes.

In the Extract Plan for the Hydrogeological Structure of the Po Basin Authority, the northern sector of the Power Station lies within the River Band B (or *Flood Band*) which includes the part of the riverbed affected by flooding on the occurrence of the reference flood (flood with return time TR 200 years) while the southern part was contained in Band C (or *Area of flooding in catastrophic flood).*

The European Directive 2007/60/EC “Floods Directive”, enacted in Italy under Legislative Decree 49/2010, led to the updating of the maps regarding the danger and risk of flooding. In the new map, delivered on 23/12/2013 (*Flood Risk Management Plan* of the Emilia Romagna Region: “Map of the danger and potentially exposed elements” to a scale of 1:25,000 – Table 162SE Monticelli D’Ongina), the area of the Power Station comes with the danger band defined by a “P1-L hazard scenario (Little probability of flooding or extreme event scenarios)”.

<u>Hydrogeology notes</u>
From the hydrogeological point of view, the main stratigraphic horizons in the area in question can be, from top down, characterised as follows (SOGIN CAV0002, 2003);

- “horizon A” made up of materials with characteristics of low permeability;
- “horizon B”, made up of materials with average permeability, site of a semi-free to free layer;
- “horizon C”, which can be classified as semipermeable or impermeable;
- “horizon D”, made up of terrain housing a layer under pressure.

In this situation, two aquifers of major importance can be identified:

Surface aquifer – constituted by “Horizon B”. The underground circulation is mainly water-bearing although, in stretched, the overlying “horizon A” places the layer under local pressure; below, the layer is sustained by semipermeable or impermeable terrain that constitutes “Horizon C”.

Deep aquifer – “Horizon “D” houses a second layer contained between the impermeable horizon “C” and another continuous level of low permeability, lying at around 90 metres deep in the area of the plant. This is a layer under pressure, the piezometric level of which stands at a height of around 39 metres above mean sea level.

6.1.2.4 Biodiversity

The Caorso Power Station is located within an agricultural context with quite a well-developed surface hydrography, particularly due to the presence of the River Po and its tributary, the Torrente Chiavenna, as described in the previous paragraph. The meandering course followed by the River Po in this geographic section favours the occurrence of valuable ecological and naturalistic situations such as floodplains, oxbow lakes, "dead" branches and paleochannels, sandy soils and the respective aquatic ecosystems. The presence of these systems is a necessary condition for the duration of the degree of naturalness of the places, notwithstanding the fact that the evolution and the fluvial dynamic have been altered in various stretches by anthropic changes (embankment defence works, movement and extraction of inert materials, river crossing of roads, water channels, barriers etc.). The direct effect of the disturbing actions finally produced a consequent simplification of the natural aspects of the riparian ecosystems. In areas of a particular degree of unspoiled nature, it is possible to observe the communities developed in a transversal sense in defined ecological spaces, place one in close contact with the other according to a determined gradient, from the riverbed to the flood terraces. What is seen in some part of the course of the widely anthropised Po is the presence of fragmented communities, often colonised by very invasive species, which are a good indicator of the degradation of nature.

The hygrophilic and mesohygrophilic plant groups are made up of white Willow (*Salix alba* L.)*,* Black Poplar (*Populus nigra* L.) and White Poplar (*Populus alba* L.)*,* locally Black Alder (*Alnus glutinosa* (L.) Gaertn., 1790) and English Oak (*Quercus robur* L.) further away from the riverbed. Other plant communities are those linked to the wetlands in correspondence with the meandering stretch of the Po.

The wetlands are bordered by strips of helophytic vegetation (reeds and bulrushes, the presence of hydrophytes typical of lime water (potamenti, lamneti, trapeti, miriofilleti, etc.).

The extension of riparian woods along the river is reduced along the Po river bank. In the phytocoenosis dominated by poplars (such as *Populus alba* L. and *Populus nigra* L.) and willows (*Salix* spp.), in addition to edifice tree species, also hygrophilic trees and shrubs like Black Alder (*Alnus glutinosa* (L.) Gaertn., 1790), or shrub willows (*Salix caprea* L.) are found, in addition to characteristic herbaceous species.

The meandering course of the river favours the occurrence of ecological situations that encourage the establishment of the typical fauna of wetland, both resident and migratory of conservation interest.

A naturalistic emergency is the Isola De Pinedo which forms the fluvial domain of the Po in the Province of Piacenza that is most important for birds of passage and wintering flocks, in addition to the high concentration of rare aquatic nests, in marked decline at the national and European level (Province of Piacenza, 2008[41]). The area is of significant interest also for the regular wintering of migratory birds linked to the wetlands: Great crested grebe (*Podiceps cristatus* (Linnaeus, 1758)), Eared grebe (*Podiceps nigricollis* C. L. Brehm, 1831), Common grebe (*Tachybaptus ruficollis* (Pallas, 1764))**,** Common cormorant (*Phalacrocorax carbo* (Linnaeus, 1758)), Grey heron (*Ardea cinerea* Linnaeus, 1758), Night Heron (*Nycticorax nycticorax* (Linnaeus, 1758)), Mute swan (*Cygnus olor* (J. F. Gmelin, 1789)), Widgeon (*Anas penelope* Linnaeus, 1758), Mallard (*Anas platyrhynchos* Linnaeus, 1758), Dun bird (*Aythya ferina* (Linnaeus, 1758))*,* Common pintail (*Anas acuta* Linnaeus, 1758), Red-crested pochard (*Netta rufina*, (Pallas, 1773)), Swallow-tailed duck (*Clangula hyemalis* (Linnaeus, 1758)), Whistler (*Bucephala clangula* (Linnaeus, 1758)), Smew (*Mergellus albellus* (Linnaeus, 1758)), Red-breasted merganser (*Mergus serrator* Linnaeus, 1758), Water rail (*Rallus aquaticus* Linnaeus, 1758), Moorhen (*Gallinula chloropus* (Linnaeus, 1758)), Common coot (*Fulica atra* Linnaeus, 1758), Woodcock (Scolopax rusticola Linnaeus, 1758), Snipe (Gallinago gallinago (Linnaeus, 1758)), Black-headed gull (*Larus ridibundus,* (Linneus 1766)). Cormorant dormitories were also found. Among wintering birds, they are as many as 12 species of priority conservation interest: Bittern (*Botaurus stellaris* (Linnaeus, 1758)), Great white heron (*Ardea alba* Linnaeus, 1758), Spoonbill duck (*Anas clypeata*, Linnaeus, 1758), Teal (*Anas crecca* Linnaeus, 1758)*,* Gadwall (*Anas strepera* (Linnaeus, 1758)), Tufted duck (*Aythya fuligula* (Linnaeus, 1758)), Ferruginous

[41] Province of Piacenza, 2008 – *Wildlife Hunting Plan of the Province of Piacenza,* approved by resolution of the Provincial Council no. 29 of 31.03.2008

duck (*Aythya nyroca* (Güldenstädt, 1770)), Marsh harrier (*Circus aeruginosus* (Linnaeus, 1758)), Peregine falcon (*Falco peregrinus* Tunstall, 1771), Dwarf heron *(Egretta garzetta* (Linnaeus, 1766)), Hen harrier (*Circus cyaneus* (Linnaeus, 1766)), Kingfisher (*Alcedo atthis* (Linnaeus, 1758)) (Provincia di Piacenza, *l.c.*). Among the most interesting mammals that visit the reed-bed, there is the harvest mouse (*Micromys minutus* Pallas, 1771) and in the flood plain woods and along the firmly structured hedges, the Doormous (*Muscardinus avellanarius* Linnaeus, 1758).

The aforementioned areas are important parts of the local ecological network: in particular, the River Po, in addition to forming an ecological corridor for these species, also represents an important reservoir of biodiversity in an extremely anthropised territory.

The expression of this wealth of biodiversity is also shown in the number of areas subject to various protection regimes in which the Power Station lies. Figure 6.1.2-6 gives the complete list of protected areas with their respective distances from the plant, the total area and percentage cover of the area coming within the sphere of influence surveyed.

TYPE	**CODE**	**NATURE 2000 SITES/PROTECTED AREAS**	**Approximate minimum distance from the infrastructure (km)**	**Total area (hectares)**	**Approximate coverage within the area of influence (%)**
ZPS	IT2090503	Castelnuovo Bocca d'Adda	0.6	165	81
SIC/ZPS	IT4010018	River Po from Rio Boriacco to Bosco Ospizio	Infrastructure lying inside	6,156	12
IBA	IBA199	River Po from Ticino to Isola Boscone	Infrastructure lying inside	15,339	6
IPA	EMR 13	River Po between Piacenza and Cremona	Infrastructure lying inside	4,049	19
Geosite area	3777	Meanders of the Po between Piacenza and Isola Serafini	Infrastructure lying inside	1,974.3	31

Figure 6.1.2-6: List of Nature 2000 Sites, protected areas and IBA in the sphere of influence of Caorso Power Station

From the consultation of the standard Model of the aforementioned Nature Sites[42], it is clear the number of habitats (Attachment I Dir. Habitat) and the Directive species (Field 3.2) and of conservation interest (Field 3.3) listed therein, as indicated in figure 6.1.2-7. The list of the habitats and species is given in Attachment 4 to this Environmental Report.

TYPE	**Code**	**Name**	**Number of community habitats (Att. I 92/43/EC)**	**Number of plant species (Field 3.2)**	**Number of animal species (Field 3.2)**	**Number of plant species (Field 3.3)**	**Number of animal species (Field 3.3)**
ZPS	IT2090503	Castelnuovo Bocca d'Adda	4	-	105	15	32
SIC/ZPS	IT4010018	River Po from Rio Boriacco to Bosco Ospizio	6	1	92	8	10

Table 6.1.2-7: Number of community fauna species habitats in the of Nature 2000 Sites Network

[42] Database of the Ministry of the Environment and the Protection of the Territory and the Sea, on the page "Cards and maps". Website ftp://ftp.minambiente.it/PNM/Natura2000/TrasmissioneCE_2015/

6.1.2.5 Ionising radiation

Release conditions

The current discharge limits were authorised by Ministerial Decree MISE of 10 February 2014 approving the Application for deactivation of the Caorso Power Station.

Gaseous effluents:

The discharge formula expressed in equivalent activity of Co-60 released into the soil is equal to:

$$A_{eq} = \sum_i (A_{io} \cdot F_i) + 0,625\,(A_{i60} \cdot F_i) < 7.62E + 10\ Bq_{eq}$$

Liquid effluents:

The discharge formula expressed in equivalent activity of Co-60 released into the soil is equal to:

$$A_{eq} = \sum_i (A_{i0} \cdot F_i) \leq 9,67E + 11Bq_{eq}$$

Monitoring of radioactive waste

The figures below report the quantity of radioactivity discharged annually through liquid and gaseous effluents, as well as the percentage use of the maximum authorised limit [43] (%FdS) for Caorso Power Station regarding the three years 2013-2015[44].

Caorso Power Station – liquid discharges – Annual activity [Bq]			
Year	**2013**	**2014**	**2015**
Co-60	9.61E+05	1.30E+07	8.55E+06
Sb-125	-	-	2.29E+06
Cs-137	2.52E+06	2.56E+07	1.44E+07
Sr-90	1.37E+03	1.91E+04	1.83E+04
H-3	1.79E+07	4.43E+08	3.33E+08
Fe-55	-	-	3.02E+04
Ni-59	-	-	4.66E+06
Ni-63	-	-	1.64E+07
Alpha total	-	-	8.89E+04
Beta total	-	-	4.10E+07
Total activity [Bq]	**2.14E+07**	**4.81E+08**	**4.20E+08**
%FdS	**6.98E-04**	**7.23E-03**	**3.71E-03**

Figure 6.1.2-8: Annual activity and use of discharge formula of discharged radioactive liquid effluents (2013-2015)

[43] Starting from 2015, the radioactive discharges are calculated using the discharge formulae updated as part of the Deactivation Application. Moreover, with the authorisation of the decommissioning activities, the total radioactivity discharged with gaseous effluence is exclusively attributed to the particulates component, noble gases making no contribution.

[44] Sogin doc. CA CH 00071, rev. 00 Report on the state of radioactivity in the environment surrounding the Nuclear Power Station of Caorso (year 2013).
Sogin doc. CA CH 00072, rev. 00 Report on the state of radioactivity in the environment surrounding the Nuclear Power Station of Caorso (year 2014).
Sogin doc. CA CH 00099, rev. 00 Report on the state of radioactivity in the environment surrounding the Nuclear Power Station of Caorso (year 2015).

Caorso Power Station – gaseous discharges – Annual activity [Bq]			
Year	**2013**	**2014**	**2015**
Co-60	2.58E+05	1.54E+05	1.15E+04
Cs-137	3.58E+03	-	-
Sb-125	-	-	-
Sr-90	4.50E+03	1.57E+03	4.97E+03
H-3	1.85E+08	2.70E+08	3.98E+08
Fe-55	-	-	5.99E+03
Ni-59	-	-	-
Ni-63	-	-	3.14E+04
Alpha total	-	-	8.49E+04
Beta total	-	-	3.58E+06
Total activity [Bq]	**1.85E+08**	**2.70E+08**	**4.02E+08**
%FdS	**9.25E-03**	**8.17E-03**	**1.92E-02**

Figure 6.1.2-9: Annual activity and use of discharge formula of discharged radioactive gaseous effluents (2013-2015)

Monitoring of environmental radioactivity

The following figures report the average concentrations of activity concerning the three years 2013-2015[45] of the main radionuclides in the most significant matrices analysed as part of the environmental surveillance of the Caorso site.

Concentration of average annual activity – LAND [Bq/kg]			
	2013	**2014**	**2015**
Caesium-137	1.07E+01	8.20E+00	5.49E+00

Figure 6.1.2-10: Concentrations of activity in the land matrix [Bq/kg] – Caorso Power Station

Concentration of average annual activity—RIVER WATER [Bq/1]			
	2013	**2014**	**2015**
Cesium-137	2.97E-04	6.01E-04	3.49E-04
Cobalt-60	3.00E-04	2.06E-04	2.08E-04

Figure 6.1.2-11: Concentrations of activity in the river water matrix [Bq/l] – Caorso Power Station

Concentration of average annual activity - DRINKING WATER [Bq/l]			
	2013	**2014**	**2015**
Strontium-90	3.47E-03	3.72E-03	4.53E-03

Figure 6.1.2-12: Concentrations of activity in the well water matrix [Bq/l] – Caorso Power Station

Concentration of average annual activity—MILK [Bq/l]			
	2013	**2014**	**2015**
Strontium-90	4.78E-02	1.05E-02	2.10E-02

Figure 6.1.2-13: Concentrations of activity in the milk matrix [Bq/kg] – Caorso Power Station

Concentration of average annual activity – LEAFY VEGETABLES [Bq/kg]			
	2013	**2014**	**2015**
Strontium-90	4.16E-02	1.53E-02	5.24E-02

Figure 2.1.2-14: Concentrations of activity in the leafy plant matrix [Bq/kg] – Caorso Power Station

Equivalent dose rate in air (gamma dose)

The intensity of the average equivalent dose in the year is equal to 0,080 µSv/h, no significance is found between the various exposure points. The values oscillate within the usual fluctuations of the environmental background radiation.

6.1.2.6 Landscape

The landscape that characterises the surroundings of the Power Station is made up of the Piacenza plain, featuring the historic agrarian division in lots and the spread of mixed cultivation, as well as the features due to the hydraulic reclamations works. The main settlements, basically of Roman origin, like along two main roads: the S.S. 9 – Via Emilia and the S.S. 10 – "Lower Po", which runs along the banks of the Po. Another of the typical features in the area around the Caorso plant but outside the sphere of influence is the confluence of the River Adda in Po where, for some time, the hydroelectric plant of Isola Serafini plant.

The main urban centres closest to the plant, in addition to Caorso, are Caselle Landi, Meleti and Castelnuovo Bocca d'Adda.

The Caorso Power Station, introduced as a technological element in the territory since the end of the nineteen seventies, is a condition of itself, both in its use and forms. Due to its position, the Power Station does not appear to represent a factor of particular visual intrusion.

[45] See previous note.

Figure 6.1.2-15 shows the location of the viewpoints for monitoring by means of photographic survey campaigns planned by the operator (SOGIN) as part of the implementation of the decommissioning strategy of the plants belonging to the energy sector.

Figure 6.1.2-15: Location of the monitoring stations

Constraints

- **Details of ministerial or regional disposition of significant public interest of the constraint on properties or areas declared to be of significant public interest (article 136 – 141 – 157 Legislative Decree no. 42/2004)**

The PTCP of Piacenza identifies an area of the “Protected vegetation siting zone", in accordance with Article 6 of Regional Law 2/77 and implemented through Regional Council Presidential Decree no. 966 of 30.11.1994, which protects "living tree specimens" in the De Pinedo - Zerbio district , as outlined by the Caorso Municipal Structural Plan (Figure 6.1.2-16)

- **Legally protected areas (article 142 of Legislative Decree no. 42/2004)**

In table PSC.V.10 – Chart of Historic, Landscape and Environment Constraints and Protections (Figure 6.1.2-16) of the Municipal Structure Plan adopted by the Municipality of Caorso, the area of the Power Station is included in the 150 m buffer zone from rivers and streams.

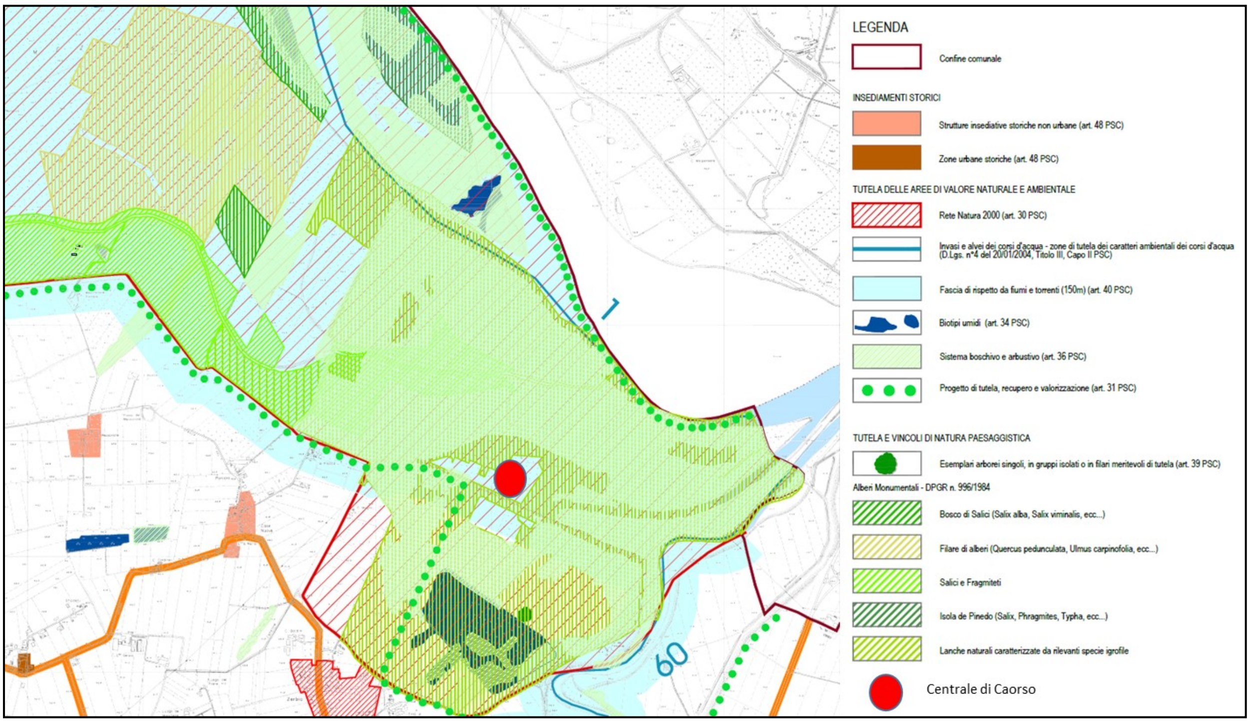


Figure 6.1.2-16: Extract from Table PSC.V.10 – Chart of Historic, Landscape and Environment Constraints and Protections

6.1.3 Latina Power Station

6.1.3.1 Territorial framework

The site is located in the municipal territory of Latina around 1 km from the coastal zone of Foce Verde and 1.5 km to the west of the district of Borgo Sabotino (Figure 6.1.3-1).

The significant roads close to the site are mainly: the provincial road "Alta" (SP42), adjacent to the provincial road "Borgo Sabotino-Fogliano" (SP50) and bordered by the northern edge of the power station; the provincial road "Ninfina II" (SP18) along the western edge; the provincial road "Lungomare Pontino" (SP39), around 530 m south of the site and the provincial road "Borgo Piave-Foce Verde" (SP40), around 600 m to the east.

Figure 6.1.3-1: In red, the area where the Latina power station is located (De Agostini road database, resolution 1:250,000)

The Latina Power Station stands in an area owned by SOGIN S.p.A, a flat altimetric profile at heights between 6 and 7 metres above mean sea level, bordered to the east by the Acque Alte canal.

As regards the area's seismicity and the danger associated with it for the Lazio Region, reference can be made to the *New Seismic Classification of the territory of the Lazio Region* (Regional Council Decree 387/09 and subsequent amendments and supplements) that amends the national classification, defining an *Seismic Administrative Unit* extending to municipalities and establishing certain subzones: the territory of the Municipality of Latina, which includes the Borgo Sabotino area, is part of seismic zone 3, subzone A (3A).

Anthropic aspects

The Pontine area, formerly the site of extensive wetlands and marches, was subject in the middle of the last century to huge hydraulic engineering works as part of the project of the "Integral reclamation of Agro Pontino". The marshy coastal plan was involved in the creation of a dense network of canals, both by regulation through drainage and channelling of the surface water, and by irrigation. This led to the transformation of the area in a fertile agricultural plain, strongly characterised by a regular system of reclamation canals, sometimes lined with trees.

The area surround the Power Station is mainly used for agriculture and the crops mainly cultivated are: fodder, cereals (especially wheat and corn), leafy plants, fruit and vegetables grown in greenhouses. Regarding the livestock division, the most common breeding around the site is of rabbits and cows but also a certain amount of sheep and goats and large poultry and pig farms. Family-run farms remain numerous and widespread throughout the territory. In addition to fixed farming, there is a significant amount of buffalo herds with beasts in the wild state.

In the Latina area, the protected origin supply chains that could be developed based on the regulations of the individual products are: Pecorino Romano, Ricotta Romana, Mozzarella di Bufala Campana, Ricotta di Bufala Campana, Salamini italiani alla cacciatora, Colline Pontine olive oil and "Aprilia" wine. Among the protected geographical indication products, the supply chains that could be developed are: Abbacchio Romano, Agnello del Centro Italia, Mortadella of Bologna, Kiwi of Latina and "Lazio" wine. In particular, farms were found involved in the supply chain for Abbacchio Romano IGP in the Borgo Sabotino district.

The closest territory to the Power Station is characterised by little centres (Borgo Sabotino, Borgo Isonzo, Borgo Piave, Borgo Montello and Fogliano), characterised by a limited residential presence in winter and inhabited in the summer. The area includes the so-called Marina di Latina, which extends from the Via del Lido to Foce Verde; in this area, the urbanised band overlooks the beach that, in summer, houses the bathing facilities.

The area of Borgo Sabotino-Foce Verde, where the Power Station is located, is a district of the Municipality of Latina with around 2,045 residents; referring to the data of the ISTAT census of 2011, 117,892 people live in the Municipality of Latina; the employment rate is 42.44%. As regards the census of industry and services in the Municipality of Latina, there are 10,683 businesses employing 33,209 employees.

6.1.3.2 Atmosphere

The site is characterised by a Mediterranean type climate belonging to the temperate climate with dry summers and generally mild, rainy winters (Ente Parco Nazionale del Circeo, 2011).

The thermal trend is characterised by wide temperature ranges between summer and winter. Specifically, from the analyses of data recorded in recent years[46]:

- average annual temperature between 14.3° and 16.3°C;
- minimum average temperature in the coldest months between 0.2% and 6.8°C;
- minimum average temperature in the hottest months between 28.3° and 33.9°C;
- annual average temperature range > 25°C.

Generally, the climate of the Pontine area is quite variable and is particularly affected by the proximity of the mountainous zones (Monti Lepini and Ausoni) and the coast; this causes a particular distribution of the anemological currents with the prevalence of south-easterly winds over northerlies, as well as the mitigating influence of the sea.

The pluviometric regime in the southern Lazio area is characterised by heavy rainfall in correspondence with the mountain heights of Monti Lepini and Ausoni, where the total annual precipitation fluctuates around 1,000 mm. Continuing towards the coast, this value gradually diminishes, stabilising on variable annual rainfall totals around 800-600 mm, with most rainfall at the end of autumn while the summer period has a high percentage of drought (SOGIN NP VA 0191, 2009).

As regards atmospheric turbulence, on the basis of the Pasquill –Gifford classification (Pasquill, 1961; Gifford, 1961), the frequency of these categories varies during the year, especially for the instable categories that display the maximum value during the summer period. The stable category D displays the greatest percentage of frequency during the whole year, oscillating between 40 and 60% with maximums in winter and autumn.

For more detail, refer to the data collected in the course of 2015 from a control unit installed a short distance from the Power Station: the thermal profile of the year displays maximum temperatures that reached values up to 27°C in the summer period with values between 9 and 14 °C for the winter months. This profile is in line with the typical local climate (SOGIN NPVA00732, 2013).

During 2015, the hygrometric profile displays values in line with the local climate. The autumn/winter months were, on average, characterised by high pressure conditions that favour the accumulation of pollutants. The month of October saw the most rainfall. In figure 6.1.3-2, the average monthly values are given of the weather and climatic parameters monitored.

As regards the anemological regime, in 2015, wind was registered with a direction of origin uniformly distributed across almost all sectors with the exception of the NE-SE quadrant with averages speeds between 1.5 and 5 m/s and around 33% of calm wind (Figure 6.1.3-2).

[46] Data referring to the UCEA-RAN "S.Michele", in the period 1995-2015, www.scia.isprambiente.it

	Acc. rain	Average UR	Average T	Average pressure	RAD SOL TOTAL media
month	mm	%	°C	mbar	W/m^2
jan-15	3.9	77.0	9.1	1017.2	60.7
feb-15	8.0	74.7	9.2	1011.6	101.4
mar-15	4.2	71.2	12.0	1016.0	146.5
apr-15	2.5	39.7	14.5	1018.8	218.6
may-15	0.0	55.8	19.2	1015.0	266.5
jun-15	1.0	71.6	23.2	1016.3	275.5
jul-15	0.5	76.4	27.6	1014.4	286.7
aug-15	0	41.1	27.3	1016.1	263.1
sep-15	2.1	20.8	22.8	1014.7	179.3
oct-15	11.2	5.2	18.2	1014.9	101
nov-15	1.9	61.7	14	1019.7	83.4
dec-15	0.2	81.5	10.1	1030.5	59.8

Figure 6.1.3-2: Trend of meteorological parameters in 2015

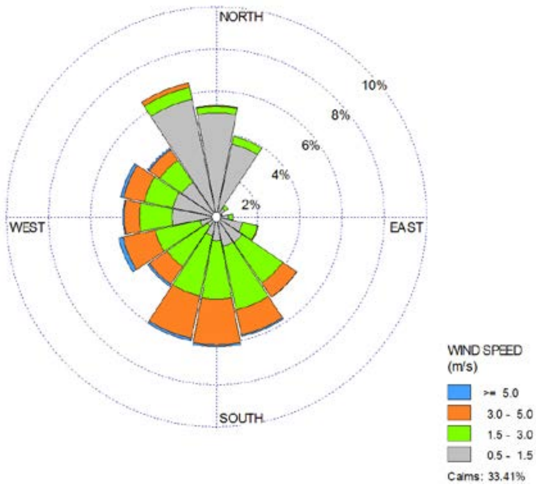


Figure 6.1.3-3: Annual wind rose 2015 (SOGIN NPVA00732, 2013)

Air quality

As regards the state of air quality, the threshold limit values can be taken as reference for the concentrations regulated by Legislative Decree 13/08/2010 no. 155 in implementation of the “Directive 2008/50/EC concerning ambient air quality and for cleaner air in Europe”. In accordance with these regulations, the Lazio Region, under the Regional Council Resolution no. 217 of 18/05/2012 approved the following zoning of the territory:

- Rome Agglomerate Zone
- Zone 1: Appennine Zone
- Zone 2: Valle del Sacco Zone
- Zone 3: Coastal Zone

The Latina Power Station lies in the "Coastal Zone" and is characterized as follows:

- nitrogen dioxide values are above the upper assessment threshold of the annual limit;
- PM_{10} values above the upper assessment threshold of the daily average limit value;
- $PM_{2.5}$ values above the upper assessment threshold with reference to the annual average limit value;
- ozone value above the long-term objective.

6.1.3.3 Water environment

Surface waters

The Pontine hydrographic system is made up both of natural watercourses that run down the southern slopes of the Albani Hills and the western slopes of Monte Lepini and Monte Ausoni, and artificial collector canals or deriving from the channelling natural watercourses. The site of the Power Station is located between two watercourse that flow directly into the Tyrrhenian Sea: to the west, the River Astura, the only natural watercourse of a substantial size near the site, to the east, the Acque Alte Canal, also called the Moscarello Canal.

The body of water receiving the discharges of the Power Station is the Acque Alte Canal, the stream discharge near to the Power Station, according to a study conducted by the Province of Latina in 2014, is equal to 0.81 m^3/s.

As regards the qualitative state of surface waters, the Lazio Regional Water Protection Plan (LRWPP) conducted its only classification of the Ecological State (SECA) for the stations distributed across the territory without assessment the environmental state (SACA). Based on this assessment, the Ecological State of the Acque Alte Canal in the year 2003 was "Very Bad".

ARPA Lazio updated the indices for the assessment of the qualitative state of the significant bodies of water and published ecological and chemical indices (but not the classification) of the Acque Alte Canal for the three years 2011-2103, given in the following table.

2011-2013 INDICES	**ACQUE ALTE CANAL**
LIMeco	Poor
Diatoms	Poor
Macrophytes	
Macroinvertebrates	Poor
Chemical	No excess

As regards the hydraulic danger associated with the area in question, the Power Station is not included in any of the perimeters linked to flood risk referred to in the "Transition plan for defence against the hydrogeological risk" of the Lazio Regional Basins Authority.

Hydrogeology notes

The rather complex hydrogeological structure of the Pontine plain is characterised by the presence, from the top down, of an unconfined aquifer near the surface, multiple confined and semi-confined aquifers of limited extent at greater depth and, at the base, the regional carbonate aquifer, fed by the circulation of water from M. Lepini (Boni et al., 1980).

In the area studied, there is a pleistocene-holocene sand dune complex, made up of ancient and recent sand dunes, deposits between the dunes, recent beach deposits and delta dunes. The complex may contain a significant underground water circulation that gives rise to a continuous and extended layer.
In the area of the Power Station, the layer is the water-bearing type, mainly in the north-west/south-east direction towards the sea and towards the Acque Alte Canal, and piezometrical surface of around 2-3 m from ground level (Capelli *et al.*, 2012].

6.1.3.4 *Biodiversity*

The landscape of vegetation of the area surround the Power Station corresponds to that typically found on flood plains close to the sea that have undergone reclamation. Along the coast, there are formations in and behind the dunes. Among the various types of vegetation, the artificial grass and shrubs, artificial woods and meadows stand out for breadth and extension. The area displays anthropic determinism with uniform agricultural areas alternating with scattered residential centres within which is the hydrographical network that, with its watercourses, constitutes one of the few elements of connection to the local ecology. An important ecological element is the SIC IT6030049 Wetlands west of the River Astura, which forms an important element of ecological connection close to the coast of Torre Astura.

Among the species of fauna, attention is drawn to the black kite (Milvus migrans (Boddaert, 1783)), which, while tolerating a high level of anthropic disturbance, is threatened by the transformation of suitable environments. Among the nesting species are the European roller (*Coracias garrulus* Linnaeus, 1758), the lesser spotted woodpecker (*Dendrocopos minor* (Linnaeus, 1758)).

Among the species of amphibians, the common toad (*Bufo bufo* (Linnaeus, 1758)) is present in cultivated areas and environments linked to water, as is the Italian tree frog (*Hyla intermedia* Boulenger, 1882) in wet environments.

In the areas to the west of the River Astura, attention is drawn to the south European roach (*Rutilus rubilio* (Bonaparte, 1837)), a fresh water fish with reasonable ecological value (Attachment II of the Habitat Directive). The species of avifauna include the little bittern (*Ixobrychus minutus* (Linnaeus, 1766)), night heron (*Nycticorax nycticorax* (Linnaeus, 1758)), the black-winged stilt (*Himantopus himantopus* (Linnaeus, 1758)), the little ringed plover (*Charadrius dubius* Scopoli, 1786) and the marsh harrier (*Circus aeruginosus* (Linnaeus, 1758)).

The complete list is given below of protected areas with their respective distances from the Power Station, the total area and percentage cover of the area coming with the sphere of influence surveyed.

TYPE	CODE	NATURA 2000 SITES/PROTECTED AREAS	Approximate minimum distance from the infrastructure (km)	Total area (hectares)	Approximate coverage falling within the sphere of influence (%)
SIC	IT6000011	Stretches between Torre Astura and Capo Portiere	1.6	2,130	16
SIC	IT6030049	Wetlands west of the River Astura	2.4	28	46
IPA	LAZ 5	Fogliano Wood and Torre Astura	2.4	2,136	1

Figure 6.1.3-4: List of Natura 2000 Sites, protected areas and IBA in the sphere of influence of Latina Power Station

From the consultation of the standard model of the aforementioned Natura 2000 Sites[47], the number of habitats (Attachment I Dir. Habitat) and species of the Directive (Field 3.2) and of conservation interest (Field 3.3) recorded within them, can be obtained, as indicated in the following table. The list of habitats and species is given in Attachment 4 to this Environmental Report.

TYPE	Code	Name	Number of community habitats (Att. I 92/43/EC)	Number of plant species (Field 3.2)	Number of animal species (Field 3.2)	Number of plant species (Field 3.3)	Number of animal species (Field 3.3)
SIC	IT6000011	Stretches between Torre Astura and Capo Portiere					
SIC	IT6030049	Wetlands west of the River Astura	3	-	-	1	1

Figure 6.1.3-5: Number of community fauna species habitats in the Sites of Natura 2000 Network

6.1.3.5 Ionising radiations

Release conditions

The current discharge limits were authorised as part of the release of the operating licence with the decree of the Ministry of Industry, Commerce and Crafts VII – 305 of 13 April 1991 and are such as to guarantee respect for the condition of radiological non-significance in terms of effective dose to the population group of reference (E < 10 µSv/year).

Gaseous effluents:

$$\frac{(\beta,\gamma)}{0.1} \leq 3.7 \cdot 10^{10}\, Bq / a$$

Where:

- (β/γ) represents the activity (Bq) of the (β/γ) emitters expressed in terms of equivalent ^{60}Co.

[47] Database of the Ministry of the Environment and the Protection of the Territory and the Sea, on the page "Cards and maps". Website ftp://ftp.minambiente.it/PNM/Natura2000/TrasmissioneCE_2015/

Liquid effluents:

$$\frac{^{3}H}{5000}+\frac{^{90}Sr}{10}+\frac{^{137}Cs+^{134}Cs}{20}+\frac{(\beta,\gamma)}{3}+\frac{\beta}{100}+\frac{\alpha}{0.1}\leq\begin{cases}3.7\cdot10^{10}Bq/a\\1.85\cdot10^{10}Bq/13\ weeks\\3.7\cdot10^{9}Bq/24\ hours\end{cases}$$

Where:

- ^{3}H is the activity (Bq) of tritium;
- ^{137}Cs and ^{134}Cs respectively represent the activities (Bq) of ^{137}Cs and ^{134}Cs respectively;
- β is the total activity (Bq) of the β emitters expressed in terms of equivalent ^{45}Ca;
- (β/γ) represents the total activity (Bq) of the (β/γ) emitters expressed in terms of equivalent ^{54}Mn;
- α represents the activity (Bq) of the α emitters expressed in terms of equivalent ^{239}Pu.

Monitoring of radioactive discharges

The figures below report the quantity of radioactivity discharged annually through liquid and gaseous effluents, as well as the percentage use of the maximum authorised limit [48] (%FdS) for Latina Power Station regarding the three years 2013-2015[49].

Latina Power Station – liquid discharges – Annual activity [Bq]			
Year	**2013**	**2014**	**2015**
H-3	7.20E+06	2.01E+07	1.74E+07
β/g	8.51E+05	5.25E+07	4.97E+06
Sr-90	1.77E+07	1.37E+09	8.40E+08
Cs-137	2.53E+07	1.07E+09	6.48E+06
Pu-239	1.88E+07	6.38E+08	5.11E+08
Beta	-	-	1.66E+07
Total activities [Bq]	**6.99E+07**	**3.15E+09**	**1.40E+09**
%FdS	**5.21E-01**	**1.80E+01**	**1.44E+04**

Figure 6.1.3-6: Annual activity and use of discharge formula of discharged radioactive liquid effluents (2013-2015)

Latina Power Station – gaseous discharges – Annual activity [Bq]			
Year	**2013**	**2014**	**2015**
Co-60	2.40E+02	2.80E+03	8.25E+03
Cs-137 (as Co-60 eq,)	5.09E+03	3.92E+05	9.87E+04
Alpha total (as Co-60 eq,)	-	3.42E+06	9.85E+05
Beta total (as Co-60 eq,)	-	2.01E+05	1.25E+04
Total activity [Bq]	**5.33E+03**	**4.02E+06**	**1.10E+06**
Total activity (as Co-60 eq,) [Bq]	**4.05E+03**	**4.01E+06**	**1.10E+06**
%FdS	**1.00E-02**	**1.10E-01**	**1.00E-01**

Figure 6.1.3-7: Annual activity and use of discharge formula of discharged radioactive gaseous effluents (2013-2015)

48 Starting from 2015, the radioactive discharges are calculated using the discharge formulae updated as part of the Deactivation Application. Moreover, with the authorisation of the decommissioning, the total radioactivity discharged with gaseous effluence is exclusively attributed to the particulates component, noble gases making no contribution.

49 Sogin doc. LT RS 00373, rev. 00 Report on the state of radioactivity in the environment surrounding the Latina Power Station (year 2013).
Sogin doc. LT RS 00526, rev. 00 Report on the state of radioactivity in the environment surrounding the Latina Power Station (year 2014).
Sogin doc. LT RS 00681, rev. 00 Report on the state of radioactivity in the environment surrounding the Latina Power Station (year 2015).

Monitoring of environmental radioactivity

The following figures report the average concentrations of activity concerning the three years 2013-2015 of the main radionuclides in the most significant matrices analysed as part of the environmental surveillance of the Latina site[50].

Concentration of average annual activity—SEA WATER [Bq/l]			
	2013	**2014**	**2015**
Caesium-137	1.52E-03	1.55E-03	1.76E-02
Strontium-90	1.02E-02	1.36E-02	1.15E-02

Figure 6.1.3-8: Concentrations of activity in the sea water matrix [Bq/l] – Latina Power Station

Concentration of average annual activity – ACQUE ALTE CANAL SEDIEMENTS [Bq7kg]			
	2013	**2014**	**2015**
Caesium-137	9.58E-01	2.31E+00	4.50E+00

Figure 6.1.3-9: Concentrations of activity in the Alte Acque canal sediments matrix [Bq/l] – Latina Power Station

Concentration of average annual activity—GROUNDWATER[51] [Bq/l]			
	2013	**2014**	**2015**
Caesium-137	3.20E-02	3.20E-02	3.20E-02
Tritium	1.40E+00	1.40E+00	5.50E+00

Figure 6.1.3-10: Concentrations of activity in the groundwater matrix [Bq/l] – Latina Power Station

Concentration of average annual activity—MILK [Bq/l]			
	2013	**2014**	**2015**
Strontium-90	2.78E-01	1.92E-01	3.00E-02

Figure 6.1.3-11: Concentrations of activity in the milk matrix [Bq/kg] – Latina Power Station

Concentration of average annual activity – LEAFY VEGETABLES [Bq/kg]			
	2013	**2014**	**2015**
Strontium-90	3.00E-02	3.10E-02	9.50E-02

Figure 6.1.3-12: Concentrations of activity in the leafy plant matrix [Bq/kg] – Latina Power Station

[50] See previous note.

[51] The samples of groundwater were taken from wells outside the Power Station area.

Equivalent dose rate in air (gamma dose)

The intensity of the average equivalent dose in the year is equal to 0,20 µSv/h, no significance is found between the various exposure points. The values oscillate within the usual fluctuations of the environmental background radiation.

6.1.4 Garigliano Power Station

6.1.4.1 Territorial framework

The Garigliano Power Station, close to the regional border between Lazio and Campania, lies within the Municipality of Sessa Aurunca in the Province of Caserta at around 7 km from the sea.

With regard to the main roads, it is located near the Via Appia (SS7), around 1.9 km to the south, the provincial road "Campo Felice" (SP115), around 2.5 km to the south and the "Valle del Garigliano" (SS430) state road, 1.5 km to the east of the site (Figure 6.1.4-1).

Figure 6.1.4-1: In red, the area where the Garigliano power station is located (De Agostini road database, resolution 1:250,000)

The area occupied by the Power Station is located on the left bank of the River Garigliano, within the flood plain, in the loop between two meanders; the area is flat, with a slight slope towards the coastline around 7 km to the south-west.

As regards the area's seismicity and the dangers associated with it, the Campania Region has adopted the seismic classification of the national territory (Order of the President of the Council of Ministers no. 3274 of 20 March 2003), which places the Municipality of Sessa Aurunca in seismic zone 2.

Anthropic aspects

In the past, this vast area was covered with malarial marshes, as the many place names in the area attest: "Il Pantano", "Panzanella", "Pantaniello", variations of the word "quagmire". The reclamation works, completed in the post-war years, allowed the resumption of the agricultural activities of the Plain, once only used for rearing buffalo. The production of typical dairy products is very widespread at the artisan level in the numerous farms scattered across the territory.

In the area surrounding the plant, the cultivation of wheat, once widespread, is being replaced by fruit and vegetables, also following the arrival of processing industries of the traditional agricultural produce in Sessa Aurunca and Cellole. In addition, there are vineyards and olive groves, both on the Plain and the slopes of Roccamonfina. The livestock sector mainly involves breeding, especially buffalo, and the associated dairy products.

In the Sessa Aurunca area, the protected origin supply chains that could be developed based on the regulations of the individual products are: Caciocavallo Silano, Mozzarella di Bufala Campana, Ricotta di Bufala Campana, Terre Aurunche olive oil and the wine "Falerno del Massico". Among the protected geographical indication products in the municipality are: Melannurca Campana and the "Campania" and "Roccamonfina" wines.

The area of Garigliano is part of the Municipality of Sessa Aurunca, which has around 22,216 inhabitants, according to the ISTAT census data of 2011; the employment rate is 32.67%. As regards the census of industry and services in the Municipality, there are 10,683 businesses employing 33,209 employees.

6.1.4.2 Atmosphere

Campania displays remarkable differences in the meteorological conditions found along the coast and those typical of more inland zones. The Garigliano Power Station lies in the coastal zone that, protected by the icy northern words, is characterised by a mild climate with temperatures that rarely go below -6 °C thanks to the influence of the sea.

The thermal trend is characterised by wide temperature ranges between the summer and winter. In particular, from the analysis of the data recorded[52]:

- average annual temperature between 14 and 16.3°C;
- average minimum temperature in the coldest months between 0.8% and 6.2°C;
- average maximum temperature in the hottest months between 26.5° and 31.5°C;
- average annual temperature range > 20°C.

The pluviometrical regime along the coast is characterised by average quantities of precipitation at around 1,000 - 1,200 mm with frequent autumn and spring storms.

The local winds are mostly breezes and generally arrive from the south during the day and north-west at night. Calm periods are frequent, reaching average annual values around 30% and most common in the summer and autumn. As regards the classes of atmospheric stability, the most common classes are neutral D, especially in the winter-spring period, and stable F, especially in the autumn (SOGIN GRV001).

In this context, for local detail, reference can be made to data detected in the course of 2015 by a control unit installed close to the power station, which found weather conditions on a regional scale but with minor oscillations in the extreme values (SOGIN NPVA00824, 2014).

The thermal profile for the first semester 2015 displays maximum temperatures that reached values up to 18°C, typical in the spring, with values between 8 and 13 °C in the winter months. This profile is in line with the typical local climate.

[52] Data referring to the UCEA-UCOS "Castel Volturno" station, period 1973-1999, www.scia.isprambiente.it

During the second semester of 2015, the thermal and hygrometric profile displays values in line with the local climate. The autumn/winter months were, on average, characterised by high-pressure conditions that favour the accumulation of pollutants. The month of October saw the most rainfall.

In figure 6.1.4-2, the average monthly values are given of the weather and climatic parameters monitored.

	Acc. rain	Average UR	Average T	Average pressure	RAD SOL TOTAL media
month	**mm**	**%**	**°C**	**mbar**	**W/m^2**
jan-15	103.2	75.5	8.5	1016.6	64.3
feb-15	85.4	81.2	9.0	1006.2	89.3
mar-15	55.8	77.1	12.2	1012.5	137.2
apr-15	41.0	76.2	13.8	1018.0	214.2
may-15	1.0	79.9	18.7	1014.1	241.0
jun-15	*	*	*	*	*
jul-15	26.2	71.8	1010	319.1	8
aug-15	24.8	73.3	1017.2	277.7	0
sep-15	20.9	68.1	1013.8	194.9	27.8
oct-15	16	79.8	1017.1	98.3	42.4
nov-15	15.2	78	1024.2	112.9	1.2
dec-15	8.8	80.5	1029.8	79.9	1

Figure 6.1.4-2: Trend of meteorological parameters in 2015 (* control unit under maintenance)

As regards the anemological regime, in 2014, wind was registered with a north-east/south-west direction of origin with averages speeds between 3 and 5 m/s and around 3% of calm periods (Figure 6.1.4-3).

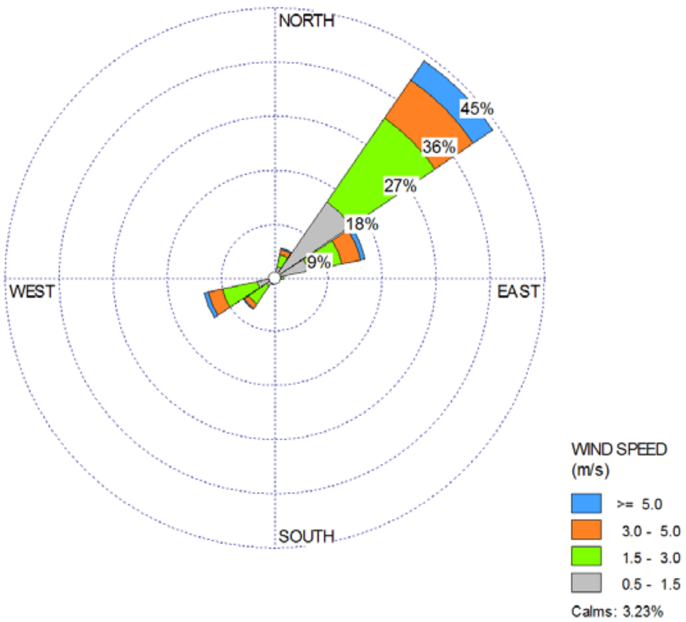


Figure 6.1.4-3: Annual wind rose 2015 (SOGIN NPVA00824, 2014)

Air quality

As regards the state of air quality, the threshold limit values can be taken as reference for the concentrations regulated by Legislative Decree 13/08/2010 no. 155 in implementation of the "Directive 2008/50/EC concerning ambient air quality and for cleaner air in Europe". After these regulations came into force, the Campania Region, under the Regional Council Resolution no. 683 of 23/12/2014, approved the project for a new zoning and classification of the territory:

- Napoli-Caserta Agglomerate;
- Coastal-hilly zone;
- Mountainous zone.

The Garigliano Power Station falls within the "Coastal-Hilly Zone", where NO_x and PM_{10} are above the assessment threshold and the $PM_{2.5}$ is above the threshold of supplementary assessment.

6.1.4.3 Water environment

Surface waters

The Garigliano Power Station is located on the left bank of the river of the same name, close to one of the meanders that characterise its final stretch. On the left bank, the Rio Grande, upstream of the plant, and the Torrente Ausente downstream, meet before the Garigliano is channelled towards the mouth of the Gulf of Gaeta.

The body of water receiving the discharges of the Power Station is the nearby River Garigliano, whose annual average capacity is around 123 m^3/sec (SOGIN NPVA00824, 2014; SOGIN NPVA00877, 2015; SOGIN NPVA00941, 2015).

The environmental state of the River Garigliano, according to the results of the monitoring carried out by ARPA Campania in the three years 2010-2012, is classed as being in a "Sufficient" Ecological State and a "Good" Chemical State. The trend improved in the two years 2013-2014 with the promotion of the Ecological State to class "Good" and the same class for the Chemical State was confirmed.

The Garigliano plant lies on an artificial rise with a height of 2-3 metres and built for the purpose of hydraulic defence, raising the ground level to 9.75 metres above mean sea level while the average height of the surrounding plain is maintained at around 7 metres above mean sea level. The potential hydraulic hazard of the plant is linked to the possibility of the River Garigliano overflowing its banks, which is embedded a few metres below the plain with a width of the river bed between 50 and 80 m.

In the current *Flood Risk Management Plan* (in observance of the European Directive 2007/60/EC "Flood Directive", enshrined in Italian law under Legislative Decree 48/2010) drawn up by the Southern Apennines River Basin District, the area of the Power Station is not included in any of the perimeters linked to the flooding risk (Drawn Up/Updated February 2013 – Tables. 03R and 04R).

Hydrogeology notes

From the hydrogeological point of view, the area in which the Power Station is located is characterised by the presence in the subsoil of a series of superimposed and interconnected aquifers, made up of levels of course granularity of the complex of deposits on the plain. These aquifers contain groundwater in close relationship with the waters of the River Garigliano and a depth to water table of around 2 – 5 m from p.c.

In the surrounding area, there are also other aquifers made up of more permeable levels of the volcanic products of Roccamonfina and the limestone formations emerging on the hills of Monti Aurunci that border the plain; the latter are the site of a layer of regional extent that feeds, in addition to the numerous springs at the foot of the Aurunci, as well as the subterranean circulation of water in the most recent sediments of the plain (SOGIN GRV0002, 2003).

6.1.4.4 Biodiversity

The vast area features the flood plain of the River Garigliano, used mainly for agricultural purposes, with the exception of certain stretches of the banks of the watercourse and the adjacent areas, where there are habitats and species of naturalistic interest that characterise the SIC IT8010029 River Garigliano.

A large part of the course of the River Garigliano is heavily anthropized; the crops mainly reach close to the river and therefore the riverbank vegetation, especially trees, is reduced to a very narrow strip. Where present, some characteristic phytocoenosis can be recognised, such as willows dominated by the Red Willow (*Salix purpurea* L.) and the Olive Willow (*Salix eleagnos* Scop.), mainly as shrubs, willows dominated by White Willow (*Salix alba* L.) which take on the appearance of high-stemmed woods and that only in a few cases reaches an extension of a few hectares; mainly poplar woods (predominantly *P. nigra* e *P. alba),* accompanied by individual White Willows (*Salix alba* L.). The poplar groves occupy the flood terraces slightly raised above the riverbed and mostly reduced to rather thin little woods, in a certain sense “compressed” and relegated to a few patches of the flood plain due to the intense cultivation that, in some cases, reaches the banks of the river.

In the areas where the waters run slower, on lime deposits or on banks partially isolated from the main flow where the waters are almost still, small communities dominated by halophytes can be seen such as *Typha* sp. pl., Bunting (*Cyperus* sp.), Common reed (*Phragmites australis* (Cav.) Trin. ex Steud.).

The strips of riverside vegetation described in the previous notes are the few elements of nature in the area and may form, together with the course of the River Garigliano, an important local ecological corridor. The patches of shrubbery may also act as stepping stones that species use to move to more unspoiled areas, such as the River Garigliano or other territories of the Roccamonfina - Garigliano Regional Park.

Both in the riverside arboreal and herbaceous formations along the reclamation canals, there are numerous amphibians and reptiles but, above all, a wealth of avifauna. Among the various species, attention is drawn to the Ardeidae, Anatidae, Rallidae and Passeriformes who find suitable nesting condition in these environments or for stopovers during migrations. In the areas closest to the river, where the habitat can be defined as fluvial-marshlands, there are many species of aquatic species. In the areas furthest away from the course of the river, there are often small inhabited areas, cultivated zones and natural environments such as garigue, shrub, wooded strips containing various species of birds.

In the upstream stretches near the Power Station, a number of fish have been recorded, such as the European chub (*Squalius cephalus* (Linnaeus, 1758) and the brook barbell (*Barbus caninus* Bonaparte, 1839) as well as, although less common, tench (*Tinca tinca* (Linnaeus, 1758)), pumpkinseed (*Lepomis gibbosus* (Linnaeus, 1758)), trout (*Salmo trutta,* Linnaeus, 1758) and the three-spined stickleback (*Gasterosteus aculeatus* Linnaeus, 1758).

The complete list is given below of protected areas with their respective distances from the Nuclear Power Station, the total area and percentage cover of the area coming with the sphere of influence surveyed.

TYPE	CODE	NATURA 2000 SITES/PROTECTED AREAS	Approximate minimum distance from the infrastructure (km)	Total area (hectares)	Approximate coverage falling within the sphere of influence (%)
SIC	IT8010029	River Garigliano	0.12	481	30
PNR	EUAP0956	Roccamonfina – Foce Garigliano Regional Park	0.08	8,748	2
Accurate geosite	2308	San Lorenzo Labyrinth	3.4	Accurate Element	100

Figure 6.1.4-4: List of Natura 2000 Sites, protected areas and IBA in the sphere of influence of Caorso Power Station

From the consultation of the standard model of the aforementioned Natura Sites[53], the number of habitats (Attachment I Dir. Habitat) and species of the Directive (Field 3.2) and of conservation interest (Field 3.3) recorded within them, can be obtained, as indicated in the following table. The list of habitats and species is given in Attachment 4 to this Environmental Report.

TYPE	Code	Name	Number of community habitats (Att. I 92/43/EC)	Number of plant species (Field 3.2)	Number of animal species (Field 3.2)	Number of plant species (Field 3.3)	Number of animal species (Field 3.3)
SIC	IT8010029	River Garigliano	5	-	80	-	4

Table 6.1.4-5: Number of community fauna species habitats in the Sites of Natura 2000 Network

6.1.4.5 Ionising radiations

Release conditions

The current discharge limits were authorised by Decree of the Ministry of Economic Development of 28 February 2014 approving the Application for deactivation of the Caorso Power Station. They are based on the criterion of radiological non-significance.

Gaseous effluents:

$\Sigma_i A_i \bullet F_i \leq 3.8$ GBq/year

$\Sigma_i A_i \bullet F_i \leq 1.39$ GBq/13 consecutive weeks

$\Sigma_i A_i \bullet F_i \leq 0.38$ GBq/24 consecutive hours

where:

A_i is the activity of the radionuclide;

F_i is the equivalence factor with regard to the radioisotope Co-60.

Liquid effluents:

$\Sigma_i A_i \bullet F_i \leq 72$ GBq/year

$\Sigma_i A_i \bullet F_i \leq 36$ GBq/13 consecutive weeks

$\Sigma_i A_i \bullet F_i \leq 7.2$ GBq/24 consecutive hours

where:

[53] Database of the Ministry of the Environment and the Protection of the Territory and the Sea, on the page "Cards and maps". Website ftp://ftp.minambiente.it/PNM/Natura2000/TrasmissioneCE_2015/

Ai is the activity of the radionuclide;

Fi is the equivalence factor with regard to the radioisotope Cs-137.

Monitoring of radioactive waste

The figures below report the quantity of radioactivity discharged annually through liquid and gaseous effluents, as well as the percentage use of the maximum authorised limit (%FdS) for Garigliano Power Station regarding the three years 2013-2015[54].

Garigliano Power Station – liquid discharges – Annual activity [Bq]			
Year	**2013**	**2014**	**2015**
H-3	3.96E+07	6.59E+05	7.62E+05
Cs-137	1.67E+08	2.20E+08	2.67E+08
Co-60	1.56E+06	7.92E+06	1.00E+07
Sr-90	7.27E+06	5.57E+06	2.80E+06
Alpha total	9.00E+03	4.70E+04	3.52E+05
Ni-63	1.79E+06	5.63E+06	8.48E+06
Fe-55	1.25E-01	0.00E+00	0.00E+00
Ni-59	1.01E+00	0.00E+00	0.00E+00
Total activity [Bq]	**2.17E+08**	**2.40E+08**	**2.89E+08**
%FdS	**2.50E-01**	**3.30E-01**	**4.05E-01**

Figure 6.1.4-6: Annual activity and use of discharge formula of discharged radioactive liquid effluents (2013-2015)

Garigliano Power Station – gaseous discharges – Annual activity [Bq]			
Year	**2013**	**2014**	**2015**
H-3	4.45E+08	6.12E+08	5.56E+08
Co-60	4.21E+02	1.45E+03	1.25E+03
Cs-137	4.63E+04	3.34E+04	7.25E+04
Fe-55+Ni-59+Ni-63	0.00E+00	0.00E+00	0.00E+00
Sr-90	5.17E+03	4.14E+03	1.49E+03
Alpha total	1.54E+03	9.04E+02	2.42E+03
Total activity [Bq]	**4.45E+08**	**6.12E+08**	**5.56E+08**
%FdS	**1.66E-02**	**9.32E-03**	**1.77E-02**

Figure 6.1.4-7: Annual activity and use of discharge formula of discharged radioactive gaseous effluents (2013-2015)

[54] Sogin doc. Sogin GR RS 00786 rev.01 Annual report on the state of radioactivity of the territories surround the Garigliano Power Station (year 2013).
Sogin doc. Sogin GR RS 00963 rev.00 Environmental radioactivity surveillance programme – Information report (year 2014).
Sogin doc. Sogin GR RS 01054 rev.00 Environmental radioactivity surveillance programme – Information report (year 2015).

Monitoring of environmental radioactivity

The following figures report the average concentrations of activity concerning the three years 2013-2015 of the main radionuclides in the most significant matrices analysed as part of the environmental surveillance of the Garigliano site[55].

Concentration of average annual activity – LAND [Bq/kg]			
	2013	**2014**	**2015**
Caesium-137	4.77E+00	7.86E+00	4.34E+00

Figure 6.1.4-8: Concentrations of activity in the land matrix [Bq/kg] – Garigliano Power Station

Concentration of average annual activity—RIVER WATER [Bq/1]			
	2013	**2014**	**2015**
Caesium-137	5.22E-01	3.45E-01	3.45E-01
Cobalt-60	< 6.10E-02	< 2.50E-01	< 4.50E-02

Figure 6.1.4-9: Concentrations of activity in the river water matrix [Bq/l] – Garigliano Power Station

Concentration of average annual activity—SEA WATER[56] [Bq/l]			
	2013	**2014**	**2015**
Caesium-137	< 3.00E-02	< 3.45E-01	< 3.45E-01

Figure 6.1.4-10: Concentrations of activity in the river water matrix [Bq/l] – Garigliano Power Station

Concentration of average annual activity—GROUNDWATER [57] [Bq/l]			
	2013	**2014**	**2015**
Caesium-137	3.15E+01	4.24E+00	1.17E+00
Tritium	3.17E+01	1.96E+01	5.74E+00

Figure 6.1.4-11: Concentrations of activity in the groundwater matrix [Bq/l] – Garigliano Power Station

Concentration of average annual activity—MILK [Bq/l]			
	2013	**2014**	**2015**
Caesium-137	< 6.60E-02	< 8.80E-02	< 4.20E-1
Strontium-90	4.36E-01	3.71E-01	< 1.10E-01

Figure 6.1.4-12: Concentrations of activity in the milk matrix [Bq/l] – Garigliano Power Station

[55] See previous note.

[56] The seawater samples were taken near the mouth of the river Garigliano.

[57] The groundwater samples were taken from wells outside the Power Station area.

Concentration of average annual activity – LEAFY VEGETABLES [Bq/kg]			
	2013	**2014**	**2015**
Caesium-137	< 2.44E-02	< 4.92E-02	< 2.63E-02

Figure 6.1.4-12: Concentrations of activity in the leafy plant matrix [Bq/kg] – Garigliano Power Station

Equivalent dose rate in air (gamma dose)

With regard to the gamma dose in air, the date found by the measurements carried out in a radius of around 8 km from the Power Station are within the range of 0.050 – 0.320 µSv/h. The values oscillate within the usual fluctuations of the environmental background radiation typical of the area[58].

6.1.4.6 Landscape

The area where the Power Station is located displays a uniform context of contours and views typical of the flood plain, by now very close to the sea, crowned with Alpine foothills. Overall, the Garigliano plain features centuries-old agricultural exploitation, encouraged by the climatic conditions, from the fertility of the land and the prominent stretches of surface and underground water. These waters, however, have been subject to channelling and control over the years as part of reclamation works, which can be clearly seen from the canals and associated works. The area is framed with hills covered with woods, including chestnut and oak, except for the limestone slopes where, in stretches, there are vast, steeper areas covered in shrub.

In this context, the Garigliano Power Station, built at the start of the nineteen sixties, an element of itself due to the specific technology, both in use and form. In consideration of the reduced size and the harmonious structure of its constituent parts, it does not appear to represent a particularly visually invasive factor.

Figure 6.1.4-13 shows the location of the viewpoints for monitoring by means of photographic survey campaigns planned by the operator (SOGIN) as part of the implementation of the decommissioning strategy of the plants belonging to the energy sector.

[58] Survey of environmental radioactivity of the area surrounding the Garigliano Nuclear Power Station - Report 197/2014 ISPRA.

Figure 6.1.4-13: Location of the monitoring stations

Constraints

1) **Legally protected areas (article 142 of Legislative Decree no. 42/2004)**

Within the Power Station area, a restriction applies of a buffer zone of 150 m from the River Garigliano, defined in accordance with article 142, paragraph 1, letter c of the Legislative Decree 42/2004 and the constraint on “territories covered by forests and woods, even though affected by fire and those subject to the constraint of reforestation”, as reported by Table B3.2.4 of the Territorial Provincial Coordination Plan (TCPC) of the Province of Caserta (Figure 6.1.4-14).

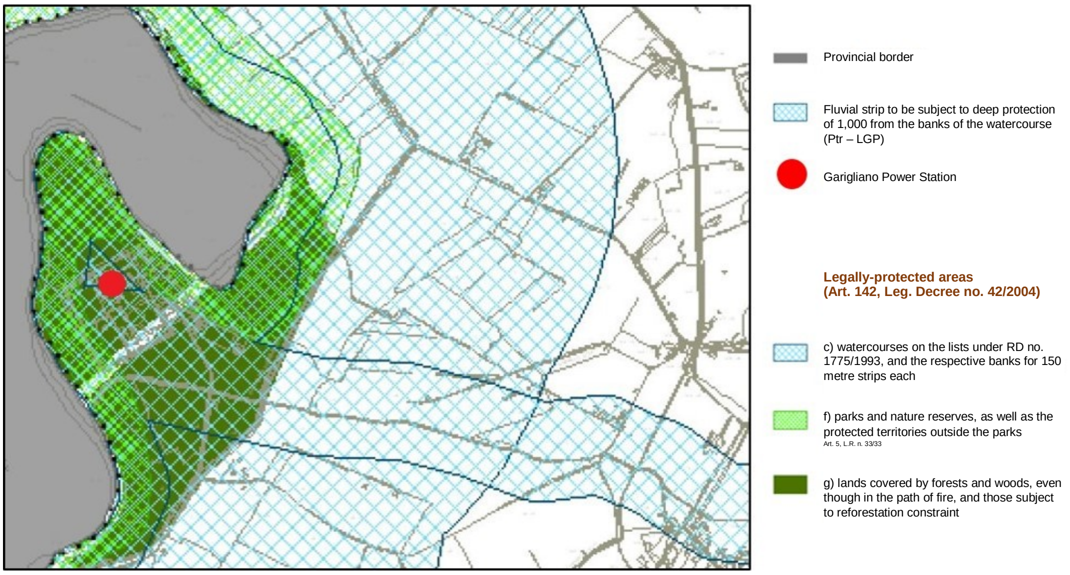


Figure 6.1.4-14: Tab. B3.2.4 – Cultural identity. The landscape assets of the TCPC of the province of Caserta

6.1.5 Saluggia Nuclear Complex

6.1.5.1 Territorial framework

The Saluggia Nuclear Complex is located in the municipality of the same name near the border between the Province of Vercelli and the Province of Turin, at a distance of around 2 km south-east of the residential centre. With regard to the main roads, it is located near the main Crescentino-Saluggia (SP37) provincial road, around 2.7 km from the provincial road of Monferrato (SP31bis) and around 4 km from the A4 motorway (Turin-Milan stretch) (Figure 6.1.4-15).

Figure 6.1.5-1: In red, the area where the Saluggia Nuclear Complex is located (De Agostini road database, resolution 1:250,000)

The Complex is bordered to the north by the Farini Canal, to the south by the Cavour Canal, to the west by the River Dora Baltea and by private property to the north. It can be divided into two separate areas: the first contains the EUREX plant managed by SOGIN S.p.A., inside the ENEA's Research Centre; the Avogadro Depot lies in the second.

The site, located in the western sector of the Po Valley, lies between the hills of Monferrato to the south and the southern offshoots of the Alpine range to the north and on the flood plain of the Dora Baltea - a little upstream of the confluence with the River Po on the left bank – in a flat area, slightly sloping (around 0.5%) to the south-east with an average height of ground level of around 170 metres above sea level.

As regards the seismicity of the area and the dangers associated with it, reference can be made to the *Seismic classification of the territory of Piedmont* (Classification in accordance with Regional Council Decree no. 11-13058 of 19.01.2010), which places the Municipality of Saluggia in seismic zone 4.

Anthropic aspects

The area of interest has high agricultural value, where anthropic actions has completely redrawn the original landscape with the creation of a remarkable number of artificial canals – including the Cavour Canal that forms one of the borders of the site – and the constant transformation of the rural fabric.

The main crops are rice, wheat, corn, vegetables, vineyards and poplar groves; fishing plays a remarkable importance in the area while the livestock is mainly the cows, pigs and poultry.

As regards the Municipality of Saluggia, the main agricultural activity that characterises it is basically the production of the Saluggia bean, a local variety of legume.

In the Saluggia area and the neighbouring municipalities, the protected origin supply chains that could be developed based on the regulations of the individual products are: Gorgonzola, Grana Padano, Toma Piemontese, Salamini italiani alla cacciatora, Baraggia Biellese and Vercellese rice. Among the protected geographical indication products, the supply chains that could be developed are: Mortadella di Bologna, Salame di Cremona, Salame Piemonte and Nocciola di Piemonte.

Based on the ISTAT census data from 2011, 4,042 people live in the Municipality of Saluggia; the employment rate is 46.94%. As regards the census of industry and services in the Municipality, there are 209 businesses employing 2,228 employees.

6.1.5.2 Atmosphere

The area in which the Saluggia Nuclear Complex is located displays the characteristics of the continental climate, with cold winters and often hot, dry summers, with spring and winter rains. The climate is characterised by a rather uniform trend, with the prevalence of phenomena of thermal rather than dynamic origin.

The region is subject to the barrier effect produced by the Alps and hills of Monferrato on bad weather both of Atlantic and Mediterranean origin and most of the territory of Piedmont, especially the plain, is characterised by a particular anemological situation, in terms of the frequency of calm weather and the systematic weakness of the winds, where up to 50% of situations are without winds, especially at night in the winter.

The thermal trend is characterised by wide temperature ranges between the summer and winter. Specifically, from the analyses of data recorded in recent years[59]:

- average annual temperature between 12.6° and 14.3°C;
- average minimum temperature in the coldest months between -5.8% and 2.7°C;
- average maximum temperature in the hottest months between 26.4° and 32.5°C;
- average annual temperature range > 20°C.

The humidity is influenced by various factors, particularly by the hydrography and especially in winter, when it rises to higher values due to the accumulation of cold air at the valley floor, which brings additional humidity from the Po. In this regard, in anti-cyclonic conditions (throughout the Po Valley and especially in the Piedmont Basin), very weak air currents prevail with light breezes. These conditions in late autumn and winter favour the accumulation of cold air on the valley floor with the formation of persistent fogs and with the consequent accumulation of any pollutants; in the hot season, the same conditions are accompanied by strong convective forces that can trigger storms.

The rainfall is characterised by maximums of precipitation in spring and autumn and minimums in the winter and summer, without dry periods. The rainfall displays considerable variability over the year but is contained, in the areas of the plain, almost always remaining below 1,100 mm/year (SOGIN SLCX0245, 2005).

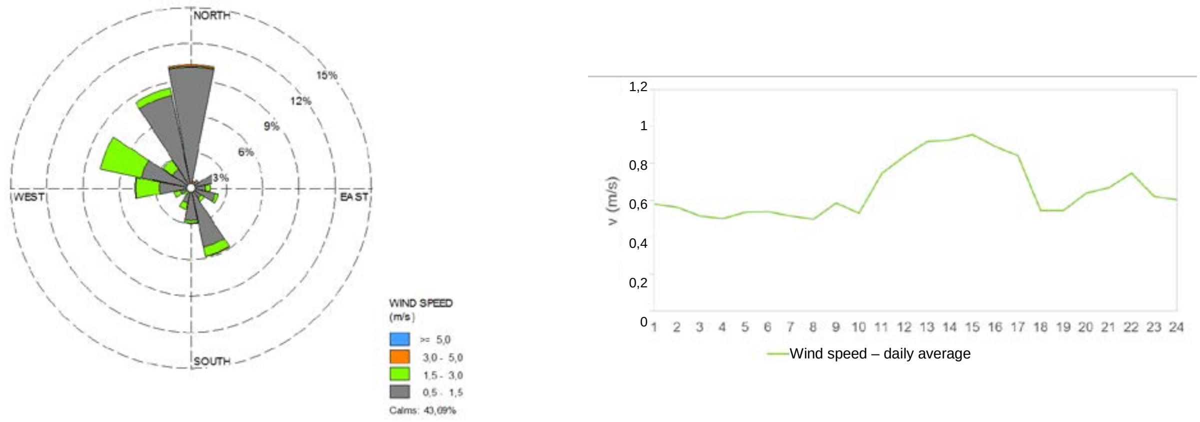
As regards the anemological position and the atmospheric stability, in accordance with the Pasquill–Gifford classification (Pasquill, 1961; Gifford, 1961), a high percentage emerges of stable classes (E, F, G), especially in winter, while unstable classes (A, B, C) are significant only in spring and summer, although limited. The maximum of category D, neutral, arrives in spring. Category G is at a maximum in autumn-winter when thermal inversion can occur in the first 100 metres of the atmosphere.

In this general context, for local detail, the most recent surveys are reported that were conducted in the area surrounding the complex, with two monitoring campaigns conducted in the period November-December 2015 and April-May 2016 (SOGIN NPVA01027, 2016).

Monitoring during November-December 2015

In the period surveyed, a wind at 10 m was recorded coming mainly from the north-west quadrant and, to a lesser degree, from the south-east. The intensity of the wind was always low with frequent periods of calm (around 44% of the total) (Figure 6.1.5-2). The daily trend of the wind speed confirms the presence of phenomena of thermal origin.

[59] Data referring to the ARPA "Tricerro" station, in the period 2001-2015 www.scia.isprambiente.it



(a) **(b)**

Figure 6.1.5-2: (a) Wind rose in the period in question and (b) average wind speed for typical day (SOGIN NPVA01027, 2016)

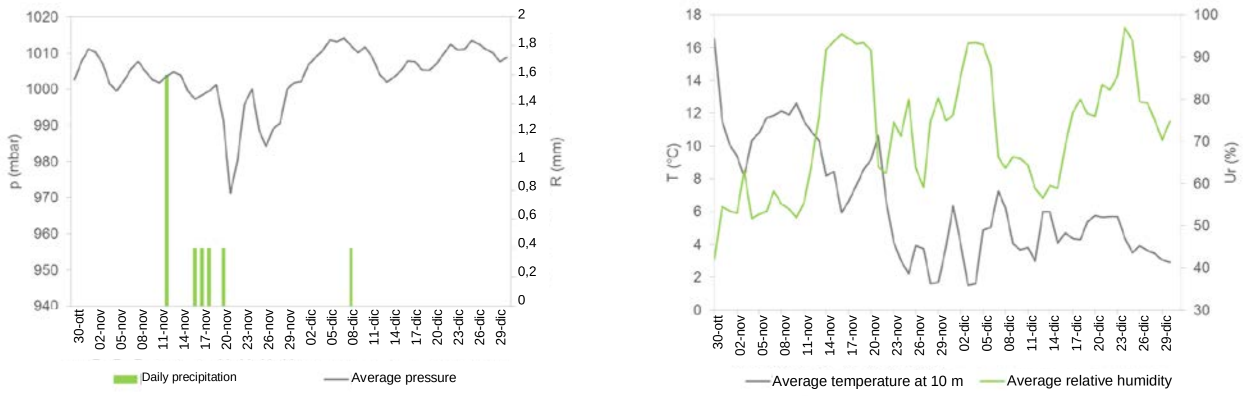


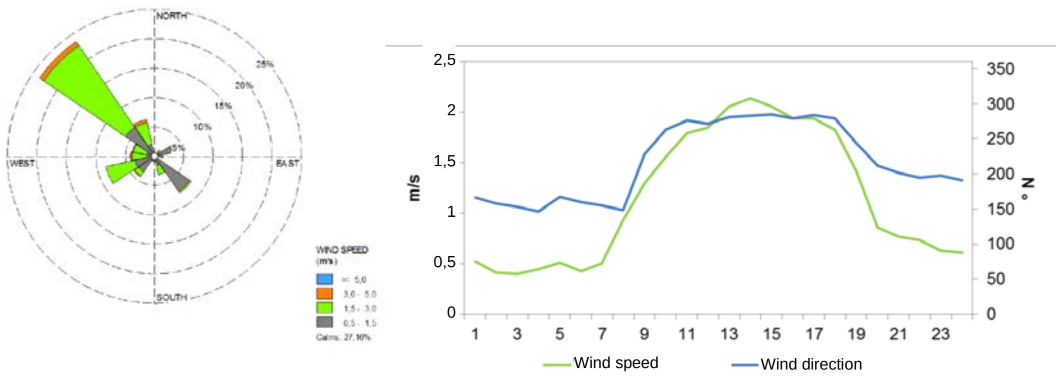
Figure 6.1.5-3. (a) Trends in atmospheric pressure superimposed on daily precipitation and (b) average daily trends in the temperature and humidity for the period surveyed (SOGIN NPVA01027, 2016)

The period surveyed was characterised in the month of November by sporadic rainfall of light intensity associated with high values of relative humidity and variable conditions of atmospheric pressure, while the month of December saw the absence of rain (only one day with showers), with more stable conditions, the formation of mists and colder temperatures (Figure 6.1.5-3).

Monitoring in April-May 2016

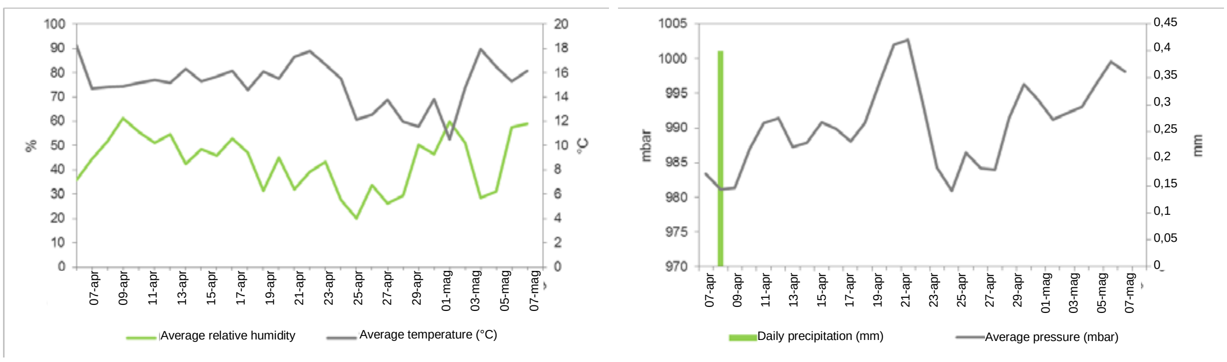
In the period surveyed, a wind at 10 m was recorded coming mainly from the north-west quadrant and, to a lesser degree, from the south-east and south-west. The intensity of the wind was always low with frequent periods of calm (around 27% of the total) (Figure 6.1.5-4). The daily trends of the wind speed and direction display the presence of phenomena of thermal origin that are generated in late morning and continue in the evening.

The entire month surveyed featured low-pressure conditions and a single rain event of weak intensity. The average temperature for the period was 15°C and average relative humidity of around 45% (Figure 6.1.5-5).



(a) **(b)**

Figure 6.1.5-4: (a) Wind rose in the period in question and (b) average wind speed for typical day in the period in question (SOGIN NPVA01027, 2016)



(a) **(b)**

Figure 6.1.5-5. (a) Trends in atmospheric pressure superimposed on daily precipitation and (b) average daily trends in the temperature and humidity (SOGIN NPVA01027, 2016)

<u>Air quality</u>

As regards the state of air quality, the threshold limit values can be taken as reference for the concentrations regulated by Legislative Decree 13/08/2010 no. 155 in implementation of the “Directive 2008/50/EC concerning ambient air quality and for cleaner air in Europe”. In accordance with this regulation, the Piedmont Region, under the resolution of the Regional Council no. 41-855 of 29 December 2014, adopted the following zoning and classification of the regional territory on the basis of the objectives of protecting human health from various pollutants (NO_2, SO_2, C_6H_6, CO, PM_{10}, $PM_{2.5}$, Pb, As, Cd, Ni, B(a)P):

- Agglomerate of Turin;
- Zone called *Plain*;
- Zone called *Hill*;
- Zone called *Mountain*.

The Saluggia Nuclear Complex comes within the “Plain” zone. This zone is characterised by the existence of levels above the upper assessment threshold, including for the following pollutants: NO_2, PM_{10} e $PM_{2.5}$.

6.1.5.3 Water environment

<u>Surface waters</u>

The area in question is part of the complex hydrographic network, part natural and part artificial, that concerns the plain of the south of Vercelli. The hydrographic structure is mainly characterised by the presence of the River Po and the Dora Baltea. The Dora, starting from the hills of the glacial amphitheatre of Ivrea on a meandering course in a generally north-south direction before joining the River Po at Brusasco. The River Po runs along a roughly west-east direction over a stretch of plain with a number of oxbow lakes or secondary branches of the river. Numerous large and important canals cross the territory in question. The Complex is located on the left bank of the end stretch of the River Dora Baltea, around 5 km from the confluence with the River Po, in an area between the Cavour Canal (which takes its water from the Po at Chivasso) to the south and the Farini Canal (which is fed by the Dora Baltea) to the north and east.

The body of water receiving the discharges of the Complex is the River Dora Baltea, which has an annual average capacity of around 23 m^3/sec (SOGIN NPVA01027, 2016; SOGIN NPVA01069, 2016; SOGIN NPVA01092, 2016).

The Overall State of the Dora Baltea, in the stretch closest to the Saluggia Nuclear Complex, according to the monitoring data of ARPA Piedmont of the three years 2012-2014 comes within the “Not Good" class. This state is based on a "Good" Chemical State and a "Sufficient" Ecological State.

The hydraulic danger of the area is connected to the possibility of the Dora Baltea bursting its banks.

In the Extract Plan for the Hydrogeological Structure of the Po Basin, approved in 2001, the areas of the Saluggia nuclear complex came within "band B" of the flooding of the Dora Baltea that includes parts of the watercourse subject to flooding on the occurrence of the flooding event of reference (flood with TR return time of 200 years).

The European Directive 2007/60/EC “Floods Directive”, enshrined in Italian law under Legislative Decree 49/2010, led to the updating of the maps of the AdB Po regarding the danger and risk of flooding. In the new map updated in 2015 (*Map of Danger from Flooding and Flood Risk Map* at a scale of 1:25,000 - Table 136 SW), the areas of the nuclear complex are prudently included in a danger band defined by a "flooding scenario" with "low probability of flooding" (tr. 500 – L-Rara); on the basis of this danger to the areas concerned, it is associated with “risk scenario” “R2 – Average risk”.

The reduction of the level of danger of flooding associated with the nuclear complex is linked with the construction of hydraulic defence works and detailed studies and modelling: indeed, as regards to the SOGIN site, this is protected from flooding events by a hydraulic defence work made up of a wall founded on piles that reach 15 metres deep and act as a barrier against the groundwater reducing the filtration motions; the size of the wall was planned taking into account extremely serious flooding scenarios linked to natural phenomena or subsidence of anthropic works. As regards the Avogadro Depot, recent studies (Hydrodata, 2015) indicate that, for extreme scenarios with return times longer than 200 years, it is possible that floods of limited extent may occur; to this end, the construction is planned of hydraulic defence works (embankments or walls) that will prevent the flow of water into the site even during extreme events with an extremely low probability of occurrence.

Hydrogeology notes

In the area in question, the following hydrogeological complexes were identified, from the top down, on the basis of the lithostratigraphic characteristics of the substrate (SOGIN SLCX0245, 2005):

- *recent alluvial complex,* made up of alluvial plains of mainly gravel and gravel-sand of the current riverbeds of the main rivers, the mainly gravel and gravel-sand alluvial plains with clay of the abandoned riverbeds. The aquifer housed in this complex is unconfined with generally low depth to water table values.

- *main alluvial complex*, made up of fluvial and fluvioglacial deposits, generally gravel and sand associated with levels or lenses of clay, corresponding to the fluvioglacial deposits of Riss and Würm. Together with the recent alluvial complex, it houses the unconfined aquifer and the suspended aquifer.

- *sand- clay complex*, made up of lacustrine sandy clay intercalated with fluvial deposits of the main plain; it defines the lower limit of the suspended aquifer.

- *complex of alternations*, the sediments of which it is formed belong to environments of marine-saltwater, continental-type lacustrine and fluvial-lacustrine sedimentation. This complex is the site of the deep aquifer.

- *sandy – lime complex,* characterised by lime and sand of marine and coastal origin with very low permeability.

The representative aquifer of the area under study is the unconfined one, that is, the one in the recent and main alluvial complexes. The permeability of this aquifer, which varies depending on whether it is mainly sand or gravel, is between 10^{-03} m/s e 10^{-05} m/s.

The depth to water table along the River Dora Baltea stands at a depth of around 1-2 m from ground level (SOGIN SLCX0246, 2005).

6.1.5.4 *Biodiversity*

On the basis of what is described in the previous paragraph, it can be seen that the area in which the Saluggia Nuclear Complex lies is characterised by the typical geomorphology of the fluvial channels produced by the dynamics of the Dora Baltea and the Po (shingle, banks, terraces, oxbow lakes); in these space, unique ecological conditions are created that allow the formation of communities of azonal vegetation.

In addition to this azonal vegetation linked to a water source, there is wooded lowland vegetation characteristic of the biogeographical region of the Po, with more typical naturalistic aspects as expressions of the macrobioclimate. This phytocoenosis on the terraces is attributable to the mixed oaks dominated by English oak (*Quercus robur* L.) Ash *(Fraxinus excelsior* L.) and Field Elm *(Ulmus minor* Mill), widespread locally although in fragmentary amounts and contained in all the Po flood plain (Camerano et al., 2009). It is possible show how the fragmentation of the communities of the woods is accentuated by the penetration of agricultural areas (extensive arable land, wood arboriculture) to the edge of the riverbed. The cultivated areas, on one hand, reduce the flora to a small contingent of weeds while, on the other, they enable the maintenance of secondary ecotonal environments in which colonisation process are disturbed, dominated and conducted by exotic species. The aggression of the exotics is being combatted today by a national strategy of conservation of the biodiversity in the attempt to contain their spread, especially in areas of large concentrations of opportunist species as is found on the Piedmont plain (Piedmont Regional Council 18.12.2012, no. 46-5100 – Identification of the lists – *Black List* – of invasive exotic plant species of Piedmont and the promotion of information and awareness initiatives).

In addition to the mixed oaks, typical formations are widespread of White Willow (*Salix alba* L.) and Black Poplar (*Populus nigra* L.). Along the banks of the Dora Baltea, these riverside communities, determined by water factors, are present in strips or small local wooded formations extending up to the first alluvial terraces. The vegetation of the oxbow lakes and shingle is characterised by certain portions of ZSC-ZPS IT1120013 Isolotto del Ritano Dora Baltea.

The watercourses are important links in the local ecological network, indeed their main function is to allow the fauna and fauna to move from one zone to another, and to make foraging areas accessible that otherwise could not be reached. These ecological links avoid the phenomenon of fragmentation and contribute to connecting the protected nature areas and Natura 2000 sites in the territory and included in anthropized environmental matrix. The existence of protected areas has certainly favoured the conservation of a number of habitats and species that otherwise would have been lost.

On a wider scale, crops and poplars are especially widespread in the entire Vercelli and Alessandria riverside complex along the course of the river Po and also act as important stepping stones for the movement of species.

The flora associated with the poplar groves for forestry use are of little environmental value due to its triviality with the entry of ubiquitous and cosmopolitan species, depending on the disturbance produced by the normal cultivation practised in the early years of rooting of the young poplar trees. In addition, these lands are particular vulnerable since the soils along the river banks are heavily exploited for agricultural purposes due to the fertility of the terrain and the availability of water resources, with the associated practices (herbicides, phytopharmaceuticals for the containment of biotic events, fertilisers etc.).

As regards the fauna, the area in question has a wealth of bird and fish species. The avifauna of the Po is especially abundant, given that the river has always been a suitable environment for foraging, nesting and wintering for many birds that find suitable climatic conditions there and a remarkable quantity of food. Among the wintering Anatidae are Teal (*Anas crecca* Linnaeus, 1758), the Northern pintail (*Anas acuta* Linnaeus, 1758), Eurasion wigeon (*Anas penelope* Linnaeus, 1758), the Northern shoveler (*Anas clypeata*, Linnaeus, 1758), the Garganey (*Anas querquedula* Linnaeus, 1758), while the diving ducks include the common pochard (*Aythya ferina* (Linnaeus, 1758)) and the grey tufted duck (*Aythya fuligula* (Linnaeus, 1758)). This environment is also ideal for the feeding and reproduction of species Ardeidae, such as the grey heron (*Ardea cinerea* Linnaeus, 1758), the night heron *Nycticorax nycticorax* (Linnaeus, 1758), the little egret (*Egretta garzetta* (Linnaeus, 1766)), and the grey egret (*Ardea alba* Linnaeus, 1758).

The oxbow lake is home to species of special interest because they are not typical of the avifauna of west Piedmont such as the black-necked grebe (*Podiceps nigricollis* C. L. Brehm, 1831), the Eurasian bittern (*Botaurus stellaris* (Linnaeus, 1758)), the purple heron (*Ardea purpurea* Linnaeus, 1766), the Black-winged stilt (*Himantopus himantopus* (Linnaeus 1758)), the Eurasian penduline tit (*Remiz pendulinus* (Linnaeus, 1758)) and the Black-tailed godwit (*Limosa limosa* (Linnaeus 1758)). Attention is also drawn to the presence of Picidae, like the Lesser spotted woodpecker (*Dendrocopos minor* (Linnaeus 1758)) and birds connected to the forest ecosystems such as the European honey buzzard (*Pernis apivorus* (Linnaeus, 1758)), the tawny owl (*Strix aluco* Linnaeus, 1758), the Common wood pigeon (*Columba palumbus* Linnaeus, 1758), the Eurasion golden oriole (*Oriolus oriolus* (Linnaeus, 1758)), the Eurasian jay (*Garrulus glandarius* (Linnaeus, 1758)), and the wood sandpiper (*Tringa glareola*, Linnaeus, 1758). The river shingle banks are frequented in spring and summer by the ilttle tern (*Sternula albifrons* (Pallas 1764)), the common tern (*Sterna hirundo* Linnaeus, 1758) and the little ringed plover (*Charadrius dubius* Scopoli 1786).

The riverside environment, with its low banks and plentiful shingle, hosts species such as the common kingfisher (*Alcedo atthis* (Linnaeus, 1758)), the common sandpiper (*Actitis hypoleucos* (Linnaeus, 1758)), and the grey wagtail (*Motacilla cinerea* Tunstall, 1771 and *Motacilla alba* Linnaeus, 1758). Among the "inhabitants" of the open spaces of the shingle banks are the European stonechat (*Saxicola rubicola* (Linnaeus, 1766)), the ortolan bunting (*Emberiza hortulana* Linnaeus, 1758) and the European turtle dove (*Streptopelia turtur* (Linnaeus, 1758)), while the scrub of willow and elder hosts the common nightingale (*Luscinia megarhynchos* (C. L. Brehm, 1831)), the Eurasion black cap (*Sylvia atricapilla* (Linnaeus, 1758)) and the Eurasian wren (*Troglodytes troglodytes* (Linnaeus, 1758)), joined in full summer by the marsh warbler (*Acrocephalus palustris* (Bechstein, 1798)) and the melodious warbler (*Hippolais polyglotta* (Vieillot, 1817)). Ubiquitous for feeding but connected to wooded environments, the birds of prey include the black kite (*Milvus migrans* (Boddaert, 1783)) and the common buzzard (*Buteo buteo* (Linnaeus, 1758)).

As regards fish species, the waters of the Dora Baltea are of a better quality than the Po, given their source is nivo-glacial and keeps the waters at a lower temperature, with more oxygen and a water flow elevated on substrate of a maximum depth of 2 m with a high flow speed. In the Dora Baltea, there are European chub (*Squalius cephalus* (Linnaeus, 1758)), Italian barbel (*Barbus plebejus* Bonaparte, 1839), grayling (*Thymallus thymallus* (Linnaeus, 1758)), northern pike (*Exos lucius* Linnaeus, 1758), souffia (*Telestes souffia* (Risso 1827)), Italian loach (*Sabanejewia larvata* (De Filippi, 1859)), marbled trout (*Salmo trutta marmoratus* (Cuvier, 1829)) and hybrids, and carp (*Cyprinus carpio* Linnaeus, 1758). The Dora then joins the Po, with a population predominantly of cyprinidae, typical of less oxygenated, slower waters.

Among the amphibians, mention must be made of the Italian crested newt (*Triturus carnifex* (Laurenti, 1768)), species of community interest, the smooth newt (*Lissotriton vulgaris* (*Linnaeus, 1758*)), the European tree frog (*Hyla arborea* (Linnaeus, 1758)), the Italian agile frog (*Rana latastei* Boulenger, 1879) considered the animal species most closely connected to the lowland environment of northern Italy and finally the agile frog (*Rana dalmatina* Fitzinger in Bonaparte, 1839) the pool frog (*Pelophylax lessonae* (Camerano, 1882)).

The expression of the wealth of biodiversity is also shown in the number of areas subject to various protection regimes in the area of influence of the nuclear complex. The complete list is given below of protected areas with their respective distances from the nuclear complex, the total area and percentage cover of the area coming with the sphere of influence surveyed. It is underlined that the Saluggia nuclear complex falls within the *Area adjacent to the fluvial strip of the Po – Turin stretch* and the IBA 027 *River Po: from Dora Baltea to Scrivia.*

TYPE	CODE	NATURA 2000 SITES/PROTECTED AREAS	Approximate minimum distance from the infrastructure (km)	Total area (hectares)	Approximate coverage falling within the sphere of influence (%)
SIC/ZPS	IT1110019	Baraccone (confluence of Po – Dora Baltea)	3.1 (Eurex)	1,574	44
SIC	IT1110050	Mulino Vecchio (fluvial strip of the Po)	4.4 (Eurex)	414	12
ZSC-ZPS	IT1120013	Isolotto del Ritano (Dora Baltea)	0.6 (Eurex)	253	100
Piedmont Parks	-	Area adjacent to the fluvial strip of the Po – Turin stretch	Infrastructure lying inside	9,969	16
Piedmont Parks	-	Nature Reserve of Mulino Vecchio	~~4.4~~	204	30
Piedmont Parks	-	Nature Reserve of the Isolotto del Ritano	0.57	253	100
Piedmont Parks	-	Nature Reserve of the Confluence of the Dora Baltea	3.1	1,615	44
IBA	IBA027	River Po: from Dora Baltea to Scrivia (separate IBA)	Infrastructure lying inside	18,761	5

Figure 6.1.5-6: List of Natura 2000 Sites, protected areas and IBA in the sphere of influence of Saluggia nuclear complex

From the consultation of the standard model of the aforementioned Natura 2000 Sites[60], the number of habitats (Attachment I Dir. Habitat) and species of the Directive (Field 3.2) and of conservation interest (Field 3.3) recorded within them, can be obtained, as indicated in the following table. The list of habitats and species is given in Attachment 4 to this Environmental Report.

TYPE	Code	Name	Number of community habitats (Att. I 92/43/EC)	Number of plant species (Field 3.2)	Number of animal species (Field 3.2)	Number of plant species (Field 3.3)	Number of animal species (Field 3.3)
SIC/ZPS	IT1110019	Baraccone (confluence of Po – Dora Baltea)	7	-	54	-	16
ZSC-ZPS	IT1120013	Isolotto del Ritano (Dora Baltea)	6	-	16	-	10
SIC	IT1110050	Mulino Vecchio (fluvial strip of the Po)	5	-	-	-	7

Table 6.1.5-7: Number of community fauna species habitats in the Sites of the Natura 2000 Network

[60] Database of the Ministry of the Environment and the Protection of the Territory and the Sea, on the page "Cards and maps". Website ftp://ftp.minambiente.it/PNM/Natura2000/TrasmissioneCE_2015/

6.1.5.5 Ionising radiations

In this section, the results are reported of the environmental radiological monitoring conducted at the Saluggia (VC) nuclear site, dividing the Complex into two survey areas: in one lies SOGIN's Eurex plant[61] and, in the other, the Sorin Complex (now LivaNova Site Management S.r.l.) and the Avogadro Depot.

Eurex plant - SOGIN

Release conditions

The current discharge limits at the Eurex plant are indicated in the authorised Technical Instructions attached to the operating licence. Gaseous and liquid effluents, respectively, are reported below.

Gaseous effluents:

$$Noble\ Gases \leq \begin{cases} 7{,}4 \cdot 10^{14} Bq/a \\ 3.7 \cdot 10^{14} Bq/\text{13 weeks} \\ 7{,}4 \cdot 10^{13} Bq/\text{24 hours} \end{cases}$$

where Noble Gases represents the activity (Bq) expressed in terms of equivalent Kr^{85}.

$$(\beta,\gamma) \leq \begin{cases} 1{,}1 \cdot 10^{8} Bq/a \\ 5 \cdot 10^{7} Bq/\text{13 weeks} \\ 1 \cdot 10^{7} Bq/\text{24 hours} \end{cases}$$

where (β,γ) represents the activity (Bq) expressed in terms of equivalent ^{90}Sr.

where (β,γ) represents the activity (Bq) expressed in terms of equivalent ^{239}Pu.

Liquid effluents:

$$\frac{^{3}H}{10000} + {}^{90}Sr + {}^{137}Cs + {}^{134}Cs + (\beta,\gamma) + \alpha \leq \begin{cases} 1{,}85 \cdot 10^{11} Bq/a \\ 9{,}25 \cdot 10^{10} Bq/\text{13 weeks} \\ 1{,}85 \cdot 10^{10} Bq/\text{24 hours} \end{cases}$$

where:

- ^{3}H, ^{90}Sr, ^{134}Cs e ^{137}Cs represent the activity (Bq) of these radionuclides.
- (β,γ) represents the activity (Bq) of other (β,γ) – emitters expressed in terms of equivalent ^{134}Cs.
- (α) represents the activity (Bq) of the α – emitters expressed in terms of equivalent ^{239}Pu.
- This discharge formula is valid for capacities of the river Dora Baltea ≥ 10 m^3/s.

[61] Sogin doc. Sogin SL L 0023 rev.11 Report on environmental radioactivity (year 2013).
Sogin doc. Sogin SL L 0023 rev.12 Report on environmental radioactivity (year 2014).
Sogin doc. Sogin SL L 0023 rev.13 Report on environmental radioactivity (year 2015).

Monitoring of radioactive waste

The figures below report the quantity of radioactivity discharged annually through liquid and gaseous effluents, as well as the percentage use of the maximum authorised limit (%FdS) for the Eurex plant of Saluggia, regarding the three years 2013-2015[62].

Liquid discharges – Annual activity [Bq]			
Year	**2013**	**2014**	**2015**
Total activity (Bq)	**1.08E+08**	**2.98E+07**	**3.05E+07**
%FdS	**5.90E-02**	**1.60E-02**	**1.64E-02**

Figure 6.1.1-8: Annual activity and use of discharge formula of discharged radioactive liquid effluents (2013-2015)

Gaseous discharges – Annual activity [Bq]			
Year	**2013**	**2014**	**2015**
Sr-90	≤ 5.50E+02	1.45E+03	≤ 1.77E+03
Cs-134	≤ 8.40E+03	< 1.32E+04	≤ 1.32E+04
Cs-137	≤ 8.78E+03	< 139E+04	≤ 1.63E+04
I-129	9.46E+03	5.62E+03	≤ 3.69E+04
H-3	0.00E+00	0.00E+00	0.00E+00
Pu-239	≤ 2.00E+02	< 5.80E+02	≤ 2.60E+02
Alpha total	6.59E+03	9.20E+03	≤ 8.90E+03
Beta-gamma	2.92E+04	3.40E+04	≤ 3.80E+04
Noble gases (Kr-85)	0.00E+00	0.00E+00	0.00E+00
%FdS alpha	**3.00E-02**	**5.00E-02**	**3.00E-02**
%FdS beta	**6.00E-02**	**3.00E-02**	**6.00E-02**

Figure 6.1.5-9: Annual activity and use of discharge formula of discharged radioactive gaseous effluents (2013-2015)

Monitoring of environmental radioactivity

The following figures report the average concentrations of activity concerning the three years 2013-2015[63] of the main radionuclides in the most significant matrices analysed as part of the environmental surveillance of the Eurex site.

Concentration of average annual activity – LAND [Bq/kg]			
	2013	**2014**	**2015**
Caesium-137	8.21E+00	8.09E+00	1.37E+01

Figure 6.1.5-10: Concentrations of activity in the land matrix [Bq/kg] – Eurex Plant

[62] Starting from 2015, the radioactive discharges are calculated using the discharge formulae updated as part of the Deactivation Application. Moreover, with the authorisation of the decommissioning, the total radioactivity discharged with gaseous effluence is exclusively attributed to the particulates component, noble gases making no contribution.

[63] See previous note.

Concentration of average annual activity—RIVER WATER [Bq/1]			
	2013	**2014**	**2015**
Caesium-137	< 9.40E-03	< 8.37E-03	< 1.06E-02
Plutonium-239	< 2.00E-6	< 2.00E-6	< 2.00E-6

Figure 6.1.5-11: Concentrations of activity in the river water matrix [Bq/kg] – Eurex Plant

Concentration of average annual activity - DRINKING WATER[64] [Bq/l]			
	2013	**2014**	**2015**
Caesium-137	< 7.56E-03	< 1.38E-02	< 1.81E-02
Strontium-90	< 8.00E-04	< 8.40E-04	< 7.90E-04
Plutonium-239	< 6.00E-07	< 5.40E-08	< 5.60E-06

Figure 6.1.5-12: Concentrations of activity in the river water matrix [Bq/l] – Eurex Plant

Concentration of average annual activity—GROUNDWATER [Bq/l]			
	2013	**2014**	**2015**
Caesium-137	< 1.73E-04	< 1.65E-04	< 4.46E-04
Plutonium-239	< 2.00E-06	< 2.20E-06	< 2.00E-06

Figure 6.1.5-13: Concentrations of activity in the groundwater matrix [Bq/l] – Eurex Plant

Concentration of average annual activity—MILK [Bq/l]			
	2013	**2014**	**2015**
Strontium-90	1.30E-02	7.20E-03	1.22E-02

Figure 6.1.5-14: Concentrations of activity in the milk matrix [Bq/kg] – Eurex Plant

Concentration of average annual activity – CORN [Bq/kg]			
	2013	**2014**	**2015**
Caesium-137	≤ 9.08E-01	≤ 7.32E-01	≤ 9.26E-01

Figure 6.1.5-15: Concentrations of activity in the corn matrix [Bq/kg] – Eurex Plant

[64] Monferrato aqueduct.

Sorin Complex (LivaNova Site Management Srl) and Avogadro Depot

Release conditions

The plants release radioactive liquid and gaseous effluents in compliance with precise instructions assigned at the time of authorisation of the Control Bodies.

Liquid discharged – Use of the discharge formula (%)			
Year	**2013**	**2014**	**2015**
Sorin (LivaNova)[65]	**n.a.**	**n.a.**	**n.a.**
Deposito Avogadro	**1.24%**	**1.71%**	**2.36%**

Figure 6.1.5-16: Annual activity and use of discharge formula of discharged radioactive liquid effluents (2013-2015)

As regards the gaseous effluents, the environmental monitoring is carried out by fixed stations of continuous sampling of atmospheric particulate located inside the SOGIN area. The results cannot therefore be used for the purpose of assessing the population dose and the concentrations of total alpha and total beta activity found can be attributed to the presence of radionuclide of natural cosmogenic origin.

Monitoring of environmental radioactivity

The following figures report the average concentrations of activity concerning the three years 2013-2015 of the main radionuclides in the most significant matrices analysed as part of the environmental surveillance network of the Saluggia Complex [66] (formerly Sorin and Avogadro Depot).

Concentration of average annual activity – LAND [Bq/kg]			
	2013	**2014**	**2015**
Caesium-137	3.51E+01	2.96E+01	2.17E+01

Figure 6.1.5-17: Concentrations of activity in the land matrix [Bq/kg] – Saluggia Complex

[65] As regards the Sorin Site Management, it is emphasised that, at the time of authorisation, a precise discharge formula was not assigned but an instruction was given for the careful verification with regard to the radiological insignificance of 10 microSv/year, referred to in Attachment 1 of the Legislative Decree 230/95 and subsequent amendments and supplements.

[66] The results of the monitoring were taken from the Reports on environmental radiological monitoring of the Saluggia nuclear site published annually by Arpa Piemonte (internet site: Reports 2013-2014-2015).

Concentration of average annual activity—RIVER WATER [Bq/1]			
	2013	**2014**	**2015**
Caesium-137	< 3.66E-03	< 3.69E-03	< 5.84E-03

Figure 6.1.5-18: Concentrations of activity in the river water matrix [Bq/l] – Saluggia Complex

Concentration of average annual activity - DRINKING WATER[67] [Bq/l]			
	2013	**2014**	**2015**
Caesium-137	< 3.85E-03	< 3.61E-03	< 3.90E-03
Strontium-90	< 4.87E-03	< 4.75E-03	< 8.85E-03

Figure 6.1.5-19: Concentrations of activity in the well water matrix [Bq/l] – Saluggia Complex

Concentration of average annual activity—GROUNDWATER [Bq/l]			
	2013	**2014**	**2015**
Caesium-137	< 3.10E-03	< 4.72E-03	< 4.06E-03
Strontium-90	< 4.79E-03	< 7.24E-03	< 6.09E-03

Figure 6.1.5-20: Concentrations of activity in the groundwater matrix [Bq/l] – Saluggia Complex

Concentration of average annual activity – LEAFY VEGETABLES [Bq/kg]			
	2013	**2014**	**2015**
Caesium-137	< 1.56E-01	< 8.28E-02	< 1.24E-01

Figure 6.1.5-21: Concentrations of activity in the leafy vegetable matrix [Bq/kg] – Saluggia Complex

Concentration of average annual activity – CORN [Bq/kg]			
	2013	**2014**	**2015**
Caesium-137	≤ 3.54E-01	≤ 2.45E-01	≤ 6.55E-01

Figure 6.1.5-22: Concentrations of activity in the corn matrix [Bq/kg] – Saluggia Complex

[67] Monferrato aqueduct.

Equivalent dose rate in air (gamma dose)

The intensity of average equivalent dose in the year was around 0.15 µSv/h, the values oscillate within the normal fluctuations of the environmental background radiation.

6.1.5.6 Landscape

A structural element of the territory in which the Saluggia Nuclear Complex lies is the system of canals that differ in size and importance: the Cavour Canal, which takes its water from the Po at Chivasso; the Farini Canal, the Depretis Canal and the Rotto Canal from the Dora Baltea, as well as other innumerable irrigation ditches and minor canals. The area therefore presents a mainly flat morphology, characterised by vast plots mostly used for agricultural production.

The territory surrounding the complex is characterised by the presence of areas of differing naturalistic value and ecological sensitivity. Those mostly represented correspond to areas marked by the prevalence of ecosystems of anthropic derivation, mainly linked to agricultural practices. However, there are areas with a high naturalistic value, characterised by biotopes with precious niches of biodiversity and important ecological corridors (Mulino Vecchio, Isolotto del Ritano, the confluence of the River Dora Baltea and the River Po). The fluvial strip of the Dora, for example, constitutes an important, semi-natural element still rich in biodiversity, where there are concentrations of a few remains of riverside woods of willow and poplar of the zone.

Figure 6.1.5-23 shows the location of the viewpoints for monitoring by means of photographic survey campaigns planned by the operator (SOGIN) as part of the implementation of the decommissioning strategy of the plants belonging to the energy sector.

Figure 6.1.5-23: Location of the monitoring stations

Constraints

Legally protected areas (article 142 of Legislative Decree no. 42/2004)

The area of the Saluggia Nuclear Complex falls within the constraint “System of Protected Areas of the Fluvial Strip of the Po" and is included in the 150-m buffer zone from rivers, streams and watercourses, as reported in table P2 of the Regional Landscape Plan (RLP) of Piedmont (Figure 6.1.5-24).

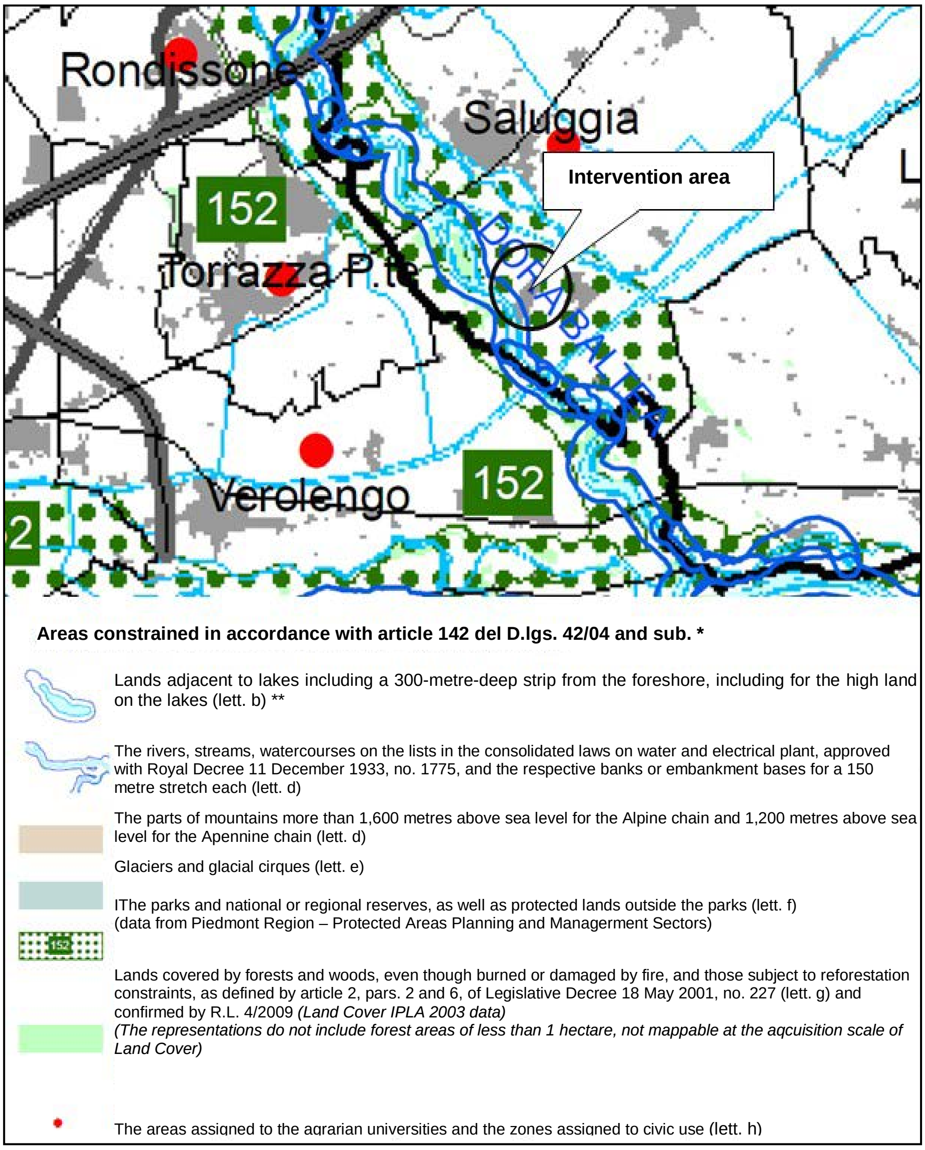


Figure 6.1.5-24: Extract of Table P2 of the RLP of Piedmont

6.1.6 <u>FN Plant of Bosco Marengo</u>

6.1.6.1 Territorial framework

The FN plant of Bosco Marengo, originally owned by the Società Fabbricazioni Nucleari and now owned by SOGIN S.p.A., is located in the municipality of the same name in the Province of Alessandria (Figure 6.1.6-1).

As regards the road network, the site lies behind the provincial road of Giovi di Serravalle (SP35bis), around 900 m from the provincial road known as the "Via delle Ghiare" (SP150), around 2.4 km from the provincial road of Levata (SP149) and around 2.4 km from the Predosa-Bettole (A26/A7) spur road.

Figure 6.1.6-1: In red, the area where the FN Plant of Bosco Marengo is located (De Agostini road database, resolution 1:250,000)

The site is located around 12 km south-east of Alessandria in the zone of plain and low hills known as the Tortonese-Alessandrina Plain: the entire sector, lying at an average height of 136 m above mean sea level, is flat with a slight slope (less than 1%) to the north-west and in certain sectors (mainly to the west and south) the terrace edges can be seen that separate high-level ground of the terrace from the current valley floor.

As regards the seismicity of the area and the hazards associated with it, based on the *Seismic classification of Piedmont territory* (Regional Government Decree no. 11-13058 of 19.01.2010), the municipality of Bosco Marengo lies in seismic zone 3.

<u>Anthropic aspects</u>

The control of the surface waters with the creation of a widespread network of artificial canals has enabled the agricultural development of the area in question.

The central stretch of the plain between the Torrente Scrivia and the Torrente Orba on which the site in question lies, is mainly used for agricultural cultivation of cereals (wheat, corn) and vegetables. The range of hills, on the other hand, is characterised by the presence of small and medium sized direct cultivation farms and, notwithstanding the rural depopulation, vineyards and fruit production are still widespread. As regards livestock, cows, pigs and poultry dominate.

In the Bosco Marengo area and the neighbouring municipalities, the protected origin supply chains that could be developed based on the regulations of the individual products are: Gorgonzola, Grana Padano, Toma Piemontese and Salamini italiani alla cacciatora. Among the protected geographical indication products, the supply chains that could be developed are: Mortadella di Bologna, Salame di Cremona, Salame Piemonte and Nocciola di Piemonte.

In the potential sphere of influence of the site, there are two plants at risk of significant risk (Ministry of the Environment and the Protection of Land and Sea, 2015).

The province of Alessandria has a complex and diverse economic structure with a marked tendency towards the services sector. Based on the ISTAT census data from 2011, 2,457 people live in the Municipality of Bosco Marengo; the employment rate is 48.12%. As regards the census of industry and services in the Municipality of Bosco Marengo, there are 147 businesses employing 618 employees.

6.1.6.2 Atmosphere

From the weather and climate point of view, the area in which the FN plant of Bosco Marengo is located displays features of the continental climate, with cold winters and often dry, hot summers, spring and winter rains. The climate is characterised by a rather uniform trend, with the prevalence of phenomena of thermal rather than dynamic origin. The region benefits from the barrier effect produced by the Alps and the hills of Monferrato on the disturbances both of Atlantic and Mediterranean origin. Most of the territory of Piedmont, especially the plain, is characterised by a particular anemological situation, in terms of the frequency of calm weather and the systematic weakness of the winds, where up to 50% of situations are without winds, especially at night in the winter. Moreover, there are significant situations, especially in winter, of thermal inversion with the formation of mist.

The thermal trend is characterised by wide temperature ranges between the summer and winter. Specifically, from the analyses of data recorded in recent years[68]:

- average annual temperature between 12.6° and 14.3°C;
- average minimum temperature in the coldest months between -6.8% and 2.6°C;
- average maximum temperature in the hottest months between 26.7° and 32.6°C;
- average annual temperature range > 30°C.

The humidity is influenced by various factors, particularly by the hydrography and especially in winter, when it rises to higher values due to the accumulation of cold air at the valley floor, which brings additional humidity from the Po. In this regard, in anti-cyclonic conditions (throughout the Po Valley and especially in the Piedmont Basin), very weak air currents prevail with light breezes. These conditions in late autumn and winter favour the accumulation of cold air on the valley floor with the formation of persistent fogs and with the consequent accumulation of any pollutants; in the hot season, the same conditions are accompanied by strong convective forces that can trigger storms.

[68] Datra referring to the ARPA “Alessandria Lobbi” station, in the period 1988-2015, www.scia.isprambiente.it

The pluviometric system is to be regarded as "sub-coastal" characterised by maximums of precipitation in the seasons of transition, spring and autumn, and minimums in winter and summer, without dry periods. The rainfall displays considerable variability over the years but is contained, in the areas of the plain, almost always remaining below 1,200 mm/year.

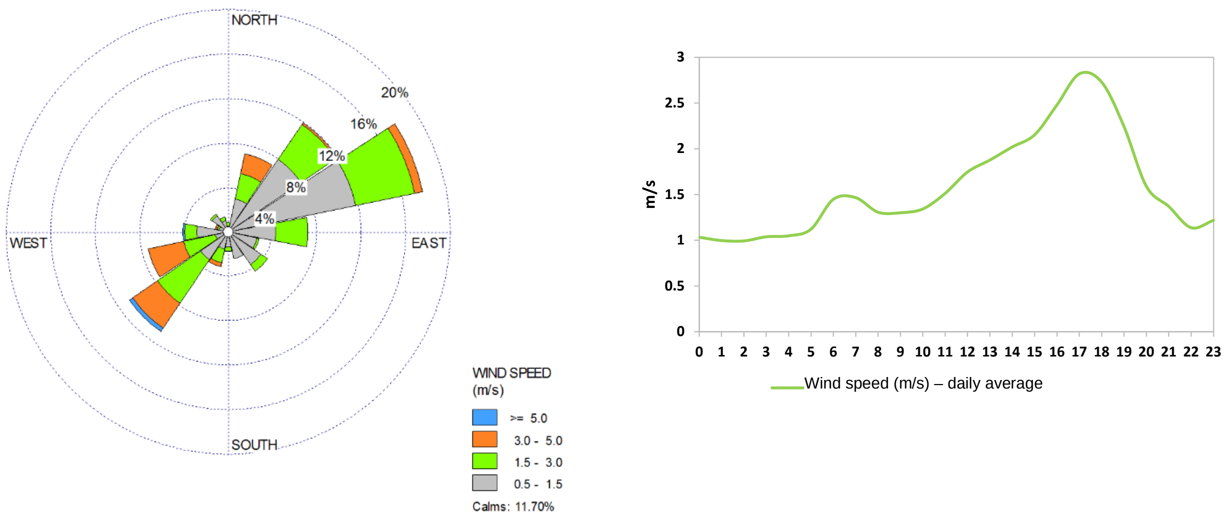
As regards the anemological system and the atmospheric stability, in accordance with the Pasquill–Gifford classification (Pasquill, 1961; Gifford, 1961), a high percentage emerges of stable classes (E, F, G), especially in winter, while unstable classes (A, B, C) are significant only in spring and summer, although limited. The maximum of category D, neutral, arrives in spring. Category G is at a maximum in autumn-winter when thermal inversion can occur in the first 100 metres of the atmosphere.

In this general context, for local detail reference can be made to the most recent surveys conducted in the area surrounding the plant, with a monitoring station active in the period June-July 2015, of which the data collected is reported below (SOGIN NPVA00981, 2015).

In the period surveyed, a wind at 10 m was recorded mainly from the NE-SW and speed lower than 3 m/s with moderate episodes of calm (around 11% of the total) (Figure (6.1.6-2). The daily wind speed trend is characterised by greater intensity during the hottest hours of the day. This confirms the absence of winds on the synoptic scale and indicates that, in the period, the thermal force was the only one to favour disturbances.

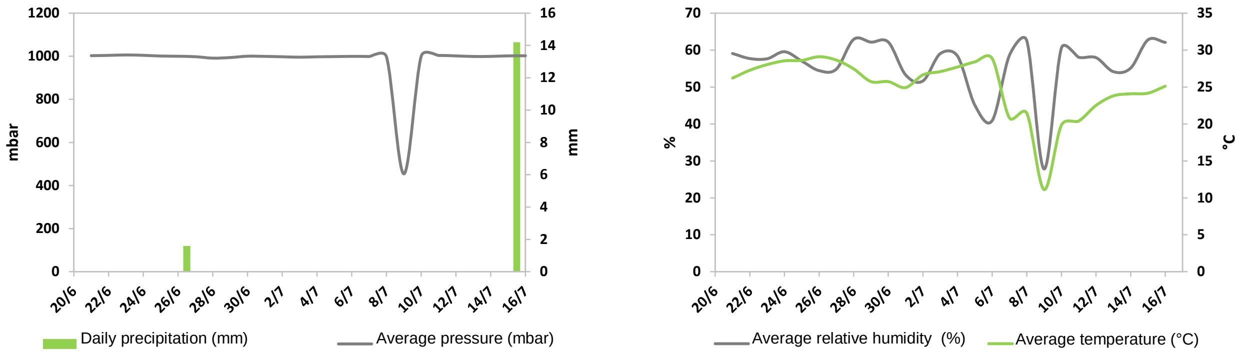
The days of the period surveyed were characterised by high pressure conditions with a day of significant precipitation. The average daily temperature values come within the average seasonal values and are between 15° and 30°C (Figure 6.1.6-3).

(a)



(b)

Figure 6.1.6-2: (a) Wind rose in the period in question and (b) average wind speed for typical day (SOGIN NPVA00981, 2015)



(a) **(b)**

Figure 6.1.6-3. (a) Trends in atmospheric pressure superimposed on daily precipitation and (b) average daily trends in the temperature and humidity for the period surveyed (SOGIN NPVA00981, 2015)

<u>Air quality</u>

As regards the state of air quality, the threshold limit values can be taken as reference for the concentrations regulated by Legislative Decree of 13/08/2010 no. 155 in implementation of the "Directive 2008/50/EC concerning ambient air quality and for cleaner air in Europe". In accordance with this regulation, the Piedmont Region, under the resolution of the Regional Council no. 41-855 of 29 December 2014, adopted the following zoning and classification of the regional territory on the basis of the objectives of protecting human health from various pollutants (NO_2, SO_2, C_6H_6, CO, PM_{10}, $PM_{2.5}$, Pb, As, Cd, Ni, B(a)P):

- Agglomerate of Turin;
- Zone called *Plain*;
- Zone called *Hill*;
- Zone called *Mountain*.

The FN site of Bosco Marengo comes within the "Plain" zone. This zone is characterised by the existence of levels above the upper assessment threshold, including for the following pollutants: NO_2, PM_{10} e $PM_{2.5}$.

6.1.6.3 Water environment

<u>Surface waters</u>

The area in question is located in the Alessandrina-Tortonese Plain, crossed in the western part by the River Tanaro with tributaries on the right, such as the River Bormida, the Torrente Orba, the Rio Lovassina and, in the eastern sector, the Torrente Scrivia and the Torrente Curone

The Plant is located on the right bank of the Rio Lovassina, which is the body of water that receives the discharges of the Plant; the Rio has an average annual capacity of 0.16 m^3/s (Piedmont Region, 2007).

As regards the environmental state of the surface waters, ARPA Piedmont defines the Overall State of the Rio Lovassina as "Not Good" for the three years 2012-2014. This state derives from a "Sufficient" Ecological State and a Chemical State class of "Good".

As regards the hydraulic danger associated with the area in question, this is not within any of the perimeters connected to the flood risk identified in the Extract Plan for the Hydrogeological Structure from the Po Basin Authority (Piedmont Region, 2005).

Hydrogeology notes

In general, the underground water circulation in the area of the plain is characterised by the presence of a surface aquifer and a multilayer deep aquifer. In the flat zones, the surface layer is located more or less in the deposits of the series of fluvial deposits, while the deep layer in the Villafranchiani series of deposits and in the underlying series of marine deposits of the Pliocene epoch.

In the area between River Tanaro and Scrivia, the surface aquifer has a variable average depth to groundwater of between 0-10 m from the p.c. in the plain zone and 10-20 m in the area of the alluvial cone.

6.1.6.4 Biodiversity

The area analysed is the result of strong anthropic determinism and characterised mainly by agricultural areas and, secondarily, by the scattered urban fabric and the industrial zones of the Municipality of Bosco Marengo. The agricultural areas mostly made up of extended areas of cultivation, sometimes lined by rows of trees.

There are few areas with natural vegetation: these are made up of hedges and narrow strips of trees - shrubs along the canal ditches, which represent the few ecological corridors in the territory. The territorial simplification and the reduced biodiversity can also be attributed to the total absence of protected areas and Natura 2000 sites in the area surrounding the site.

The species of fauna potentially present in the area are those linked to mankind, anthropophile species, or at least tolerant of human presence. The fauna in this area is also made up of the typical species of open environments and species linked to the presence of shrub vegetation.

Among the mammals potentially present is the west European hedgehog (*Erinaceus europaeus* Linnaeus, 1758), which, although it prefers zones covered with vegetation, also live in open environments. Another species potentially present is the fox (*Vulpes vulpes* Linnaeus, 1758), a species that lives in all environments, both the plain and the mountain, and, being adapted to human presence, it is also present in inhabited centres.

The open environments may be frequented by certain species of reptiles, such as the green lizard (*Lacerta viridis* Laurenti 1768) and the Italian wall lizard (Podarcis siculus (Rafinesque, 1810) and the green whip snake (*Hierophis viridiflavus* (Lacépède, 1789)).

The watercourses to the south of the plant could also make possible the presence of amphibians: the common toad (*Bufo bufo* (Linnaeus, 1758)), the green toad (*Bufotes viridis* (Laurenti, 1768)) and the green toad.

As regards the avifauna, those connected to open spaces and agricultural areas for food sources are potentially present: the goldfinch (*Carduelis carduelis* (Linnaeus, 1758)), the European robin (*Erithacus rubecula* (Linnaeus, 1758)), and the Eurasion magpie (*Pica pica* (Linnaeus, 1758)). Among the species potentially present in this area, there are passeriforms such as the Eurasian skylark (*Alauda arvensis* Linnaeus, 1758), the European stonechat (*Saxicola rubicola* (Linnaeus, 1766)) and the barn swallows (*Hirundo rustica* Linnaeus, 1758). The hooded crow is very common (*Corvus cornix* Linnaeus, 1758), and the rock dove, present in semi-domestic populations (*Columba livia* var. *domestica*). The open areas can be used as hunting grounds by some birds of prey such as the common kestrel (*Falco tinnunculus* Linnaeus, 1758) and the common buzzard (*Buteo buteo* (Linnaeus, 1758)). The shrubs can be used by the common blackbird (*Turdus merula* Linnaeus, 1758), the nightingale (*Luscinia megarhynchos* (C. L. Brehm, 1831)) and the blackcap (*Sylvia atricapilla* (Linnaeus, 1758)).

The proximity to habitations and the presence of some rural buildings encourage the presence of anthropophile and synanthropic species or that tolerate human presence. These species in the theriofauna, there are rodent species such as the house mouse (*Mus domesticus* Linnaeus, 1758), the brown rat (*Rattus norvegicus* Berkenhout, 1769) and the black rat (*Rattus rattus* Linnaeus, 1758). Among the reptiles are the common gecko (*Tarentola mauritanica* (Linnaeus, 1758)) and the Mediterranean house gecko (*Hemidactylus turcicus* (Linnaeus, 1758)) are habitual guests of human habitations, where they are sheltered from the snakes and birds that prey on them.

6.1.6.5 *Ionising radiations*

Release conditions

The current discharge limits were authorised by the authorisation decree in the first phase of deactivation, Ministerial Decree 27 November 2008.

Gaseous effluents:

$$U_{Tot} \leq \begin{cases} 90 \text{ g/year} \\ 45 \text{ g/quarter} \\ 9 \text{ g/week} \end{cases} \quad \begin{cases} 7.0 \cdot 10^6 \text{ Bq/year} \\ 3.5 \cdot 10^6 \text{ Bq/quarter} \\ 7.0 \cdot 10^5 \text{ Bq/week} \end{cases}$$

Liquid effluents:

$$U_{Tot} \leq \begin{cases} 6kg/a \\ 3kg/trim. \\ 0{,}6kg/24\ hours \end{cases} \begin{cases} 4{,}78 \cdot 10^8 Bq/a \\ 2{,}39 \cdot 10^8 Bq/trim. \\ 4{,}8 \cdot 10^7 Bq/24\ hours \end{cases}$$

Monitoring of radioactive waste

The figures below report the quantity of radioactivity discharged annually through liquid and gaseous effluents, as well as the percentage use of the maximum authorised limit (%FdS) for the Plant of Bosco Marengo, regarding the three years 2013-2015[69].

[69] Sogin doc. Sogin FN DS 0949 rev.00 Environmental Surveillance Report (year 2013).
Sogin doc. Sogin FN DS 0990 rev.00 Environmental Surveillance Report (year 2014).
Sogin doc. Sogin FN DS 1023 rev.00 Environmental Surveillance Report (year 2015).

Bosco Marengo Plant – liquid discharges – total uranium			
Year	**2013**	**2014**	**2015**
Equivalent activity [Bq]	9.95E+07	2.71E+07	1.57E+07
Total uranium [kg]	1.25E+03	3.40E-01	1.96E-01
%FdS	2.08E+01	5.67E+00	3.27E+00

Figure 6.1.6-4: Annual activity, total quantity and use of discharge formula of discharged radioactive liquid effluents (2013-2015)

Bosco Marengo Plant – gaseous discharges – total uranium			
Year	**2013**	**2014**	**2015**
Equivalent activity [Bq]	3.79E+04	8.10E+03	6.10E+03
Total uranium [g]	4.83E-01	1.03E-01	7.78E-02
%FdS	5.37E-01	1.15E-01	8.65E-02

Figure 6.1.6-5: Annual activity, total activity and use of discharge formula of discharged radioactive gaseous effluents (2013-2015)

Monitoring of environmental radioactivity

The figures below give the average concentrations of activity in the most significant matrices expressed as total uranium for the three-year period 2013-2015[70].

Concentration of average annual activity – LAND [71] [ppm]			
	2013	**2014**	**2015**
Total uranium	6.21E-01	5.86E-01	4.08E-01

Figure 6.1.6-5: Concentrations of activity in the land matrix [ppm] – Bosco Marengo Plant

Concentration of average annual activity—GROUNDWATER [ppm]			
	2013	**2014**	**2015**
Total uranium	7.42E-04	5.67E-04	4.92E-04

Figure 6.1.6-6: Concentrations of activity in the groundwater matrix [ppm] – Bosco Marengo Plant

Concentration of average annual activity—RIVER WATER [ppm]			
	2013	**2014**	**2015**
Total uranium	9.75E-04	5.65E-04	4.67-04

Figure 6.1.6-7: Concentrations of activity in the river water matrix [ppm] – Bosco Marengo Plant

Concentration of average annual activity – FLUVIAL SEDIMENTS [ppm]			
	2013	**2014**	**2015**
Total uranium	1.05E+00	6.52E-01	5.40E-01

Figure 6.1.6-8: Concentrations of activity in the fluvial sediments matrix [ppm] – Bosco Marengo Plant

[70] See previous note.
[71] The values refer to soil samples taken along the plant perimeter.

Equivalent dose rate in air (gamma dose)

The intensity of average equivalent dose in the year was around 0.07 µSv/h, the values oscillate within the normal fluctuations of the environmental background radiation.

6.1.7 RC ENEA Casaccia

6.1.7.1 Territorial framework

The ENEA Casaccia Research Centre is located in Casaccia, in the Municipality of Rome, in an area between Via Anguillarese and Via Braccianese Claudia (Figure 6.1.7-1).

The main roads in the vicinity of the research site are the provincial road called "Via Anguillarese" (SP5a), which crosses the area occupied by the Research Centre, the provincial road "Via Braccianese Claudia" (SP493), around 100 m approx. away to the south of the site; the provincial road "Palidoro-Crocicchie" (SP15b), 3.6 km away to the west-south-west and the provincial road "Santo Stefano" (SP4b), around 3.7 km away to the west-north-west.

Figure 6.1.7-1: In red, the area where the CCR ENEA Casaccia is located (De Agostini road database, resolution 1:250,000)

The area concerned is located on the southern slope of the volcanic hill that incorporated Lake Bracciano at the top of a weak sub-planar relief, between the valleys of Fosso Rosciolo and Fossetto, right-bank tributaries of the River Arrone that descend towards the south-east and south-west at heights of between 150 and 130 metres above mean sea level.

As regards the area's seismicity and the danger associated with it for the Lazio Region, reference can be made to the *New Seismic Classification of the territory of the Lazio Region* (Regional Council Decree 387/09 and subsequent amendments and supplements) that amend the national classification, defining *Seismic Administrative Units* extending to municipalities and establishing certain subzones: the territory of the Rome Municipality XV (formerly XX), which includes the Casaccia area, lies in seismic zone 3, subzone A (3A).

Anthropic aspects

The territorial context in which the site lies is characterised by a multi-causal development model that is typical of the agricultural municipalities north of Rome; as regards the agro-territorial system of the area, there is a high incidence of large farms (>50 hectares), equal to the average size of livestock activities.

The remarkable concentration of agricultural land in large farms influences the production systems with a marked predominance of extensive cereal cultivation and livestock rearing.

In the Casaccia area, the protected origin supply chains that could be developed based on the regulations of the individual products are: Pecorino Romano, Ricotta Romana, Mozzarella di Bufala Campana, Ricotta di Bufala Campana, Salamini italiani alla cacciatora and wine products such as "Roma" and "Tarquinia". Among the protected geographical indication products, the supply chains that could be developed are: Abbacchio Romano, Agnello del Centro Italia, Mortadella di Bologna, Carciofo Romanesco del Lazio and "Lazio" wine. In particular, producers in the supply chain of protected origin Ricotta Romana and protected geographical indication Agnello del Centro Italia were much in evidence in the zone.

The territory of Cesano-Casaccia, the location of the Casaccia Research Centre, is part of Municipality XV of the Municipality of Rome, established in 2013; the Municipality has a population of 158,161 inhabitants while, with reference to the ISTAT census data of 2011 for the entire Municipality of Rome, there are 2,617,175 people; the employment rate of the entire municipality of 47.38%. As regards the census of industry and services in the Municipality of Rome, there are 244,688 businesses employing 1,308,361 employees.

6.1.7.2 *Atmosphere*

The zone presents a climate that is generally not excessively hot in the summer and mild in the winter, only rarely very cold. Specifically, from the analyses of data recorded in recent years[72]:

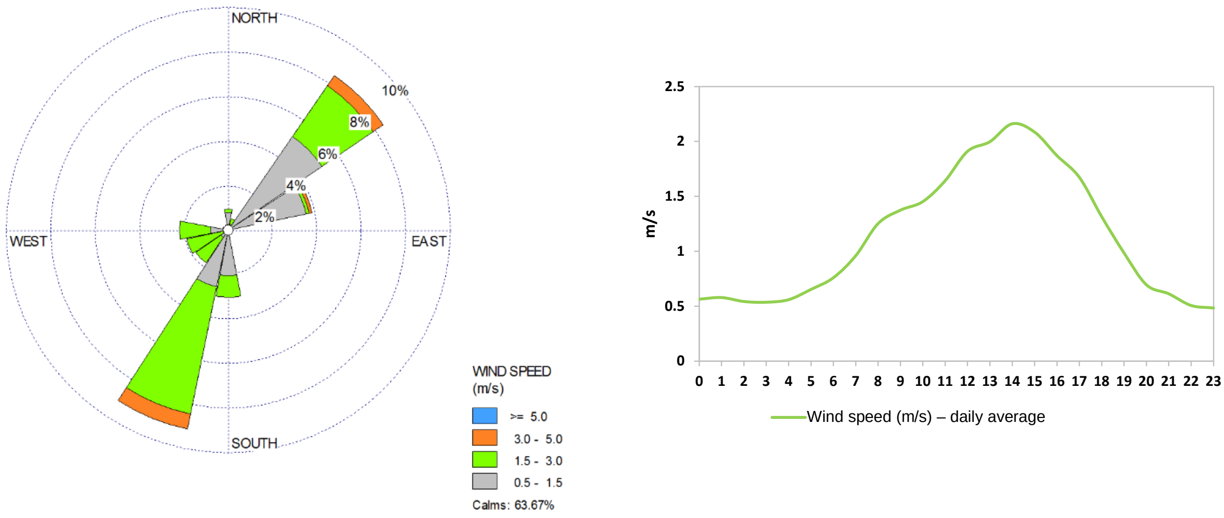
- average annual temperature between 14.4° and 16.6°C;
- average minimum temperature in the coldest months between -1.1° and 6.1°C;
- average maximum temperature in the hottest months between 27.9° and 35.6°C;
- average annual temperature range > 25°C.

Rainfall is mainly concentrated in the autumn and spring months. The average annual precipitation stands at around 950 mm, with a minimum in summer and a maximum peak in autumn. The average annual relative humidity stands at around a value of 73% with minimums of 66% in July and August and maximums of 80% in November and December. The local winds are mostly breezes and calm days take up around 18% of the annual frequencies.

In this context, for local detail reference can be made to the most recent surveys conducted in the area surrounding the Centre, with a monitoring station active in the period May-June 2015, of which the data collected is reported below (SOGIN NPVA00930, 2015).

In the period surveyed, a wind at 10 m was recorded mainly from the NE-SW and speeds lower than 3 m/s with moderate episodes of calm (around 63% of the total) (Figure 6.1.7-2). The daily wind speed trend is characterised by greater intensity during the hottest hours of the day. This confirms the absence of winds on the synoptic scale and indicates that, in the period, the thermal force was the only one to favour disturbances.

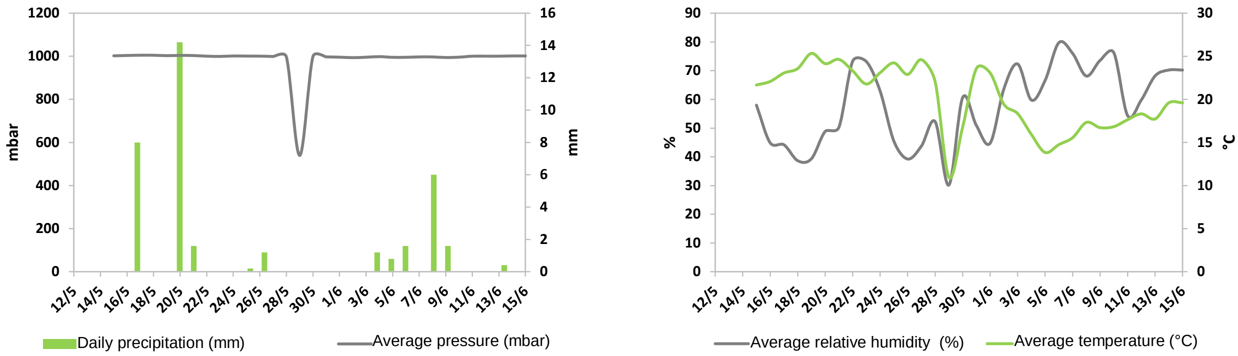
The days of the period surveyed were characterised by low pressure conditions with some phenomena of precipitation. The average daily temperature values come within the average seasonal values and are between 12° and 24°C (Figure 6.1.7-3).



(a) **(b)**

Figure 6.1.7-2: (a) Wind rose in the period in question and (b) average wind speed for typical day (SOGIN NPVA00930, 2015)

[72] Data referring to the ARSIAL Lazio "Bracciano" station, period 2004-2015, www.scia.isprambiente.it



(a) (b)

Figure 6.1.7-3. (a) Trends in atmospheric pressure superimposed on daily precipitations and (b) average daily trends in the temperature and humidity for the period surveyed (SOGIN NPVA00930, 2015)

Air quality

As regards the state of air quality, the threshold limit values can be taken as reference for the concentrations regulated by Legislative Decree 13/08/2010 no. 155 in implementation of the “Directive 2008/50/EC concerning ambient air quality and for cleaner air in Europe”. In accordance with these regulations, the Lazio Region, under the Regional Council Resolution no. 217 of 18/05/2012 approved the following zoning of the territory:

- Rome Agglomerate Zone
- Zone 1: Apennine Zone
- Zone 2: Valle del Sacco Zone
- Zone 3: Coastal Zone

The area in which the site is located comes within the "Rome Agglomerate Zone" and is characterised as follows:

- nitrogen dioxide values are above the upper assessment threshold of the annual limit;
- PM_{10} values above the upper assessment threshold of the daily average limit value;
- $PM_{2.5}$ values above the upper assessment threshold with reference to the annual average limit value;
- ozone value above the long-term objective.

6.1.7.3 Water environment

Surface waters

The area of the Casaccia Research Centre is located in the Sabatino Volcanic District, characterised by a complex morphology since it is the outcome of the widespread development of the zone. Some of the numerous single and multiple crater volcanic depressions, which can still be recognised today, have been occupied by bodies of water.

The lacustrine basins, Bracciano but also the smaller Martignano, are actually branches of the regional water table contained in these areas within the series of volcanos (Camponeschi & Lombardi, 1969).

The hydrographic network displays numerous natural rainfall drainage ditches that radiate from the centre of the volcanic system, along its sides, towards the peripheral zones, taking on a ring-like centrifugal shape with a series of watercourses including the Arrone, an outlet of Lake Bracciano. The area of the Casaccia Research Centre is between the “Rosciolo" and “Fossetto” ditches, tributaries on the right bank of the River Arrone.

The body of water that receives the Casaccia RC is the Fossetto. Surveys conducted in the 1960s (Dall'Aglio & Giannotti, 1964) measured its capacity downstream from the confluence with the Rosciolo at around 0.16 m^3/s, while the River Arrone, after receiving the contribution of the Fossetto was around 0.25 m^3/s.

As regards the qualitative state of surface waters, the Lazio Regional Water Protection Plan (RWPP) conducted its only classification of the Ecological State (SECA) for the stations distributed across the territory without assessment the environmental state (SACA). For the River Arrone, the Ecological State, in the station near the Casaccia Centre in the year 2003 was "Very bad".

ARPA Lazio, for the assessment of the quality of the significant bodies of water, published the following ecological and chemical quality indices of the river regarding the three years 2011-2013, detected in the monitoring station considered in the RWPP.

2011-2013 INDICES	**RIVER ARRONE**
LIMeco	Poor
Diatoms	Sufficient
Macrophytes	Sufficient
Macroinvertebrates	Poor
Chemical	No excess

The current HSP *(Hydrogeological Structure Plan)* of the Lazio Regional Basins Authority does not define areas of hydraulic danger ("area subject to protection from danger of flooding") in the zone in question; however, along the watercourse called *Il Fossetto*, an area can be identified of *warning of danger of flooding* (which in the Hydrogeological Structure Plan is associated with *all watercourses on the lists of water referred to the in the Consolidate Act 1775/33, as identified in the Regional Council Resolution no. 452 of 01/04/05,* with the methods described in article 9, letter b in the Implementation Regulations of the HSP).

As regards the areas in question, certain sectors are included *in the warning area* defined above; the performance of any interventions as part of the NP must therefore be subject to the Implementation Regulations of the HSP (Article 27) regarding the hydraulic warning areas, which lays down the conduct of suitable hydraulic studies aimed at assessing – on the basis of the objective situation - the actual level of danger associated with the zone. In order to identify significant environmental criticalities, it is emphasised that the absence of hydraulic danger zones of any level in the zone in question.

Hydrogeology notes

The general hydrogeological framework is made up of a large continuous aquifer system in the entire area of volcanic heights that form a reservoir of regional importance, supported by a pre-volcanic bedrock that represents its basal aquiclude. The underground water circulation in volcanic rocks can be divided into two types (Capelli et al., 2005):

- the local type, in the part closest to the topographical surface, as a consequence of the contrasting permeability of volcanic terrains along the vertical, which can be permanent or temporary;
- the deep type, with circulation and storage in the basal part of the volcanic system, on average 100-150 metres thick, supported at the base by plio-quaternary marine clay formations. This is a potent layer (base layer) that extends over the entire volcanic area continuously between the various buildings and systems.

6.1.7.4 Biodiversity

At first sight, the territory surveyed appears as a mosaic of generally anthropized environments within which, however, isolated centres can be found, in marginal positions, of forms of vegetation that have retained a certain degree of naturalness over time. The territorial matrix is strictly agricultural, made up of fields, crops and rural settlements. Alongside cultivation systems, there are rolling meadows, horticultural hedges, residual and fragmentary strips of farm copses.

The wooded areas lie on slopes of the complex hydrographical grid. In particular, woods of mostly turkey oak (*Quercus cerris* L.) are found with the local presence of Italian oak (*Quercus frainetto* L.), generally preserved in less accessible places, located in correspondence of flat or slightly inclined surfaces, where they grow in deep soil, generally rich and usually subacid. This type represents the major part of the wooded formations in the area in question, together with deciduous woods dominated by *Quercus cerris L.,* often accompanied by the European hop-hornbeam (*Ostrya carpinifolia* Scop.) and downy oak (*Quercus pubescens* W.) and, indeed, especially in situations of close contact with other phytocoenosis, sporadic examples of English oak (*Quercus robur* L.) and holm-oak (*Quercus ilex* L.). These areas are elements of primary connection, according to the Ecological Network of the Province of Rome. They are in contact with agricultural areas, vital to ensure the ecological functioning of the Provincial Ecological Network and called “green ribbons”.

Post-cultivation sub-Mediterranean vegetation is widespread: this form of vegetation is the only semi-natural meadow biocoenosis. These are meadows shaped by the constant presence, albeit to a varying degree, of grasses, legumes and a network of spinous and/or poisonous plants bearing witness to the frequent use for pasture of these areas.

In terms of fauna, the area has quite a variety of avifauna, made up of species typical of oak woods, alternating with pasturelands and cultivated areas, in addition to many other common species in all the environments, that is, ubiquitous. The populations of reptiles and amphibians are made up of species of conservation interest forming part of the Natura 2000 Sites, falling partly in the area surveyed. The broad-leaf forest formations are mainly surrounded by post-cultivation meadow formations and agro-ecosystems with very widespread species, such as the common wall lizard (*Podarcis muralis* Laurenti, 1768) and the Italian wall lizard (*Podarcis siculus* (Rafinesque, 1810)) among the Lacertidae, the two typical geckos of urban areas, the Mediterranean house gecko (*Hemidactylus turcicus* (Linnaeus, 1758)) and the common gecko (*Tarentola mauritanica* (Linnaeus, 1758)) and among the Colubridae, the green whip snake (*Hierophis viridiflavus* (Lacépède, 1789)). Among the amphibians, species such as the common toad (*Bufo bufo* Linnaeus, 1758)) and the green frog manage to exploit any type of body of water.

The complete list of protected areas is given below with the respective distances from the nuclear complex, the total area and the percentage coverage of the area lying within the sphere of influence surveyed.

TYPE	CODE	NATURA 2000 SITES/PROTECTED AREAS	Approximate minimum distance of the infrastructure (km)	Total area (hectares)	Approximate coverage falling within the sphere of influence (%)
ZPS	IT6030085	Bracciano-Martignano Complex	2.9 (distance considered by the IPU plant)	19,554	6
AANP	EUAP1083	Natural monument Ancient tunnel	0.45	31	100
PNR	EUAP1079	Regional natural park of the lacustrine complex Bracciano - Martignano	4.3	16,692	2
IBA	IBA210	Lake Bracciano and Monti della Tolfa	2.9	90,681	1

Figure 6.1.7-4: List of Natura 2000 Sites, protected areas and IBA in the sphere of influence of Casaccia ENEA Research Centre

From the consultation of the standard model of the aforementioned Natura 2000 Sites[73], the number of habitats (Attachment I Dir. Habitat) and species of the Directive (Field 3.2) and of conservation interest (Field 3.3) recorded within them, can be obtained, as indicated in the following table. The list of habitats and species is given in Attachment 4 to this Environmental Report.

TYPE	Code	Name	Number of community habitats (Att. I 92/43/EC)	Number of plant species (Field 3.2)	Number of animal species (Field 3.2)	Number of plant species (Field 3.3)	Number of animal species (Field 3.3)
ZPS	IT6030085	Bracciano-Martignano Complex	6	-	51	11	9

Table 6.1.7-5: Number of community fauna species habitats in the Sites of Natura 2000 Network

6.1.7.5 Ionising radiation

Release conditions

The plants release radioactive liquid and gaseous effluents in compliance with precise instructions assigned at the time of authorisation. Discharge in the external environment of liquid radioactive waste can only take place from the complex of the installations of the Nuclear Centre of the Casaccia Research Centre in compliance with specific limits laid down for each radionuclide. The discharge authorisation is provided by the Representative on the site of Holder of the Waiver, on the basis of the radioprotection assessments carried out by the Centre's Qualified Expert.

[73] Database of the Ministry of the Environment and the Protection of the Territory and the Sea, on the page "Cards and maps".
Website ftp://ftp.minambiente.it/PNM/Natura2000/TrasmissioneCE_2015/

In relation to the extent of the gaseous effluents of the Casaccia Research Centre, a discharge formula has not been defined for the present plants, with the exclusion of the Plutonium Plant (IPU), the maximum discharge limit of which is defined in the Technical Instructions and given below.
All the plants of the Centre are furnished, however, with an extraction chimney with absolute filters and monitoring instruments with alarm thresholds and continuous registration of the discharged radioactivity.

Gaseous effluents

Discharge limit for Plutonium Plant

$$\alpha \leq \begin{cases} 7 \cdot 10^5 Bq/a \\ 3{,}5 \cdot 10^5 Bq \, /13 \; weeks \end{cases}$$

where (α) represents the activity (Bq) of the α-emitters.

Monitoring of radioactive discharges

The figures below report the quantity of radioactivity discharged annually through liquid and gaseous effluents, as well as the percentage use of the maximum authorised limit (%FdS) for the IPU Plant, regarding the three years 2013-2015[74].

Nucleco – liquid discharges – Annual activity for radionuclide (Bq)			
Radionuclide	**2013**	**2014**	**2015**
H-3	7.91E+09	4.08E+08	9.25E+08
C-14	9.16E+05	6.54E+05	5.93E+05
Co-60	3.94E+03	1.32E+03	9.98E+02
Sr-89	3.23E+07	1.23E+06	7.87E+06
Sr-90	1.24E+05	7.79E+04	1.26E+05
Ru-106	2.97E+04	8.04E+03	5.20E+03
I-125	6.04E+03	1.96E+03	1.43E+03
I-131	2.88E+03	8.43E+02	5.52E+02
Cs-134	2.16E+03	9.69E+02	6.30E+02
Cs-137	2.17E+05	1.22E+05	2.24E+05
Eu-152	6.16E+03	2.55E+03	1.58E+03
Ra-226	6.68E+04	2.31E+04	2.24E+04
Th-232	1.31E+04	5.18E+03	3.76E+03
U-235	8.10E+01	5.61E+01	5.24E+02
U-238	8.02E+02	6.50E+02	1.03E+04

[74] ENEA RTI IRP (2014) – Annual report on environmental radioactivity of the Casaccia Research Centre (year 2013).
ENEA RTI IRP (2015) – Annual report on environmental radioactivity of the Casaccia Research Centre (year 2014).
ENEA RTI IRP (2016) – Annual report on environmental radioactivity of the Casaccia Research Centre (year 2015).

Nucleco – liquid discharges – Annual activity for radionuclide (Bq)			
Radionuclide	**2013**	**2014**	**2015**
Pu-238	9.41E+01	5.64E+01	5.98E+01
Pu-239	9.41E+01	5.64E+01	5.98E+01
Pu-240	9.41E+01	5.64E+01	5.98E+01
Pu-241	3.75E+04	4.23E+04	3.17E+04
Am-241	1.15E+02	8.10E+01	7.82E+01
Pu-242	9.41E+01	5.64E+01	5.98E+01
Total activity [Bq]	**7.94E+09**	**4.10E+08**	**9.34E+08**

Figure 6.1.7-6: Annual activity of discharged radioactive liquid effluents – Nucleco (2013-2015)

Gaseous discharges – Annual activity for radionuclide (Bq)				
TRIGA - RC 1 TAPIRO	**Radionuclide**	**2013**	**2014**	**2015**
	Ar-41	1.77E+11	4.58E+11	3.61E+11
	Kr-88	-	-	-
	I-131	< 1.00E+06	< 1.00E+06	< 1.00E+06
IPU ED OPEC	**Alpha totale**	1.55E+04	1.68E+04	1.51E+04
	Beta-gamma totale	7.63E+04	2.75E+05	2.19E+05

Figure 6.1.7-7: Annual activity of the radioactive gaseous discharged by all the plants in the Casaccia Research Centre (2013-2015)

Monitoring of environmental radioactivity

The following figures report the average concentrations of activity concerning the three years 2013-2015[75] of the main radionuclides in the most significant matrices analysed as part of the environmental surveillance of the Casaccia Research Centre.

Concentration of annual media activity – LAND [Bq/kg]			
	2013	**2014**	**2015**
Caesium-137	3.87E+00	4.13E+00	4.74E+00
Plutonium-239	≤ 1.06E-01	≤ 4.98E-02	1.70E-01

Figure 6.1.7-.8: Concentrations of activity in the land matrix [Bq/kg] – Casaccia Research Centre

Concentration of average annual activity—RIVER WATER [Bq/1]			
	2013	**2014**	**2015**
Alfa total	1.35E-01	2.66E-01	1.03E-01

[75] See previous note.

Beta total	5.22E-01	5.54E-01	6.68E-01
Caesium-137	< 7.05E-03	< 6.56E-03	< 6.05E-03

Figure 6.1.7-9: Concentrations of activity in the river water matrix [Bq/kg] – Casaccia Research Centre

Concentration of average annual activity - DRINKING AND GROUNDWATER [Bq/l]			
	2013	**2014**	**2015**
Caesium-137	< 9.20E-03	< 1.01E-02	< 1.10E-02

Figure 6.1.7-10: Concentrations of activity in the well water matrix [Bq/l] – Casaccia Research Centre

Concentration of average annual activity—MILK [Bq/l]			
	2013	**2014**	**2015**
Strontium-90	2.01E-02	1.47E-02	1.84E-02

Figure 6.1.7-11: Concentrations of activity in the milk matrix [Bq/] – Casaccia Research Centre

Concentration of annual media activity – LEAFY VEGETABLES [Bq/kg]			
	2013	**2014**	**2015**
Caesium-137	1.28E+00	1.67E+00	8.80E-01

Figure 6.1.7-12: Concentrations of activity in the leafy plant matrix [Bq/kg] – Casaccia Research Centre

Equivalent dose rate in air (gamma dose)

The intensity of average equivalent dose in the year was around 0.16 µSv/h, the values oscillate within the normal fluctuations of the environmental background radiation.

6.1.8 Rotondella ITREC Plant

6.1.8.1 Territorial framework

The ITREC Plant is located inside the ENEA Research Centre, in the “Trisaia Inferiore” area of the Municipality of Rotondella, in the Province of Matera (Figure 6.1.8-1).

The grounds of the Centre are bordered to the north by the River Sinni, to the east by the Jonica state road (SS106) and to the south by the provincial Trisai road that, together with the Sinnica state road (SS653) at a distance of around 500 m to the north), make up the main communication links closest to the site.

Figure 6.1.8-1: In red, the area where the ITREC Plant of Rotondella is located (De Agostini road database, resolution 1:250,000)

The ITREC plant is located in the extreme south of the Metaponto plain at the top of one of the lower and most recent marine terraces that characterise this sector at a height of around 39-40 metres above sea level on the right bank of the River Sinni, which lies at a height of around 15 metres above mean seal level.

As regards the area’s seismicity and the dangers associated with it, the Basilicata Region has adopted the seismic classification of the national territory (Order of the President of the Council of Ministers no. 3274 of 20 March 2003) which places the Municipality of Rotondella, which includes the Trisaia site, in seismic zone 2.

Anthropic aspects

The use of the soil in the area in question displays a marked emphasis on agriculture, developed following reclamation works carried out in the last century and that enable the spread of specialised cultivation along the coastal zone, while pine trees and dense "Mediterranean scrub" vegetation mark the border with the coast. Olive cultivation, which, together with wheat, is the most ancient crop of the territory, is now much less widespread. Livestock mainly consists of beef and dairy cattle, mainly bred on small family farms.

In the Rotondella's municipalities and the neighbouring municipalities, the DOP supply chains that could be developed based on the regulations of the individual products are: Caciocavallo Silano cheese and “Matera” wine. Among the protected geographical indication products, the supply chains that could be developed are: Matera bread, Rocca Imperial lemons and “Basilicata” wine. In particular, producers were found in the zone involved in the production chain of the “Matera” DOP wine, Rocca Imperiale lemons and “Basilicata” IGP wine.

The Trisaia is part of the Municipality of Rotondella, which has around 2,707 inhabitants, according to the ISTAT census data of 2011; the employment rate is 40.65%. As regards the census of industry and services in the Municipality of Rotondella, there are 119 businesses employing 328 people.

6.1.8.2 Atmosphere

The area in which the Rotondella ITREC plant lies is characterised by a “Mediterranean” type climate with hot, wet summers and mild winters, influenced by the seasons and the special orographic situation. Indeed, the Apennine chain to the west protects against disturbances from the north-west and the proximity of the Ionian Sea regulates the daytime cloud formation.

The precipitation is not uniform but is mostly concentrated in the transitional seasons and very low, with an annual average of 500 mm, often below this threshold.

In particular, as regards the temperatures, from the analysis of data recorded in recent years[76]:

- average annual temperature between 15.8° and 18.2°C;
- minimum average temperature in the coldest months between 2.3° and 9.4°C;
- minimum average temperature in the hottest months between 28.6° and 34.8°C;
- annual average temperature range > 25°C.

About the atmospheric stability, the annual trend displays the maximum for category D during the whole year with the minimum values in the summer months. At the monthly level, the unstable categories (A, B, C) display typical trends, that is, greater frequency in the hot periods, when the wind is from the south-west and north-west sectors (SOGIN NPVA0127, 2008).

For more local detail, refer to the data collected in the course of 2015 from a control unit installed a short distance from the plant: Figure 6.1.8-2 gives the monthly averages for the meteorological parameters measured at the site in the course of the year (SOGIN NPVA00960, 2015).

The thermal profile from the second phase of monitoring (May-December 2015) was characterised by lower average temperatures (3/4°C) compared to the date recorded at the Trisaia CRE station in the period 1990-2001. The maximum temperatures reached values up to 36°C in July and the minimums were as low as -4°C in December.

The level of relative humidity remained in line with the monthly average in the period 1990-2001 and varying between 50-60% in the summer months and up to 70% in winter.

Precipitation was abundant and the autumn saw especially plentiful rainfall with a total value in October of 204 mm.

As regards the barometric regime, in the period surveyed stable average monthly values of around 1010 mBar and high-pressure conditions in November and December.

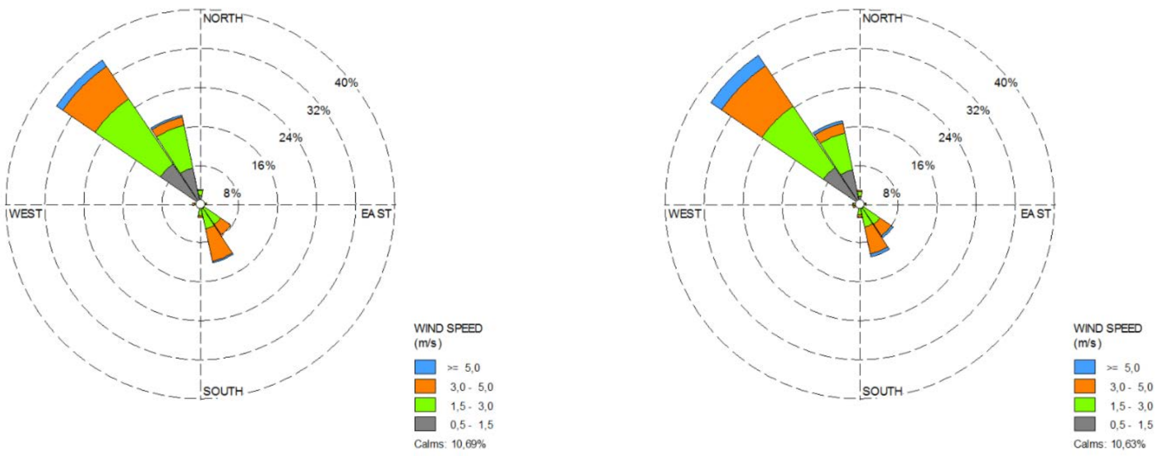
The site’s anemological profile is characterised mainly by breezes (sea and land). This is confirmed by the wind roses reported in the table that shows, for the period surveyed and in the year 2015, a wind at

[76] Data referring to the “Marina di Ginosa” station, period 1995-2015, www.scia.isprambiente.it

10 m mainly from the north-west and south-east quadrants. The zone is also sheltered from synoptic winds to the east by the Apennine chain and to the north by the Murge and Gargano heights. The wind speeds were mainly of a light intensity (average speeds lower than 5 m/s with frequencies of occurrence of around 80%) and with around 10% of calm episodes.

Month	Temperature	Relative humidity	Precipitation	Pressure	Solar radiation
	°C	%	mm	mBar	W/m2
Jan	4.6	67.8	2.5	1012.2	57.5
Feb	3.6	70.1	8.8	1008.5	86.6
Mar	6.7	71.3	6.4	1012.4	107.3
Apr	9.9	62.8	0.8	1014.1	192.3
May	15.1	64.3	77.6	1010.4	235.8
Jun	19.4	55.6	52.8	1011.7	260.0
Jul	24.8	48.9	0.0	1010.7	281.3
Aug	22.7	61.2	80.2	1010.2	206.1
Sep	19.3	59.9	34.4	1010.7	151.3
Oct	13.5	72.9	204.0	1011.7	80.2
Nov	9.9	70.3	36.4	1015.2	68.6
Dec	5.3	69.3	2.0	1026.1	58.1

Figure 6.1.8-2: Summary of meteo parameters for the year 2015



(a) **(b)**

Figure 6.1.8-3: Wind roses (ad) in the period surveyed for the year 2015 (SOGIN NPVA00960, 2015)

Air quality

According to what is reported in Resolution 2217 of 29 December 2010, the Basilicata region, depending on the values of pollutants monitored, divides the territory into:

- Reclamation of zones
- Maintenance zones

The Rotondella Municipality and the ITREC plant lies within the "Maintenance zones", that is, the zones in which the estimated concentration is lower than the limit value for all the pollutants analysed. In particular, NO_X, are below the assessment threshold, the PM_{10} is between the lower and upper assessment threshold, while ozone is above the target values.

6.1.8.3 *Water environment*

Surface waters

The ITREC Plant is located on the right bank of the River Sinni, corresponding in the area analysed to the most southerly part of the Ionian coastal strip, the main watercourse. The river has quite substantial summer flows, due to the contributions of springs fed by the Sirino hydrostructures of Monte Alps, Monti di Lauria, Pollino and Caramola. The minor watercourses in the area at the Fosso Pantanello-Fosso della Rivolta, the Torrente Toccacielo and the Fosso Granata, a tributary to the right of the Sinni. Upstream of the ITREC Plant, the river is affected by a system of dams and barriers that have changes its natural capacity.

The body of water receiving the conventional discharges is the River Sinni while, for radiological discharges, it is the Ionian Sea.

For the qualitative characteristics of the surface waters, the data of ARPA Basilicata reported in the “Yearbook of regional environmental data 2006”, regarding the years 2001-2006 were analysed. In the monitoring station on the River Sinni near the Plant, the Ecological State detected was always within the “Sufficient” class. As regards the Chemical State, defined depending on the presence and concentration of hazardous chemical substances, monitoring data are not available.

As regards the hydraulic danger associated with the area in question, the ITREC plant does not lie within any of the perimeters linked to flood risk established along the course of the River Sinni in the "Transitional plan for the defence from the hydrogeological risk” (Transitional plan of the fluvial strips) by the Interregional Authority of the Basilicata Basin.

Hydrogeology notes

From the hydrogeological point of view, the following aquifers can be identified in the area in question:

- *surface aquifer,* set in a quaternary sandy complex;
- *deep aquifer,* set in a calcareous and marly lime complex.

In the alluvial deposits that make up the surface complex is a multilayer aquifer made up of interconnected layers partially confined by the clay levels. The main underground bodies of water are overlapping layers that, in some periods, depending on the hydrogeological regime, can take on the characteristic of pressure layers. The alluvial aquifer is supplied both by the direct precipitation and the emergence of groundwater circulating in the terraced deposits. This latter is the underground body of water directly concerning the area on which the ITREC Plant stands. In correspondence with the site, the thickness of this layer varies, depending on the zone and the season, by several centimetres to a metre and the free surface lies around 7 m from p.c. (SOGIN NPVA0127, 2008).

6.1.8.4 Biodiversity

From the naturalistic point of view, the area in question, once managed under feudal criteria, it has remained more or less unchanged until the advent of hydraulic reclamation and Land Reform, which, starting in the nineteen thirties, marked the start of a radical change in the political-economic and also, therefore, naturalistic conditions of these places.

Starting from the nineteen fifties, in fact, Agrarian Reform[77] introduced a series of profound changes that led to the increase in arable land to the detriment of the wooded areas.

A striking example is the intense deforestation to which the major coastal forest of Policoro was subject, which was once part of the piedmont woods; it was subject to wholesale cutting and only a few hundred hectares of the original forest were saved and still exist, the ownership of which is divided among public and private bodies. This area is currently recognised as SIC/ZPS IT220055 "Pontano Wood of Policoro and Ionian Coast, Sinni Delta" and the Bosco Pantano Nature Reserve of Policoro; it is an important core area in the local ecological network, due to the areas of nature, the source of the spread of species of conservation interest and the presence of habitats under the Directive: a real basin of biodiversity connected with the Nature 2000 coastal areas immediately to the north and south of the sphere of influence.

The hygrophilous wood of Policoro is mainly made up of mesohygrophyles such as the narrow-leafed ash (*Fraxinus angustifolia* V.), the common alder (*Alnus glutinosa* (L.) Gaertn., 1790), the white poplar (*Populus alba* L.) and the field elm (*Ulmus minor* Mill.). Frequently appearing alongside these species are the Turkey oak (Quercus cerris L.), the field maple (*Acer campestre* L.), the bay laurel (*Laurus nobilis* L.), the white willow (*Salix alba* L.), the manna ash (*Fraxinus ornus* L.), the common fig (*Ficus carica* L.), and the European olive (*Olea europea* var. *sylvestris*). As a consequence of certain situations of degradation, in some stretches the shrub layer is mainly made up of secondary species, such as *Acer campestre L.*, *Fraxinus ornus L.*, *Laurus nobilis L.*, the Europeaanhop-hornbeam (*Ostrya carpinifolia* Scop.) and the Montpelier maple (*Acer monspessulanum* L.), together with the main species or groups to a variable degree (laurel and hop-hornbeam) in small monospecific groups. The woods zone, with the great variety of different environments, including the seafront, is a strategic area for the migration of birds. The richness of bird species is due to the existence of strips of natural shrub vegetation and areas submerged by fresh water. These species exploit corridors that act as transit surfaces, mainly between the coast and the Basilicata hinterland. Attention is also drawn to the lepidoptera fauna of the Policoro wood, which is unique of its kind in southern Italy and represents a complex of faunistic and zoogeographical rarity.

Between the sandy shoreline and the woods, there is a broad band characterised by the presence of Mediterranean shrub vegetation in which the floral composition is dominated by evergreen shrub (*Pistacia lentiscus* L.) and juniper (*Juniperus oxycedrus* subsp.*macrocarpa* L.). The other elements are distributed in varying degrees in an alternation of dry, humid or wet zones where hygrophilous formations are found typical of soils that are moist for most of the year and dry during the summer and, along the canals, typical elements of the riverside vegetation.

[77] The Agrarian Reform outlined in article 44 of the Constitution is defined by the three laws presented under the De Gasperi government: Law 12/05/1950 no. 230 ("Sila Law"), Law 21/10/1950 no. 841 ("Stralcio Law") and Regional Law 27/12/1950 no. 104 promulgated by the Sicilia Region.

Even though it only marginally covers the western limit of the area subject to this study, mention must be made of the coves. The steep slopes, the instability of the terrain, the long periods of drought lead to sparse herbaceous vegetation adapted to difficult climatic and pedological conditions. The herbaceous vegetation is made up of esparto grass (*Lygeum spartum* L.) and the Canforata of Montpellier (*Camphorosma monspeliaca* L.). With an increase in salinity, the shrubby seabight (*Suaeda fruticosa* (L.) Forssk.) comes to the fore. In the shoreline zones, the vegetation appears uniform but displays significant differences. Indeed, there are summit zones or "caps" not affected by erosion and covered by lentisk shrub (*Pistacia lentiscus* L.) or even some little downy oak woods (*Quercus pubescens* W.)) and various sclerophylls. Where the erosion is heavy, the main species are the esparto grass (*Lygeum spartum* L.), the Mediterranean saltbush (*Atriplex halimus* L.), the caper bush (*Capparis sicula* Veill.), the common beet (*Beta vulgaris* L. subsp. *maritima* (L.) Arcang.) and the Canforata of Montpellier (*Camphorosma monspeliaca* L.). In the cooler alluvial cones of silt, there are also some terrestrial orchids and various terophytes, including the sulla coronaria (*Hedysarum coronarium* L.).

The fauna in the cove environments are worth a very short description, with a variety of ecotypes that make possible a diversified bird population that range from Passeriformes to day and night birds of prey, including numerous colonies of black kites (*Milvus migrans* Boddaert, 1783), common kestrels (*Falco tinnunculus* Linnaeus, 1758) and common buzzards (*Buteo buteo* Linnaeus, 1758) with the presence of little colonies of lesser kestrels (*Falco naumanni* Fleischer, 1818). As is clear, the biodiversity within this ecosystem is significant and therefore may constitute an important part of the local ecological network.

At the mouth of the Sinni, an important ecological corridor, and along the coast, various sea bird species such as the Manx shearwater (*Puffinus puffinus* Brünnich, 1764), the Kentish plover (*Charadrius alexandrinus* Linnaeus, 1758), the common tern (*Sterna hirundo* Linnaeus, 1758), the Caspian tern (*Hydroprogne caspia* (Pallas, 1770)), while the wetlands and marshes further inland host various Anatidi, such as the mallard (*Anas platyrhynchos* Linnaeus, 1758), the Eurasian teal (*Anas crecca* Linnaeus, 1758), the Eurasion wigeon (*Anas penelope* Linnaeus, 1758), the northern shoveler (*Anas clypeata* Linnaeus, 1758), the garganey (*Anas querquedula* Linnaeus, 1758), the common pochard (*Aythya ferina* (Linnaeus, 1758)). In these areas, there are numerous Ardeidae; the grey heron can often be seen (*Ardea cinerea* Linnaeus, 1758) as well as the little egret (*Egretta garzetta* (Linnaeus, 1766)), while it is rarer to encounter the purple heron (*Ardea purpurea* Linnaeus, 1766), the night heron (*Nycticorax nycticorax* (Linnaeus, 1758)) and the squacco heron (*Ardeola ralloides* (Scopoli, 1769)).

Among the reptiles: the slow worm (*Anguis fragilis* Linnaeus, 1758), the green whip snake (*Hierophis viridiflavus* (Lacépède, 1789)), the grass snake (*Natrix natrix* Linnaeus, 1758), the dice snake (*Natrix tessellata* (Laurenti, 1768)), and the European pond turtly (*Emys orbicularis* (Linnaeus, 1758)). Among the amphibians: the green frog and the yellow-bellied toad (*Bombina variegata* (Linnaeus, 1758)), in addition to the Italian crested newt (*Triturus carnifex* (Laurenti, 1768)), a species endemic to southern Italy.

The complete list is given below of protected areas with their respective distances from the Nuclear Power Station, the total area and percentage cover of the area coming with the sphere of influence surveyed.

TYPE	CODE	NATURA 2000 SITES/PROTECTED AREAS	Approximate minimum distance of the infrastructure (km)	Total area (hectares)	Approximate coverage falling within the sphere of influence (%)
SIC/ZPS	IT9220055	Pantano Wood of Policoro and Ionian Coast Mouth of the Sinni	0.27	1,794	59
RNR	EUAP0547	Pantano Wood Nature Reserve of Policoro	0.43	1,044	78
IPA	BAS 2	Metaponto-Policoro Coast	0.26	3,882	24

Figure 6.1.8-4: List of Natura 2000 Sites, protected areas and IBA in the sphere of influence of the ITREC plant

From the consultation of the standard model of the aforementioned Natura Sites[78], the number of habitats (Attachment I Dir. Habitat) and species of the Directive (Field 3.2) and of conservation interest (Field 3.3) recorded within them, can be obtained, as indicated in the following table. The list of habitats and species is given in Attachment 4 to this Environmental Report.

TYPE	Code	Name	Number of community habitats (Att. I 92/43/EC)	Number of plant species (Field 3.2)	Number of plant species (Field 3.2)	Number of plant species (Field 3.3)	Number of animal species (Field 3.3)
SIC/ZPS	IT9220055	Pantano Wood of Policoro and Ionian Coast Mouth of the Sinni	19	-	112	23	42

Table 6.1.8-5: Number of community fauna species habitats in the Sites of Natura 2000 Network

6.1.8.5 *Ionising radiation*

Release conditions

The current discharge limits were authorised as part of the Operating Licence issued under the Ministry of Economic Development Decree of 26 July 2006.

Gaseous effluents:

$$^{85}Kr \leq \begin{cases} 1{,}48 \cdot 10^{14} Bq/a \\ 7{,}4 \cdot 10^{13} Bq/13\ weeks \\ 3{,}7 \cdot 10^{12} Bq/24\ hours \end{cases}$$

where ^{85}Kr represents the activity (Bq) expressed in terms of equivalent ^{85}Kr.

[78] Database of the Ministry of the Environment and the Protection of the Territory and the Sea, on the page “Cards and maps”. Website ftp://ftp.minambiente.it/PNM/Natura2000/TrasmissioneCE_2015/

$$(\beta,\gamma) \leq \begin{cases} 2{,}96 \cdot 10^{9} Bq / a \\ 1{,}48 \cdot 10^{9} Bq / 13\ weeks \\ 5{,}6 \cdot 10^{8} Bq / 24\ hours \end{cases}$$

where (b,γ) represents the activity (Bq) expressed in terms of equivalent ^{137}Cs.

Liquid effluents:

$$\frac{^{3}H}{500} + \frac{^{90}Sr}{2.5} + \frac{(\beta,\gamma)}{2.5} + \frac{\alpha}{0.025} \leq \begin{cases} 3{,}7 \cdot 10^{10} Bq / a \\ 1{,}8 \cdot 10^{10} Bq / 13\ weeks \\ 3{,}7 \cdot 10^{9} Bq / 24\ hours \end{cases}$$

Where:

- ^{3}H and ^{90}Sr represent the activity (Bq) of these radionuclides.
- (b,γ) represents the activity (Bq) of other (b,γ) − emittors expressed in terms of an equivalent mixture made up of ^{137}Cs, ^{90}Sr and ^{90}Y in equal parts.
- (α) represents the activity (Bq) of the α − emitters expressed in terms of equivalent U_{nat}.

Monitoring of radioactive discharges

The figures below report the quantity of radioactivity discharged annually through liquid and gaseous effluents, as well as the percentage use of the maximum authorised limit for the ITREC Plant, regarding the three years 2013-2015[79].

ITREC plant – liquid discharges – Annual activity [Bq]			
Year	**2013**	**2014**	**2015**
H-3	1.62E+08	2.41E+08	3.57E+08
Sr-90	2.61E+08	2.71E+08	6.10E+08
Beta-gamma	6.05E+08	5.34E+08	1.08E+09
Alpha total	1.98E+06	2.95E+06	2.37E+06
Total activity [Bq]	**1.03E+09**	**1.05E+09**	**2.05E+09**
%FdS	**1.15E+00**	**1.19E+00**	**2.08E+00**

Figure 6.1.1-8: Annual activity and use of discharge formula of discharged radioactive liquid effluents (2013-2015)

ITREC plant – liquid discharges – Annual activity [Bq]						
Year	**2013**		**2014**		**2015**	
	Gas	**Particulates**	**Gas**	**Particulates**	**Gas**	**Particulates**
Total activity (Bq)	5.59E+12	2.07E+06	6.61E+12	2.14E+06	6.87E+12	2.07E+06
%FdS	3.78E+00	7.00E-02	4.47E+00	7.00E-02	4.64E+00	7.00E-02

[79] Sogin doc. TR MS 00082 rev.00 Report on environmental radioactivity (year 2013).
Sogin doc. TR MS 00094 rev.00 Report on environmental radioactivity (year 2014).
Sogin doc. TR MS 00145 rev.00 Report on environmental radioactivity (year 2015).

Figure 6.1.8-7: Annual activity and use of discharge formula of discharged radioactive gaseous effluents (2013-2015)

Monitoring of environmental radioactivity

The following figures report the average concentrations of activity concerning the three years 2013-2015[80] of the main radionuclides in the most significant matrices analysed as part of the environmental surveillance of the ITREC site.

Concentration of annual media activity – LAND [Bq/kg]			
	2013	**2014**	**2015**
Caesium-137	2.95E+00	2.24E+00	2.55E+00

Figure 6.1.8-8: Concentrations of activity in the land matrix [Bq/kg] – ITREC Plant

Concentration of average annual activity—SEA WATER [Bq/l]			
	2013	**2014**	**2015**
Caesium-137	< 1.21E-02	< 1.26E-02	< 1.30E-02
Strontium-90	< 5.56E-02	< 3.46E-02	< 2.00E-02

Figure 6.1.8-9: Concentrations of activity in the seawater matrix [Bq/l] – ITREC Plant

Concentration of average annual activity—GROUNDWATER[81] [Bq/l]			
	2013	**2014**	**2015**
Total Beta	3.86E-01	2.48E-01	2.50E-01

Figure 6.1.8-10: Concentrations of activity in the groundwater matrix [Bq/l] – ITREC Plant

Concentration of average annual activity—MILK [Bq/l]			
	2013	**2014**	**2015**
Strontium-90	5.01E-02	2.67E-02	4.46E-02

Figure 6.1.8-11: Concentrations of activity in the milk matrix [Bq/l] – ITREC Plant

Concentration of annual media activity – LEAFY VEGETABLES [Bq/kg]			
	2013	**2014**	**2015**
Strontium-90	4.27E-02	1.45E-02	3.31E-02

Figure 6.1.8-12: Concentrations of activity in the leafy plant matrix [Bq/kg] – ITREC Plant

[80] See previous note.

[81] The results relate to the piezometers outside the ITREC site (located along the Sinni escarpment and close to the east side of the Plant).

Equivalent dose rate in air (gamma dose)

The intensity of average equivalent dose in the year was around 0.08 µSv/h, the values oscillate within the normal fluctuations of the environmental background radiation.

6.1.8.6 Landscape

The territory surrounding the plant area comes within the complex of the former mountain community of "Basso Sinni" with a heritage of nature, landscape and ecology of regional importance. The complex contains landscape systems of remarkable interest: wide valleys, numerous watercourses, woods, the remains of forests of the plains and cove environments, as well as a vast architectural, historical, artistic and archaeological heritage. The natural element that characterises the landscape is the River Sinni, with its wide riverbed by now virtually without water. In this context, at the end of the nineteen fifties, the ENEA Research Centre (formerly CNEN) was built in Trisaia, now an intrinsic element of the landscape structure, moderately intrusive since it was built over a vast area with scattered buildings.

The territory has a marked agricultural nature, interspersed in some stretches with transitional areas where the character of the natural vegetation of the places can still be seen. The Central zone, on average about four kilometres from the coast, lies foothills on the edge of the coastal strip and is markedly characterised by the nature, with remnants of Mediterranean scrub. At the edges of the aforementioned nature areas, the territory features highly-specialised intensive farming, characterised by the cultivation of valuable fruit and vegetables, grown in fields or under glass.

In summary, there is a good level of naturalness, marked at the same time by centuries of human activity.

Figure 6.1.8-13 shows the location of the viewpoints for monitoring by means of photographic survey campaigns planned by the operator (SOGIN) as part of the implementation of the decommissioning strategy of the plants belonging to the energy sector.

Figure 6.1.8-13: Location of the monitoring stations

Constraints

- **Details of ministerial or regional disposition of significant public interest of the constraint on properties or areas declared to be of significant public interest (article 136 – 141 – 157 Legislative Decree no. 42/2004)**

Panoramic beauty.

- **Legally protected areas (article 142 of Legislative Decree no. 42/2004)**

The area is subject to the landscape-environmental constraint established in accordance with Law no. 1497 of 29 June 1939 (repealed by Legislative Decree 490/1999) regarding the Protection of Natural Beauty, as with all municipal territory (Figure 6.1.8-14).

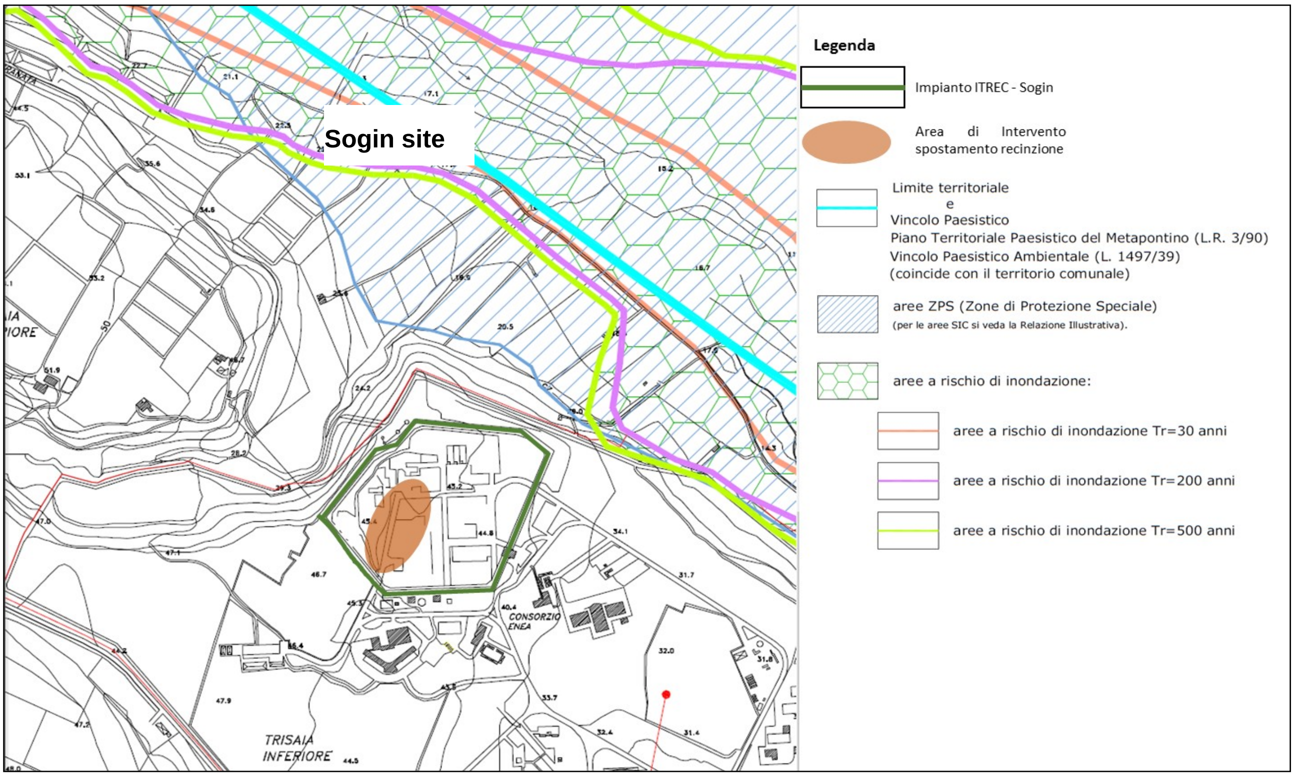


Figure 6.1.8-14: Extract from Table 1.c.1 - Drafts of the Urban Regulations of Rotondella Municipality – Current territorial constraints

6.2 Description of the conditions of environmental criticality detected

Essentially, on the basis of the foregoing and in consideration of the fact that the actions implemented by the NP were authorised in advance, following the unavoidable local procedure, since, notwithstanding the fact that the main work envisaged is the National Repository, which will only be authorised following the issuing of an Environmental Compatibility Decree, at the current state of knowledge, no likely conditions of significant environmental criticality were found.

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7 Analysis of the environmental effects of the NP

7.1 Action strategy - *Decommissioning*

In this chapter, assessments are made under the environmental profile of the action lines[82] identified for the implementation of the two defined action strategies[83] for attaining the various objectives of the NP[84], with particular reference to the objectives 1, 3, 5, 6 and 7, which can be summarised as: "safe management of all types of radioactive waste and spent fuels, under national jurisdiction, during all the phases of the life cycle of such waste, from generation to disposal".

It is necessary to make clear that, while the end of the life cycle (disposal) of this waste/fuel strictly related to the attainment also of objective 4, which concerns the "siting, construction and operation of the ND", the analysis conducted below does not consider the potential environmental effect, since the overall process of attaining this objective is still in its initial phase, the siting procedure is currently underway and the design required for the ND is preliminary. Therefore, as described in paragraph 5.3 (in which only the non-site-specific potential disturbance factors linked to the ND) are indicated, since it is not currently possible to define a potential sphere of interest, as well as an adequate level of definition of the engineering solutions that will be adopted, it has not been possible to proceed with an environmental characterisation aimed at contextualising, and consequently assess, the potential environmental effects caused by the construction and operation of the ND.

Finally, the remaining objectives (2, 8, 9, and 10), although of similar value as the previous, were not subject to specific analysis since their attainment cannot actually determine direct repercussions on the state of the environment in the strictest sense. However, the importance of their implementation is emphasised in contributing to substantiating the proper, organic management of the problems deal with, in line with the most advanced environmental sustainability strategies; therefore, they will be subject to the planned environmental monitoring of the NP, even if limited to the quantification of the "process indicators". A similar approach is valid for objective 4.

Basically, therefore, in compliance with what is specified by the Guidelines of ISPRA[85], the potential environmental effects previous identified to define the sphere of influence within which the interference generated by the implementation of the actions of the NP could be exhausted or become negligible (chapter 5) are analysed and assessed below, relating them to the territorial context defined for each nuclear plant (section 6), as well as placing them in relation to the consequent development of the environment.

In particular, the expected environmental effects will be explained for each action line of the NP and for each environmental component analysed, in relation to the degree of disturbance caused by the generation of the various disturbance factors identified (par. 5.1), depending on the progress of the actions of the NP. This progress, for the decommissioning strategy, can be measured by making reference to the three specific time phases:

- *short-term* – operation of the facilities for the treatment and conditioning of previous radioactive waste deriving from maintenance in safety and that will be produced by the decommissioning of nuclear sites, as well as the operation of temporary on-site depots, until they are completely full;

[82] Treatment/packaging of liquid, solid radioactive waste of specific flows and spent fuel, stored on site or at the ND and disposal at the ND.

[83] Decomissionining and Integrated Service.

[84] General objectives of the NP listed at paragraph 3.1.

[85] Operating instructions in support of the assessment and drawing up of the Strategic Assessment Strategy documents – Guidelines 124/2015

- *medium-term* – storage, in the site's depots, of treated and packaged radioactive waste and spent fuel while awaiting the availability of the ND, including those arising from the dismantlement of the above facilities *(brown field)*;
- *long-term* – transfer to the ND of radioactive waste and spent fuel with the release of the site, without radiological constraints (green field).

The environmental effect, which will be measured as an increase/decrease of the possible environmental disturbance, compared to the preceding time phase of the action assessed, will therefore be defined as:

- *absent:* in the event the disturbance factor, although identifiable, does not in fact produce any change/disturbance of the external environment, therefore maintaining the characteristics of the environmental context analysed unchanged, compared to the time phase taken as reference, notwithstanding the progress of the activities;
- *not significant:* in the event the change/disturbance comes within the variable of the system considered, not therefore causing any significant variation in the environmental context, compared to the temporary phase preceding the action underway;
- *positive:* when, at the end of the process activities, the release is possible of the site without radiological constraints, defining a possible trend in the development of the state of the environment overall, including in the sense of recovering its specific characteristics.

In conclusion, for the purpose of assessing not only the effects expected from the individual actions of the NP, in the short, medium and long-term, permanent and temporary, positive and negative, but also the accumulative effects, the disaggregated analysis conducted on the effects arising for each line of action defined, of each individual environmental component potentially disturbed, were subject to additional organic assessment, aimed at defining the overall environmental effects on the environmental context affected by NP.

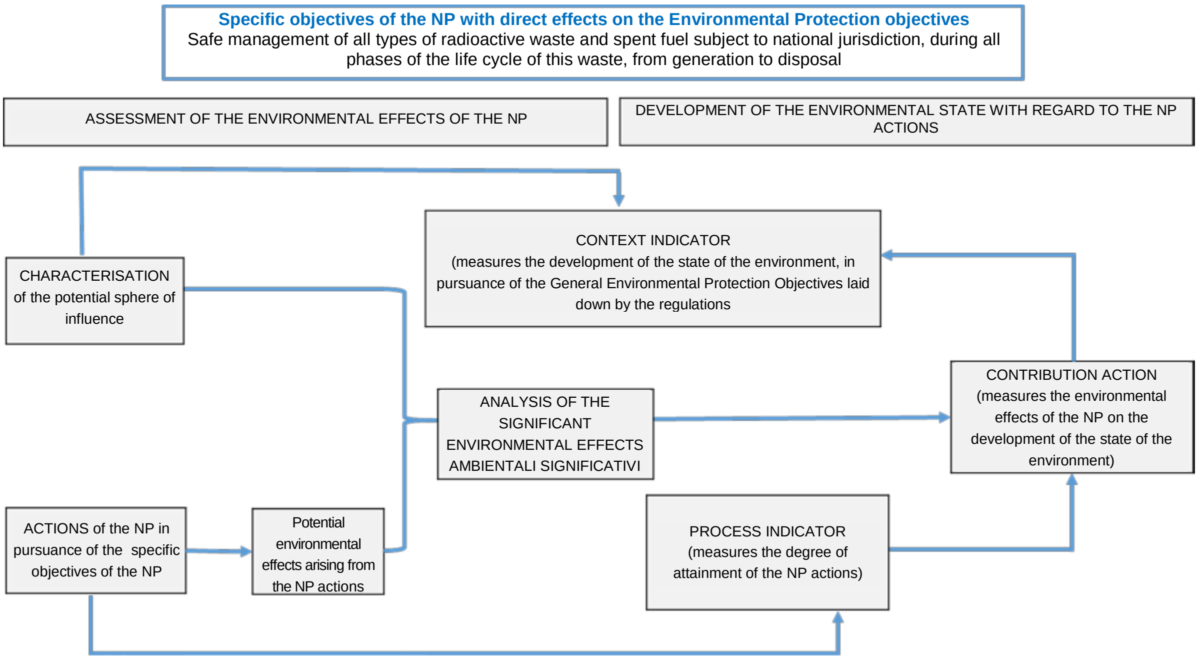

Figure 7.1-1 – Assessment procedure

7.1.1 Trino, Caorso, Latina and Garigliano nuclear power stations

The four Nuclear Power stations on Italian territory, no longer operating, even though located in different territorial areas and characterised by different industrial cycles (however, aimed at the production of electricity), that is, with previous radioactive waste and what will be produced by decommissioning activities, not of uniform types but nevertheless similar with regard to the actions of the NP (treatment, conditioning and storage on site), underway and that will be conducted, as well as for management strategy (Decommissioning in two phases, brown and greenfield).

Action lines – Treatment and conditioning of radioactive waste (A1, A2, A3 and A4[86])

The existing plants and those to be built in support of the decommissioning for all four Power Stations are generally the same, even if, depending on the type of radioactive flow to be treated (physical state, activity level, radionuclides present), the most suitable technology (specific process) will be favoured for the purpose of minimising the radioactive waste to be packaged.

Atmosphere and Water Environment

The facilities referred to above, as detailed in chapter 5, due to their construction specifications, mainly structural and engineering, during their ordinary operation, since carried out in a totally confined environment, cannot produce any significant disturbance of the surrounding the environment. Controlled and recorded gaseous and liquid discharges, produced by treatment and conditioning processes underway and planned, are and will be released into the environment, in compliance with the “Discharge formula", insofar as it regards the radiological aspects, or the "Single Environmental Authorisation" (SEA), insofar as it concerns the conventional aspects.

[86] Only for the Trino Power Station (WOT-SiCoMor Plant).

The Discharge formulae, for each Power Station, were defined in pursuit of the objective of "radiological non-significance" of releases, assessing both the radioactivity content of every plant (release limits) and the characteristics of the environmental sensitivity of territorial and socioeconomic context for which they were defined, such as the capacity of the receiving body of water, extent of the release, speed and temperature of release, atmospheric stability class and anemological regime, demographic structure and whatever else is involved.

The SEA or the individual authorisations for liquid discharges and atmospheric emissions still valid (while awaiting the conclusion of the process underway to acquire the unified authorisation), were obtained on the basis of the engineering configuration of every site, the number of declared discharge points and the quantitative and quantitative types of effluents released. In accordance with the regulations (Presidential Decree of 13 March 2013, no. 59), only one of the aforementioned parameters was changed, the Sole Authorisation was updated.

As a result of the above, although direct environmental effects cannot be foreseen on the Atmosphere and Water Environment components, it is possible to state that the environmental protection safeguards described above will be able to also keep under control the effects of the actions of the NP, with regard to the development of the environmental context of each of the sites in question. Furthermore, where special environmental conditions must be implemented or substantial variations adopted to the process methods, again assessing if the potential disturbance factors identified, so far regarded as not significant, could interfere with the surrounding environment.

For the activities in question, the characteristics so far analysed with regard to the actions of the NP lead to a gradual improvement in the components in questions over time of the possible environmental effects. This tendency is linked to the reduction of the quantitative waste to be treated and packaging in the conduct of the decommissioning strategy until reaching the termination of the operation of the plants, once all the radioactive waste as suitable artefacts for transfer as such to the ND, temporarily stored in the depot on site *(brown field).* Therefore, the potential environmental effects defined for the components in question can be regarded as exhausted at the end of the conditioning and treatment activities, not leading in the long term (green field) to any change in the state of the environment.

ATMOSPHERE AND WATER ENVIRONMENT
Liquid and gaseous effluents release

Development over time	**Environmental effect**
short term (operation)	not significant
medium term (brown field)	positive
long term (green field)	absent

The identification of appropriate "process, context and contribution indicators" will enable the development to be measured of the state of the environment as the NP activities continue.

"Process indicators" of the actions of the NP:

- number of waste packages produced as the processes continue of treatment and conditioning of radioactive waste;
- number of new treatment/conditioning plants in operation;

"Context indicators" typical of the territory analysed:

- physical elements: capacity of the receiving body of water, climatic conditions, pluviometrical regime, atmospheric stability classes, anemological regime;

"Contribution indicators":

- for the radiological aspects: percentage increase in the use of the discharge formulae;
- for the conventional aspects: need to update the SEA (increase of the capacities/concentrations of the effluents released, engineering changes, new emission points).

<u>Landscape</u>

Italian Power Stations, with the exception of Latina, are located inside areas under landscape-environmental constraints, by virtue of the special natural characteristics (excellent landscapes) that characterise them.

With regard to the actions of the NP, the new plant for treatment and conditioning will preferably be located inside existing buildings, and only in the cases in which safe management of the treatment/conditioning processes does not allow, the construction of new structures to house the above facilities is planned. The context in which these industrial-type structures are inserted (Power Station area), since the construction of structures outside the grounds of the plant already identified is not foreseen. In most cases, landscape disturbance will not be generated since the construction of new structures will only be visible from a short distance.

In any case, the existence of territorial constraints leads to the necessity, before constructing new structures, of acquiring the respective landscape authorisations: therefore, the specific potentially disturbing effect induced on the component in question will be assessed as part of the procedure to be conducted and, when necessary, any mitigation works will be considered.

On the basis of the foregoing, it is possible to conclude, as a result of the studies already conducted on the matter[87], that the construction of new structures:

- does not cause a physical alteration to the landscape, concerning already existing industrial areas
- does not prejudice the current level of quality in the landscape-environmental context of reference, since the disturbance is transitory.

On the basis of the foregoing, it is possible to state that the effect of the actions of the NP on the Landscape component will not be significant.

Finally, as with the analysis conducted for the Atmosphere and Water Environmental, for the Landscape the trend in the development of the state of the environment is characterised by a gradual improvement with the progress of the decommissioning activities until the completion of the potential disturbance once the treatment plants have been dismantled *(brown field).*

[87] By way of example, mention is made of landscape studies conducted on ICPF, CEMEX, WOT-SiCoMor, Upgrade of Caorso depots, which investigated the landscape disturbances of the larger plants that it is currently planned to construct.

LANDSCAPE Physical volume	
Development over time	**Environmental effect**
short term (operation)	not significant
medium term (brown field)	positive
long term (green field)	absent

The identification of appropriate "process, context and contribution indicators" will enable the development to be measured of the state of the environment as the NP activities continue.

Specifically:

the *"Process indicators"* of the actions of the NP can be attributed to:

- number of new landscape authorisations acquired;
- number of structures demolished during the decommissioning;

the *"Context indicators"* typical of the territory are substantially measurements of:

- presence of protected areas and constrained at the international, community, national and regional level;

the "*Contribution indicators":*

- increase in the above ground volumes;
- decrease in the above ground volumes;

<u>Ionising radiation</u>

The potential environmental effect that could cause alterations to the natural environmental background radiation due to the emission of artificial radionuclides, is due to the release of liquid and gaseous effluents during the ordinary operation of the treatment and conditioning plants. In this regard, it is pointed out that these effluents may be released into the environment only in compliance with the discharge limits, set on the criterion on radiological non-significance.

IONISING RADIATION Liquid and gaseous effluents release	
Development over time	**Environmental effect**
short term (operation)	not significant
medium term (brown field)	positive
long term (green field)	absent

Therefore, by virtue of the foregoing, the non-significance is confirmed of the environmental effects due to the current nuclear practices.

The identification of appropriate "process, context and contribution indicators" will enable the development to be measured of the state of the environment as the NP activities continue.

In order to define the "contribution indicators", reference must be made to the networks of environmental surveillance that, in accordance with article 54 of Legislative Decree 230/95 as subsequently amended and supplemented, oblige the Operator to guarantee the permanent surveillance *"of the degree of radioactivity of the atmosphere, the water, the soil and the foodstuffs"* in the zones neighbouring the Nuclear Installations.

Specifically, the various indicators identified are described below:
"Process indicators" of the actions of the NP can be attributed to*:*

- number of waste packages produced as the processes continue of treatment and conditioning of radioactive waste.

"Context indicators" typical of the territory analysed are substantially measurements of:

- the measurement of the concentration of artificial radionuclides in the foodstuffs and environmental matrices as part of the radioactivity surveillance network.

"Contribution indicators":

- measurement of the activity release in the form of liquid and gaseous liquids and comparison with the authorised limits.

<u>Biodiversity</u>
The environmental characterisation conducted on this component demonstrated the high naturalistic value of the areas owned by SOGIN surrounding the Power Stations in question, a territorial configuration probably due to the presence of Nuclear Installations since a buffer zone was defined around them right from their construction, within which no anthropic activity was allowed.

In these areas, therefore, not subject to any pressure connected to industrial, agricultural, commercial and residential activities, it was possible to indirectly establish favourable general conditions for the colonisation of plant species, flora and fauna.

For the actions envisaged by the decommissioning strategy, the artificial radioactivity released into the environment can be regarded as minimal if compared with what was released during the operation of the Power Stations (even though this was also within the limits set by the Discharge Formulae). Notwithstanding this, the buffer zone remains around the sites and, therefore, as does the more naturalistic character of the area, rather than anthropic.

In consideration of the fact that the Italian Power Stations have not operated for around 30 years and that during this time the development of the biodiversity in the respective areas has been appreciable, on the basis of the scientific knowledge on the matter currently available, it is considered reasonable to deduce the non-significance of the pressure exerted by the presence of the nuclear station in operation compared to the current state of the component in question.

Therefore, due to the minor extent of the releases of radioactivity in the environment envisaged for the implementation of the actions of the NP, compared to releases that occurred during the operation of the power stations, the expected disturbance consequent to the emission of artificial radionuclides in the environment can be deemed insignificant and, in any case, not capable of causing measurable effects on the component in question.

This consideration is further supported by the temporary nature of the release of artificial radionuclides linked to the actions of the NP; since at the end of the treatment and conditioning processes envisaged, there will be a reduction of the disturbance factor "alteration of the environmental background radioactivity due to emissions of artificial radionuclides".

Finally, it should be made clear that, as regards the conventional-type aspects, the non-significance of releases into the environment of the liquid and gaseous effluents assessed, enables the occurrence of potential indirect disturbances on the component in question to be excluded.

The following diagram shows the trend in the expected degree of disturbance and the consequent environmental effects, depending on the progress of the decommissioning activities.

BIODIVERSITY
Alteration of the natural environmental background radiation due to emission of artificial radionuclides

Development over time	**Environmental effect**
short term (operation)	not significant
medium term (brown field)	positive
long term (green field)	absent

The identification of appropriate "process, context and contribution indicators" will enable the development to be measured of the state of the environment as the NP activities continue.

"Process indicators" of the actions of the NP:

- number of waste packages produced as the processes continue of treatment and conditioning of radioactive waste.

"Context indicator" typical of the territory analysed and measurable as:

- number and surface area of the protected areas at the international, community, national and regional level;
- number of habitats and species of community interest;

"Contribution indicators":

- variation of the extension of the buffer zone following the implementation of the radiological practices.

Action lines – On-site storage in radioactive waste (A5)

In sites belonging to the four Italian Nuclear Power Stations, temporary depots are already present or the adaptation is underway of existing buildings to depots, designed for the storage of previous waste or that will be produced during the decommissioning required until the ND is available.

As made clear in chapter 5, the possible disturbance factors generated following the operation of these storage plants could lead to environmental effects within the defined sphere of influence, limited to the gradual loading of the packaged waste packages inside the temporary depots, the emissions of gaseous effluents attributable to the internal ventilation systems of the depots and the variation of the physical extent of the nuclear site.

Atmosphere

As regards the component in question, the gaseous effluents released into the environment through the forced ventilation systems of the temporary depots can only be attributed to the radiological aspects and limited to those depots in which previous waste and/or produced during the safe maintenance of the power stations, not yet subject to treatment and conditioning, is stored.

However, the expected quantity of gaseous effluent is markedly lower than what was released during the treatment and conditioning activities, already assessed as non-significant. Therefore, in conditions of the normal operation of the depots, the environmental effect that could cause the alteration of the natural environmental background due to the emission of artificial radionuclides, which is absent in the short term and consequently in the medium and long term.

The foregoing is confirmed by the results of the environmental studies assessed as part of the environmental procedures carried out and concluded with a positive outcome by the Ministry of the Environment and the Protection of Land and Sea, with regard to the treatment, conditioning and storage of the "problem flows" (WOT-SiCOMor Plant, CEMEX Plant and ICPF Plant), in addition to the upgrading of the depots of the Trino and Caorso Power Stations.

The following diagram shows the trend in the degree of disturbance expected.

ATMOSPHERE
Gaseous effluents release

Development over time	Environmental effect
short term (operation)	absent
medium term (brown field)	absent
long term (green field)	absent

The “process, context and contribution indicators” that will enable the development of the state of the environment to be confirmed and assessed as the NP activities proceed can be summarised as follows:

“Process indicators” of the actions of the NP:

- percentage of the number of stored radioactive waste, not conditioned;

“Context indicators” typical of the territory analysed:

- physical elements: climatic conditions, pluviometrical regime, atmospheric stability classes, anemological regime;

“Contribution indicators”:

- control of the analyses of the HEPA filters of the flues.

<u>Ionising radiation</u>

The accumulation of the waste packages, generated by the progress of the treatment and conditioning activities, could lead to increase in the radiation dose rate in proximity to the storage structure such as to potentially alter the natural background radioactivity, characteristic of the area studied.

However, it is appropriate to make clear that, as a result of the foregoing, the Power Stations, within their industrial perimeter, are subject to physical zoning (the classification of the areas is defined in accordance with Legislative Decree 230/95 and subsequent amendments and supplements), and that the areas where these depots are located are classified as Controlled Zones, outside of which the regulations laid down for the purpose of protection from ionising radiation no longer apply, due to the decrease in the gamma dose rate as the distance from the source increased.

Due to the nature of the zoning type described, the extent of the Controlled Zone may vary as the nuclear activities conducted there vary (increase/decrease), such as, for example, during the loading of a depot.

Without prejudice to the constraint of radiological non-significance within the enclosure of the Power Stations and therefore the non-significance of the environmental effects on the territorial context of reference, on implementation of the action of the NP, the monitoring of the measurements of the gamma dose rate in air, conducted periodically, will enable any anomalies to be revealed regarding the natural fluctuation of the environmental background radiation.

A diagram of the development of the degree of disturbance is given below.

IONISING RADIATION Presence of conditioned waste packages	
Development over time	**Environmental effect**
short term (operation)	not significant
medium term (brown field)	not significant
long term (green field)	positive

For the purpose of measuring the evolutionary trend in the degree of expected disturbance, as a result of the actions of the NP, the following indicators were identified.

"Process indicators" of the actions of the NP*:*

- load percentage of the depot
- variation of the area extension (m^2) of the Controlled Zone

"Context indicator" typical of the territory analysed, which measures*:*

- the gamma dose rate in air (microSv/h) characteristic of the natural background radiation;

"Contribution indicators":

- the gamma dose rate in air (microSv/h) monitored at the fence of the nuclear power station

<u>Landscape</u>

As regards the landscape component, what was defined for the waste treatment facilities can also be applied to this action line (on-site storage), with particular reference to the process, context and contribution indicators identified.

The difference with the previous analysis lies only in the assessment of the degree of expected disturbance as the decommissioning activity continues. In fact, the brown field (medium term) stage of a deactivated nuclear installation is defined by the sole presence of temporary depots, even after the conclusion of the treatment/conditioning activities, until all the waste packages stored there have been transferred to the NR.

A diagram of the development of the degree of disturbance is given below.

LANDSCAPE Physical volume	
Development over time	**Environmental effect**
short term (operation)	not significant
medium term (brown field)	not significant
long term (green field)	positive

The identification of appropriate "process, context and contribution indicators" will enable the development to be measured of the state of the environment as the NP activities continue.

Specifically:

the "*process indicators*" of the actions of the NP can be attributed to:

- number of new landscape authorisations acquired
- number of structures demolished during the decommissioning;

the "*context indicators*" typical of the territory analysed are substantially measurements of:

- presence of protected areas and constrained at the international, community, national and regional level;

the "*contribution indicators*":

- increase in the above ground volumes in m^3
- decrease in the above ground volumes in m^3.

<u>Biodiversity</u>

As regards the storage in temporary depots on site of radioactive waste, any disturbance caused to the component in question can be attributed to any variation of the environmental gamma dose rate due to the presence of waste.

The measures implemented during the time period from the commissioning of the Power Stations until the present day have always produced perimeter values of the nuclear site within the values of fluctuation of the environmental background radioactivity.

Therefore, as with the assessment with regard to the potential alteration of the environmental background following the emission of artificial radionuclides, generated by the release of radioactive effluents during the decommissioning operations of the Power Stations (minimal release compared to operation), it is reasonable to assume that the contribution of gamma dose from irradiation is, in any event, within the natural local fluctuations.

On the basis of the foregoing, the environmental effect that could cause variation of the natural environmental background due to irradiation is, in fact, absent in the short term and, consequently, in the medium and long term.

BIODIVERSITY
Alteration of the natural environmental background radiation due to irradiation

Development over time	Environmental effect
short term (operation)	absent
medium term (brown field)	absent
long term (green field)	absent

The "process, context and contribution indicators" that will enable the development of the state of the environment to be confirmed and assessed as the NP activities proceed can be summarised as follows:

"process indicators" of the actions of the NP:

- load percentage of the depot;

"context indicator" typical of the territory analysed and measurable as:

- number and surface area of the protected areas at the international, community, national and regional level
- number of habitats and species of community interest;

the “*contribution indicators”:*

- variation of the extension of the buffer zone following the implementation of the radiological practices.

7.1.1 Saluggia Nuclear Complex

SOGIN site of Saluggia

Action lines – Treatment and conditioning of radioactive waste (A1, A2, A3, A4[88] and A5)

As regards the SOGIN site in Saluggia, the actions of the NP provided for the purpose of the decommissioning of the Nuclear Installation are the same as those assigned to the Power Stations described in the previous paragraph (paragraph 7.1.1).

In summary, the activities laid down concern the treatment and conditioning of liquid and solid waste, including specific flows (CEMEX Plant), as well as the storage in the on-site temporary depots of waste produced from past operation and maintenance in safety, part of which is yet to be packaged, as well as waste that will be produced in future. In the case of the SOGIN site of Saluggia, not all the facilities required to implement the processes identified are currently present and, for some plants, the respective design phases are underway, while the CEMEX Plant is in the course of construction.

On the basis of the foregoing, the expected environmental effects due to the completion of the entire cycle of radioactive waste management, depending on the progress of maintenance in safety and decommissioning, are those already described, analysed and assessed in the previous paragraph. Therefore, the developing trend is given in diagrammatic form of the expected state of the environment due to the various action lines of the NP while, for the *process, context and contribution indicators* identified for each environmental component involved in the processes, reference should be made to what has already be described in detail.

Action lines – Treatment and conditioning

ATMOSPHERE AND WATER ENVIRONMENT
Liquid and gaseous effluents release

Development over time	Environmental effect
short term (operation)	not significant
medium term (brown field)	positive
long term (green field)	absent

IONISING RADIATION
Liquid and gaseous effluents release

Development over time	Environmental effect
short term (operation)	not significant
medium term (brown field)	positive
long term (green field)	absent

LANDSCAPE
Physical volume

Development over time	Environmental effect
short term (operation)	not significant
medium term (brown field)	positive
long term (green field)	absent

BIODIVERSITY
Alteration of the natural environmental background radiation due to irradiation

Development over time	Environmental effect
short term (operation)	not significant
medium term (brown field)	positive
long term (green field)	absent

[88] CEMEX plant

Action lines – Storage

ATMOSPHERE
Gaseous effluents release

Development over time	Environmental effect
short term (operation)	absent
medium term (brown field)	absent
long term (green field)	absent

IONISING RADIATION
Presence of conditioned waste packages

Development over time	Environmental effect
short term (operation)	not significant
medium term (brown field)	not significant
long term (green field)	positive

LANDSCAPE
Physical volume

Development over time	Environmental effect
short term (operation)	not significant
medium term (brown field)	not significant
long term (green field)	positive

BIODIVERSITY
Alteration of the natural environmental background radiation due to irradiation

Development over time	Environmental effect
short term (operation)	absent
medium term (brown field)	absent
long term (green field)	absent

<u>Avogadro Depot</u>

Action lines – Storage in on-site pools of irradiated fuel (B2-B.2.1)

The Avogadro Depot was included among the facilities in service of the energy sector, since the only irradiated fuel stored in pools there is currently attributable to the energy production cycle, awaiting transfer abroad for scheduled reprocessing.

With regard to the current operating phase of the Depot in question, the radioprotection criteria adopted for the operation of these structures are the same as those adopted for the temporary on-site depots of radioactive waste therefore, in conditions of normal operation, the potential expected environmental effects for each component identified, as well as their degree of development, are shown in summary in the following figure.

Action lines – Storage in pool (on site) of spent fuel

IONISING RADIATION Presence of spent fuel	
Development over time	**Environmental effect**
stored energy fuel	not significant
detached energy fuel	positive

BIODIVERSITY Alteration of the natural environmental background radiation due to irradiation	
Development over time	**Environmental effect**
stored energy fuel	absent
detached energy fuel	absent

The indicators already identified for the action line of the NP regarding "on-site storage of radioactive waste" can also be obtained for this action line, with the exception of the process indicator that, for this particular case, will be determined by the depot's load percentage, understood as the progress of transfer abroad of the irradiated fuel for reprocessing.

7.1.2 <u>Bosco Marengo Nuclear Fuel Fabrication Plant</u>

Action lines – On-site storage of radioactive waste (A5)

As specified in Chapter 2.1.2, the performance of activity is not planned at the Bosco Marengo plant except for the storage of radioactive waste inside the existing temporary depots.

In the figure below, as described for the other energy sector sites, the expected degree of disturbance up to the conclusion of the decommissioning activities is shown diagrammatically. The respective indicators will be the same as those already identified.

Action lines – Storage

ATMOSPHERE Gaseous effluents release	
Development over time	**Environmental effect**
short term (operation)	absent
medium term (brown field)	absent
long term (green field)	absent

IONISING RADIATION Presence of conditioned waste packages	
Development over time	**Environmental effect**
short term (operation)	not significant
medium term (brown field)	not significant
long term (green field)	positive

BIODIVERSITY Alteration of the natural environmental background radiation due to irradiation	
Development over time	**Environmental effect**
short term (operation)	absent
medium term (brown field)	absent
long term (green field)	absent

7.1.3 ENEA RC Casaccia – SOGIN Site

Action lines – Treatment, conditioning and storing of radioactive waste (A1, A2, A3, A4 and A5)

As with the Nuclear Power Station, treatment, conditioning and storage activities of radioactivity are planned at the SOGIN site in Casaccia for the purpose of suitably preparing it for transfer to NR, when available.

With regard to what is reported in paragraphs 7.1.1 and 7.1.2, the management of this waste does not involve the release of radiological liquid waste since the latter, even if produced during the planned processes, will not be able to be managed on site as waste water (since SOGIN does not have the dedicated discharge formula) but will be transferred as waste to NUCLECO, which, as part of its duties, will carry out any treatment before final release into the environment, in compliance with its discharge formula.

For this reason, the environmental components potentially disturbed by the implementation of the "Treatment" and "Conditioning of the NP" action lines do not include the "Water Environment" component.

As regards the storage, what was described in the previous paragraph is also applicable in the case of the SOGIN site in Casaccia, as with the indicators identified, the details of which can be found in the table of monitoring indicators in Chapter 10.

Action lines – Treatment and conditioning

ATMOSPHERE Gaseous effluents release		IONISING RADIATION Release of gaseous effluents		BIODIVERSITY Alteration of the natural environmental background radiation due to irradiation	
Development over time	**Environmental effect**	**Development over time**	**Environmental effect**	**Development over time**	**Environmental effect**
short term (operation)	not significant	short term (operation)	not significant	short term (operation)	not significant
medio termine (brown field)	positivo	medio termine (brown field)	positivo	medio termine (brown field)	positivo
long term (green field)	absent	long term (green field)	absent	long term (green field)	absent

Action lines – Storage

ATMOSPHERE Gaseous effluents release		IONISING RADIATION Presence of conditioned waste packages		BIODIVERSITY Alteration of the natural environmental background radiation due to irradiation	
Development over time	**Environmental effect**	**Development over time**	**Environmental effect**	**Development over time**	**Environmental effect**
short term (operation)	absent	short term (operation)	not significant	short term (operation)	absent
medium term (brown field)	absent	medio termine (brown field)	non significativo	medium term (brown field)	absent
long term (green field)	absent	long term (green field)	positive	long term (green field)	absent

Action lines – Dry storage on-site of irradiated fuel (B2-B.2.2)

Compared to the other sites belonging to the energy sector, the substantial difference that arises with the assessments so far conducted can be attributed to the presence of dry-stored irradiated fuel from past activities, for which no type of reprocessing abroad is provided since it will be subject only to repackaging in casks to be transferred to the NR, when available, to await geological disposal yet to be defined (action line B4 of NP).

As regards the on-site storage, the assessment conducted for the on-site temporary depots is confirmed and, consequently, the monitoring indicators will also be similar to those identified for the action line A.5.

Action lines – Dry storage (on site) of spent fuel

ATMOSPHERE Gaseous effluents release	
Development over time	**Environmental effect**
short term (operation)	absent
medium term (brown field)	absent
long term (green field)	absent

IONISING RADIATION Presence of spent fuel in casks	
Development over time	**Environmental effect**
short term (operation)	not significant
medium term (brown field)	not significant
long term (green field)	positive

BIODIVERSITY Alteration of the natural environmental background radiation due to irradiation	
Development over time	**Environmental effect**
short term (operation)	absent
medium term (brown field)	absent
long term (green field)	absent

7.1.4 Rotondella ITREC Plant

Action lines – Treatment, conditioning and storing (A1, A2, A3, A4[89] and A5)

The management of the current radioactive waste and what will be produced as the maintenance in safety and decommissioning activities continue in the ITREC site in Rotondella is the same as described and assessed for the SOGIN sire located inside the nuclear complex of Saluggia, as well as for the old Power Stations.

It is therefore possible to reiterate the analyses already conducted, with the sole exception being the storage of radioactivity waste, for which reason, as a result of the radiological inventory of the site, the design and construction of a new temporary depot is underway, given the existing ones are insufficient to ensure the necessary future capacity. However, the environmental factors that could potentially cause disturbance to the "Landscape" component are the same as identified for the adaptation of existing buildings to a depot.

On the basis of the foregoing, including for the ITREC plant, the same analyses and assessments conducted for the identify the degree of disturbance of the environment surrounding the site are confirmed, on the implementation of the NP lines, on the various environmental components involved, as well as the various "*process, context and contribution*" indicators previously identified.

[89] ICPF plant

Action lines – Treatment and conditioning

ATMOSPHERE AND WATER ENVIRONMENT Gaseous and liquid effluents release	
Development over time	**Environmental effect**
short term (operation)	not significant
medium term (brown field)	absent
long term (green field)	absent

IONISING RADIATION Gaseous and liquid effluents release	
Development over time	**Environmental effect**
short term (operation)	not significant
medium term (brown field)	positive
long term (green field)	absent

LANDSCAPE Physical volume	
Development over time	**Environmental effect**
short term (operation)	not significant
medium term (brown field)	positive
long term (green field)	absent

BIODIVERSITY Alteration of the natural environmental background radiation due to irradiation	
Development over time	**Environmental effect**
short term (operation)	not significant
medium term (brown field)	positive
long term (green field)	absent

Action lines – Storage

ATMOSPHERE Gaseous effluents release	
Development over time	**Environmental effect**
short term (operation)	absent
medium term (brown field)	absent
long term (green field)	absent

IONISING RADIATION Presence of conditioned waste packages	
Development over time	**Environmental effect**
short term (operation)	not significant
medium term (brown field)	not significant
long term (green field)	positive

LANDSCAPE Physical volume	
Development over time	**Environmental effect**
short term (operation)	not significant
medium term (brown field)	not significant
long term (green field)	positive

BIODIVERSITY Alteration of the natural environmental background radiation due to irradiation	
Development over time	**Environmental effect**
short term (operation)	absent
medium term (brown field)	absent
long term (green field)	absent

Action lines – Storage in on-site pools and dry of irradiated fuel (B2-B.2.1 - B2-B.2.2)

Compared to the other sites belonging to the energy sector, the substantial difference that arises with the assessments so far conducted can be attributed exclusively to the presence of irradiated fuel still stored in the pool of the ITREC Plant, for which no type of reprocessing abroad is provided since it will be subject only to repackaging in casks to be dry stored inside a dedicated temporary on-site depot and then sent to the NR, when available, to await geological disposal yet to be defined (action line B4 of NP).

The pool of the ITREC plant is similar in design to a proper on-site depot, with water jets acting as a confinement screen. Therefore, as described for the Avogadro Depot, the degree of disturbance over time is defined depending on the presence or otherwise of the fuel.

The expected disturbance following irradiation due to the presence of "stored energy fuel", as well as its packaging in casks, can be assessed as non-significant, not leading to any significant disturbance on the Ionising Radiation component, compared to the current configuration. At the time, the spent fuel in the casks is transferred to the on-site depot, awaiting the availability of the NR, the expected disturbance can be regarded as positive since the irradiation will no longer be present and it will also be possible to proceed with the dismantling of the pool. It is appropriate to make clear that the activities necessary for the treatment and conditioning of waste from this dismantling coincide with the NP action lines already assessed in the sphere of the treatment and packaging of radioactive waste that will be produced due to the decommissioning of the ITREC Plant.

Finally, as regards the Biodiversity component, the results of the analysis for the on-site storage of radioactive waste action line is also valid for storage in pools.

Action lines – Storage in pool (on site) of the spent fueld

IONISING RADIATION Presence of spent fuel		BIODIVERSITY Alteration of the natural environmental background radiation due to irradiation	
Development over time	**Environmental effect**	**Development over time**	**Environmental effect**
stored energy fuel	not significant	stored energy fuel	absent
detached energy fuel	positive	detached energy fuel	absent

As regards the on-site storage of these casks (action line B.2.2), the assessment for the storage of radioactive waste in the temporary on-site depots also applies to spent fuel, as with the indicators identified for this activity (action line A.5).

Action lines – Dry storage (on site) of spent fuel

ATMOSPHERE Gaseous effluents release		IONISING RADIATION Presence of spent fuel in the cask		BIODIVERSITY Alteration of the natural environmental background radiation due to irradiation	
Development over time	**Environmental effect**	**Development over time**	**Environmental effect**	**Development over time**	**Environmental effect**
short term (operation)	absent	short term (operation)	not significant	short term (operation)	absent
medium term (brown field)	absent	medium term (brown field)	not significant	medium term (brown field)	absent
long term (green field)	absent	long term (green field)	positive	long term (green field)	absent

7.2 Action strategy – Integrated Service (A1, A2, A3 and A5)

As regards the nuclear installations belonging to the Non-Energy Sector – Integrated Service, as made clear in paragraph 5.1.2, the analyses conducted for the assessment of any environmental impact caused by the implementation of the action lines of the NP (Treatment, Conditioning and Storage of radioactive waste) refer below to activities that will be conducted at the NUCLECO site (location inside the ENEA RC Casaccia), since it is the only site of the non-energy sector, for which reason it was possible to identify a potential area of influence (coinciding with the area defined by the External Emergency Plan of the ENEA Centre in Casaccia).

For the purpose of the environmental analyses conducted, it is appropriate to make clear that the "NP strategy – Integrated service", pursuing the objective of safely managing the continuously produced radioactive waste of medical and industrial origin, is characterised by the cyclical repetition of the NP action lines. In fact, the plants belonging to the NUCLECO, unlike those of the energy sector where the operating life is linked to the duration of the decommissioning of each nuclear site, operate on single campaigns depending on the waste gradually collected.

Therefore, the assessment of the expected degree of disturbance on implementation of the NP action lines, coinciding in any event with those already dealt with for the energy sector, refers only to the short term, understood as the operation of treatment, conditioning and storage plants.

Action lines – Treatment and conditioning of radioactive waste (A1, A2, A3 and A5)

As already assessed for the nuclear sites belonging to the energy sector, since the NP action lines are similar in type, the same analyses and assessments conducted for the identification of the degree of disturbance of the environment surrounding the site are confirmed on the implementation of the NP action lines for the various environmental components involved, as well as, consequently, the various *"process, context and contribution"* indicators previously identified. With the sole exception of the "Landscape" component, since the relevant area of the NUCLECO (ENEA CR Casaccia) is not bound by environmental/territorial/landscape constraints.

Action lines – Treatment and conditioning

ATMOSPHERE AND WATER ENVIRONMENT Gaseous and liquid effluents release		IONISING RADIATION Gaseous and liquid effluents release		BIODIVERSITY Alteration of the natural environmental background radiation due to irradiation	
Development over time	**Environmental effect**	**Development over time**	**Environmental effect**	**Development over time**	**Environmental effect**
short term (operation)	not significant	short term (operation)	not significant	short term (operation)	not significant

Action lines – Storage

ATMOSPHERE Gaseous effluents release		IONISING RADIATION Presence of conditioned waste packages		BIODIVERSITY Alteration of the natural environmental background radiation due to irradiation	
Development over time	**Environmental effect**	**Development over time**	**Environmental effect**	**Development over time**	**Environmental effect**
short term (operation)	absent	short term (operation)	not significant	short term (operation)	absent

7.3 Overall assessment of the environmental effects of the NP

The disaggregated analysis conducted, with reference to the expected environmental effects on the components that could be disturbed by the NP actions, enabled the identification, where a potential disturbance occurred, of a positive evolution over time of the environmental context surrounding the nuclear sites examined, due to the reduction of the artificial radioactivity until its complete disappearance, for the sites being decommissioned as a consequence of the conclusion of nuclear practices.

The maximum assessed degree of disturbance, limited to the short term (operation of the plants) does not actually cause any significant change/disturbance of the external environment. Therefore, even assuming that more than one plant could be operated at the same time on the same nuclear site, it is reasonable to assume that even adding together each individually insignificant contribution, the expected environmental effects would not cause any environmental criticalities, given the preliminary environmental assessments to which these activities are subject.

In support of the foregoing, it is appropriate to make clear that the conduct of every nuclear practice is authorised by the designated authorities, both under the radiological and the conventional profile, as early as the design phase.

As regards the radiological aspects, the approval of the overall project concerns both the management procedures to be implemented for the purpose of ensuring the radiological non-significance and assessment of the construction technologies and the process proposed.

As regards the non-radiological aspects, the current regulations lay down that the construction and operation of new treatment and storage plants of radioactive waste must be subject to Environmental Assessment procedures. Specifically, procedures of:

- Environmental Impact Assessment – EIA, for the plants that will treat highly radioactive waste flows;
- Verifications of eligibility for EIA for all the other plants;
- Nature Impact Assessments – NIA – for plants to be constructed near sites of community importance and special protection zones;
- Landscape assessments, for plants to be constructed in zones with landscape/environmental constraints.

These plants, finally, will also be subject to assessments as part of the building permits to be obtained, therefore the respective projects will be accompanied by suitable documentation depending on the territorial area of reference, aimed at obtaining the consequent authorisations, such as, for example: geological-seismic, geological-hydrogeological compatibility and hydraulic risk.

In these areas, due to the greater definition of the design level and the adequate time and site-specific contextualisation of the work to be carried out, it will be possible to assess in detail both the potential environmental impacts and any cumulative effects. Therefore, in the case of assessments that reveal significant environmental effects, it will be possible to change the design and/or identify adequate measures of mitigation before construction of the plant, aimed at reducing the expected impact to the minimum reasonably admissible level.

The overall assessment of the expected environmental effects from the implementation of the NP lines referred to in this paragraph is also confirmed, finally, in the current experience of running several nuclear installations in operation in the same complex, belonging to different operators. It is, for example, the case of the ENEA RC of Casaccia, where the monitoring conducted as part of the environmental surveillance network operating in the area surrounding the site since its construction, no situations of environmental anomalies have ever arisen, notwithstanding the fact of operating several plants at the same time. However, the case indicated is even more exemplary, since both the operator

SOGIN of the energy sector, whose site is due for decommissioning, and NUCLECO of the non-energy sector, which carries out activities for cyclical campaigns, operate in the same Complex.

7.4 Risks for human health or the environment

The management of emergencies in a nuclear site has substantially different aspects to a conventional one due to the possible occurrence of an incident with the release of radioactive substances to the external environment.

A nuclear incident requires a complex organisation, internal and external, which involves both site personnel and the External Authorities. The organisation and training of the personnel assigned to intervene in critical situations is sufficient to tackle any type of emergency, including those due to natural events (earthquake, floods, fire).

Therefore, in line with the regulations laid down, Nuclear Installations are generally furnished with:

Framework Report/Technical Presuppositions, which, as well as a description of the site, Power State buildings, Plant systems and their current conditions, provides indications regarding the radioprotection assessments, the estimate of the effects on the external environment of the current activities of the Plant, the safety analysis concerning the operations underway.

Interprovincial external emergency plan, for the definition of which, refer to chapter 5.1.1. In this Plan, in addition to the actions/measures to be implemented, the activation procedure of the External Authorities is described in the case of nuclear emergency. In addition, the Internal Emergency Plan forms an integral part of this Plan, in which the essential actions are indicated that must be undertaken as part of the internal organisation of the nuclear installations, should an incident envisaged by the plan occur.

A nuclear emergency condition is declared by the Plant Manager or his deputy, who coordinates all the operations necessary to deal with the internal situation, in addition to activating and maintaining the connections with the External Authorities. Notification of the incident is given by telephone by the Shift Supervisor, in accordance with article 100 of Legislative Decree 230/95 and subsequent amendments and supplements, on the order of the Plant Manager, to the Prefecture and the Provincial Fire Brigade Command, explaining, in accordance with a schedule laid out in the Interprovincial Emergency Plan, the type of incident, the nature of the release and other important information.

Operating procedures, in which the actions are defined that the personnel must implement in the event of emergencies, such as:

- Fire;
- Management of the discharges of industrial waste water;
- Evacuation of the plant.

Assessment and planning documents, such as:

- Fire risk assessment;
- Fire prevention programme;
- Area risk assessment documents;
- Operating Safety Plans.

Documents for the protection of the health and safety of workers (Legislative Decree 81/2008)

- Risk Assessment Document;
- Construction Sites Safety Plan;
- Interference Risk Assessment Documents.

Moreover, it is made clear that the Nuclear Installations are manned round the clock, with an alarm system always operating, which enables immediate intervention should any environmental anomaly occur.

In addition to the foregoing, it is worth remembering that every facility involved in the treatment, conditioning and storage of radioactive waste or irradiated fuel, described in the previous chapters, and, more generally, any nuclear practice, is subject from the design stage to a site-specific risk analysis aimed at defining, following controlled discharges or hypothetical incident scenarios that can be classed as radiological, the spread of radionuclides dispersed in the ecosystem and the respective environmental receptivity following uncontrolled gaseous and liquid discharges.

The above analyses are based on the use of calculation codes that, starting from the territorial context characteristic of the site (conceptual model), enable, by means of modelling the transport and diffusion processes both in the river-marine and the atmospheric environment, the analytical determination of the effective dose values associated with controlled-emission and incident events.

Therefore, since these analyses are the basis of the project, they can guide, in the design phase, the construction and operation of the plants in question, towards more appropriate radioprotection criteria, both under conditions of normal operation (controlled release into the environment within the discharge limits) and in the case of an incident event, and thereby identify the engineering strategies and the operating procedures required to minimise the probability of the occurrence and severity of the event.

The possible significant incidents in the cases in question that lead to the release of radioactivity into the environment and that effect others of the same type, but with a lesser environmental impact, are generally attributable to:

Incidents with loss of confinement:

- a fall during the handling of containers where radioactive waste or irradiation fuel are stored.

Incidents with the release of radioactive gaseous effluents:

- breakage or malfunction of the HEPA filters of the expulsion systems (chimney);
- localised fire in supervised/remotely managed area during processes (process plants);
- fire in controlled zone (radioactive waste depot).

Incidents with the release of radioactive liquid effluents:

- accidental discharge of a storage tank/basin with contaminated liquid (end part of the drainage system of industrial waste water).

Energy sector installations

The outcomes of the incident analyses conducted to date for all the projects that, for various reasons, have acquired the respective construction authorisations (both in accordance with Legislative Decree 230/95 and with Legislative Decree 152/06 and subsequent amendments and supplements), displayed values lower than the effective dose limit for the individuals of the population, established at 1 mSv per solar year (attachment IV to Legislative Decree 241/2000).

These incident analyses were also taken as reference in the Environmental Impact Studies conducted for the decommissioning projects of the four SOGIN Power Stations, and for the construction of the CEMEX plant (SOGIN site of Saluggia) and the ICPF plant (ITREC plant of Rotondella).

As regards incident events of a conventional kind attributable, for example, to the accidental spillage of chemical reagents or hazardous substances in general that are used in the processes included in the action lines of the NP, involving the components; “water environment” and "soil and subsoil", likely to be the main targets in the event of incidents, it is appropriate to make clear that the probability of their occurrence, already considered negligible within the sphere of the EIA procedures conducted, and still more remote due to best practices, both the managerial and technical type, adopted at the SOGIN sites, in compliance with the requirements of certain instructions of the Environmental Compatibility Decrees promulgated as a result of the above EIA procedures.

The aforementioned technical best practices refer to the implementation of engineering interventions aimed at minimising the probability of the occurrence of any incidents that could cause the risk of the pollution of the soil and running water, both surface and deep underground, basically summarised in the following strategies:

- impermeability of the grounds of the Power Station concerned with decommissioning activities;
- creation of areas dedicated to the storage of hazardous material/waste;
- creation of areas dedicated to the storage of non-hazardous material/waste;
- construction of a network to channel rainfall to the plants for the collection and treatment of rainwater.

The aforementioned strategies actually enable the probability of occurrence of possible incident scenarios (spillage/run-off) to be controlled/minimised/ annulled.

Therefore, the paragraph goes on to analyse the possible conventional impacts on the external environment, limited to the incident events indicated previously, classified as nuclear, that are considered as scenarios encompassing other events of the same type.

As regards the *“loss of confinement/containment of the radioactivity of the containers* of the radioactive waste/irradiated fuel” during the drum handling operations, any deterioration of the container in question, for example, due to a fall, would happen in a confined environment, therefore, under the conventional profile, the incident scenario proposed must be considered irrelevant, just as the potential conventional repercussions on the surrounding environment are non-significant.

As regards the *uncontrolled release of gaseous effluents,* with potential change of the air quality, any loss of confinement of the ventilation systems of the treatment/conditioning/storage plants or the centralised chimneys of the Nuclear Installations has no conventional relevance, since, in this case also, the breakage of part of the HEPA filters, the emission of conventional gaseous effluents in the atmosphere can, in any event, be considered insignificant.

The type of fires identified, concerns events that could occur inside the buildings: In localised areas, manned or used for remote-controlled activities, which are always furnished with redundant alarm systems, in line with the measures linked to radiological practice, that is, inside a radiological depot, also furnished with alarm systems. However, in the latter case, the fire load of a depot, regarding stored materials (containers of radioactive waste), under the conventional profile, can be regarded as practically zero. Only fire in the engineering systems (equipment and instruments of various systems: electrical, fire prevention, handling etc.), could cause effects on the external environment.

In this regard, it is clear that, since the activities conducted at the nuclear sites classified high fire risk, that is, bearing risks not only for workers but also for the external environment and public safety, are appropriately located in the areas outside the grounds of the Installations and inside the buildings where the plants are located, an adequately planned number of fixed firs prevention situation, portable and mobile fire extinguishers, a hydrant system, alarm and passive protection systems, checked periodically.

Additionally, procedures are in operation that, on the occurrence of an anomalous situation that could trigger a fire, can be implemented promptly. As laid down by the current regulations, every site is furnished with a fire fighting team, made up of appropriately trained workers and responsible for implementing the fire prevention measures, fighting fires, evacuating workers in the case of severe and imminent danger and emergency management.

That said, it is possible to consider as improbable both the possibility of ignition and, above all, the generalised spread of a fire to any area of a nuclear installation, which could lead to risks for public health and the environment.

The last incident scenario concerns *the uncontrolled release of radioactive liquid effluents,* following the accidental discharge of a storage tanks of contaminated liquid.

The tank from which the release is assumed is the final destination of the collection line of industrial effluents classified as potentially radioactive before release into the receiving body of water, subject to sampling and analysis, therefore any accidental spillage is only likely in the case of human error, intrinsically remote, since operators applied precise technical-managerial procedures.

However, in consideration of the fact that the potentially radioactive liquid discharges occur through the use of dedicated devices (doubling valves, relay pumps) furnished with alarms connected to the Control Rooms (supervised round-the-clock) in each site, any anomaly in the operation of these devices, or the implementation of these by human error would immediately be identified and managed. Therefore, as a result of the hypothetical volume accidentally spilled, uncontrolled release would cause a non-significant scenario, just as the associated impact on the receiving body of water would not be significant.

On the basis of the foregoing, it is thought reasonable to excluded risks for public health or the environment, since the possible incident scenarios, the probability of the occurrence of which should be considered remote, by virtue of the limited quantity of contaminants that could be released into the environment and the prevention measures implemented, would cause non-significant impact and, in any case, mitigated by the implementation of the intervention procedures for the management of the emergencies in the case of incidents and/or natural catastrophes.

Finally, with reference to the presence of two plants at risk of significant incident (RSI) located around 1 km from the Bosco Marengo site (paragraph 6.1.6), the involvement of the nuclear installation in incident events, such as, for example, explosions and/or fire, by virtue of the engineering configuration described, limited to the presence of the temporary depot characterised by a fire load of more or less zero and the managerial procedures described above, it is held that the installation makes no contribution of any kind. In addition, pursuit of the decommissioning strategy leads to an overall decrease of the current anthropic pressure on the territory in question.

Non-energy sector installations

On the basis of the information available and with reference to the assessments conducted in the previous paragraphs, the only operator of the non-energy sector that, in managerial and technical techniques designed for the safe operation of its installations, is similar to the operator of energy plant, is NUCLECO.

8 Assessments of the alternatives of the NP

Over the years, parliament and the government have undertaken various initiatives aimed at tackling the problem of radioactive waste and spent fuel management.

The Legislative Decree of 15 February 2010, no. 31, on the “regulations of storage systems of irradiated fuel and radioactive waste, as well as the economic benefits, in accordance with article 25 of the Law of 23 July 2009, no. 99” in Heading III, lays down the procedures for the siting, construction and operation of the National Repository, within the sphere of the Technological Park, that is, a research centre open to international collaboration, specialised in the waste treatment sector.

At the international level, our country is obliged to respect the commitments deriving from the Joint Convention on the safe management of fuel and radioactive waste, with particular reference to the Directive 2011/70/Euratom, the adoption of which leads to the impossibility of postponing a national strategic programme for the safe management of radioactive waste and spent fuel.

Moreover, in relation to the need for the National Repository, it is reiterated that Italy does not have a depot suitable for the disposal of radioactive waste and spent fuel and, in the coming year, the re-entry in Italy from England and France is envisaged of package waste deriving from the operations of reprocessing of irradiate fuel.

Therefore, the availability in reasonable time of the National Repository meets three needs for Italy:

- honouring the times laid down by agreements stipulated by Italy for the re-entry in Italy of radioactive residues arising from the fuel reprocessing activities;
- concluding the decommissioning of the nuclear plants and releasing of areas subject to previous nuclear facilities, without radiological constraints;
- appropriately dealing with non-nuclear power radioactive waste (medical-healthcare, industrial and from research).

The construction of the National Repository therefore also takes on a functional character with regard to the intention to pursue the strategy of decommissioning identified, rapidly concluding the final dismantling of nuclear power stations, thereby enabling a reduction of the items on the bills for Italian citizens, made up of “other system charges", as well as guaranteeing suitable disposal of the radioactive waste deriving from the activities of nuclear medicine, industrial and research activities, concerning the strategy of the Integrated Service.

The transfer of radioactive waste to a single structure will guarantee both the total safety for citizens and the environment and respect for the European directives, aligning Italy with countries that have operated similar depots.

On the basis of the above, it is not therefore possible to strategically consider other alternatives, compared to those identified by NP and far less a zero alternative.

9 Environmental monitoring of the NP

9.1 General matters

In this Chapter, the criteria adopted for the monitoring and control of the environmental effects arising from the implementation of the PN are described, defining, in particular, the set of indicators used, the methods of collecting the data and drawing up the indicators required for the assessment of the impacts, frequency of drawing up the monitoring report containing the results of the assessment of the impacts and any corrective measures to be adopted.

As defined by the regulations, the monitoring must guarantee the control of environmental impacts arising from the implementation of the NP and the verification of the attainment of the established environmental protection objectives, in order to promptly identify unforeseen negative impacts and to adopt the appropriate corrective measures (Figure 10-1].

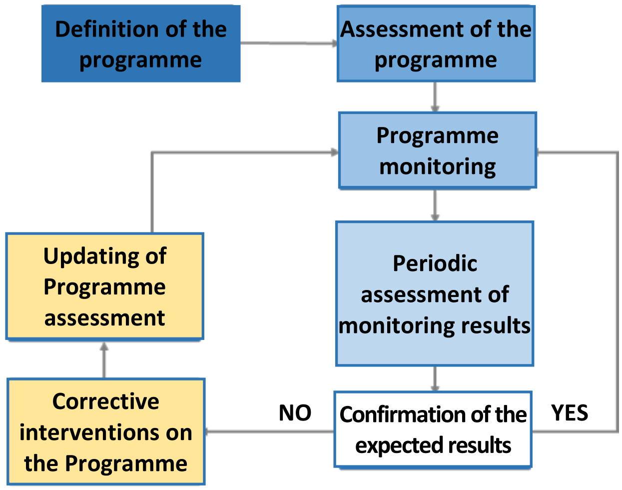

Figure 9-1 – Diagram of the monitoring project

The assessments implemented in the previous chapter demonstrated that, from a general point of view, the action lines examined for the implementation of the NP objectives, explicitly and implicitly pursue environmental objectives (it should be recalled in this regard that the primary purpose of the NP is making radioactive waste safe and its final disposal), the reason that the environmental monitoring of the NP often translates into measuring the expected benefits rather than negative "impacts".

Therefore, the purpose of the environmental monitoring will be to confirm, from the qualitative and quantitative point of view, the positive outcomes of the environmental assessment carried out and arrange any corrective interventions for the reformulation of the Programme actions or specific activities, on the basis of what emerged from the assessment.

The monitoring activities defined in this Report are divided into:

- Monitoring of the environmental context, aimed at the analysis of the development of the environmental context of reference, defined in accordance with the criteria reported in chapter 7;
- Monitoring of the NP, aimed at verification of the attainment of the objectives of the NP and the degree of implementation of the respective action lines;
- Environmental monitoring of the NP for the purpose of following and assessing the contribution of the programme to the evolution of the environmental context and the pursuit of the general objectives of environmental protection.

9.2 System of indicators

The monitoring system must allow the information to be connected and processed regarding the trend in the environmental context of reference, the state of progress of the activities and the implementation methods of the actions laid down by the Programme, as well as the significant environmental effects caused by the aforementioned actions. In order to fulfil this purpose, the following indicators have been identified, in compliance with the provision of the Manuals and Guidelines recognised at the international level[90]:

- Process indicators, which take account of the degree of implementation of the NP actions;
- Indicators of the plan's contribution to the variation of the context;
- Context indicators that follow the development of the environmental context.

In Chapter 7, assessments have been made under the environmental profile of the treatment/conditioning action lines of liquid and solid radioactive waste, specific flows and spent fuel, stored on site or at the NR and disposed of at the NR, identified for the implementation of two action strategies, Decommissioning and Integrated Service, in turn defined in order to attain the various objectives of the NP with particular reference to objectives 1, 3, 5, 6 and 7, which can be summarised as: "safe management of all types of radioactive waste and spent fuels, under national jurisdiction, during all the phases of the life cycle of such waste, from generation to disposal".

For these objectives, it was possible to identify, in addition to the "Process Indicators", the "Contribution Indicators" and "Context Indicators" in relation to the environmental components affected, directly and indirectly, by the potential environmental effects caused by the actions of the NP.

Furthermore, in chapter 7, it is made clear that, while the end of the life cycle (disposal) of the waste/fuel strictly related to the attainment also of objective 4 (which concerns the "siting, construction and operation of the NR), the analysis conducted below does not consider the potential environmental effect, since the overall process of attaining this objective is still in its initial phase (the siting procedure is currently underway, as is the planning of the NR). Therefore, in the absence of the definition of the potential sphere of influence, as well as an adequate level of planning, it was not possible to conduct an environmental characterisation aimed at contextualising and, consequently, assessing the potential environmental effects caused by the conduct of the activities.

For objective 4, until information is available on the siting of the NR and the respective design, it will only be possible to carry out the monitoring of the NP through the use of "Process Indicators".

Finally, for the remaining objectives (2, 8, 9 and 10), it is also correct to state that their attainment cannot have direct repercussions on the state of the environment and, therefore, no environmental assess was carried out, nor were context and contribution indicators identified. However, the importance of the implementation of the aforementioned objectives is reiterated, in contributing to substantiating the proper, organic management of the problems dealt with, in line with the most advanced environmental sustainability strategies, the reason for which they will be subject to the planned environmental monitoring of the NP, even if limited to the quantification of the "process indicators".

[90] ISPRA Manuals and Guidelines 124/2015 "Operating instructions in support of the assessment and drawing up the Strategic Environmental Assessment documents"

On the basis of the foregoing, the monitoring system defined for the NP envisages:

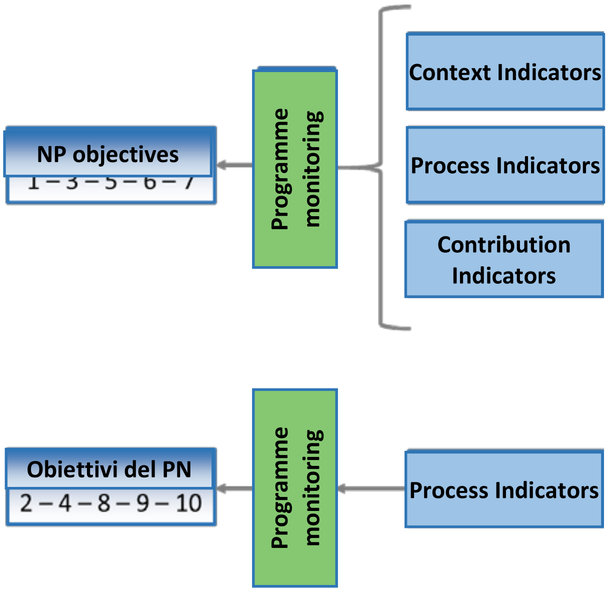

Figure 9.2-1: NP monitoring system

With reference to the assessments made in chapter 6, in addition to the criteria for identifying the indicators, the indicators of context/contribution/process are given in the following tables for the monitoring of objective 1 - 3 - 5 - 6 - 7 of the NP and the respective action lines, as well as the process indicators for the objectives 2 - 4 - 8 - 9 – 10.

It is made clear that, as regards the Atmosphere and Water Environment components, the contribution indicator *“increase in percentage of the use of the discharge formulae (RAD)"* does not cause effects on the environmental context of the components examined if 100% of the discharge formula is not exceeded, since the latter is defined, as previously made clear, pursuing the objective of “radiological non-significance” of the release, assessing both the typical radioactivity content of every plant (release limits) and the characteristics of environmental receptivity of the territorial and socioeconomic context for which they were defined, such as the capacity of the receiving body of water, the level of release, the speed and temperature of release, the atmospheric stability class and anemological regime, the demographic structure. The monitoring of the context indicators, in this case, will serve specifically to appropriately assess any development of the contribution indicator, the determination of which is closely linked to the conditions of the environmental context of reference.

9.2.1 Objectives of the NP 1 – 3 – 5 – 6 – 7

Energy Sector Strategy - *Decommissioning*

Power stations of Caorso – Garigliano – Latina - Trino

Action Lines (A1-A2-A3-A4) – Treatment and Conditioning of Waste

For the Latina Power Station, indicators regarding the landscape component must not be considered since the site is not subject to landscape constraints.

Environmental Component	Process Indicator	Unit of Measurement	Contribution Indicator	Unit of Measurement	Context Indicator	Unit of Measurement	General Objective of Environmental Protection
Atmosphere and Water Environment	Number of waste packages produced as the processes continue of treatment and conditioning	Whole number	Percentage increase in the use of the discharge formulae (RAD)	%	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	Improvement of the air quality Improvement of the quality of bodies of water
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
					Capacity of receiving body of water	m3/s	
			Necessity of updating Single Environmental Authorisations (CONV)	Whole number	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
					Capacity of receiving body of water	m3/s	
	Number of new treatment and conditioning plants	Whole number	Percentage increase in the use of the discharge formulae (RAD)	%	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
					Capacity of receiving body of water	m3/s	
			Necessity of updating Single Environmental Authorisations (CONV)	Whole number	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
					Capacity of receiving body of water	m3/s	
Landscape	number of new landscape authorisations acquired	Whole number	increase in the above ground volumes	m^3	presence of protected areas and constrained at the international, community, national and regional level	YES/NO	Protection of the Landscape
			decrease in the above ground volumes	m^3			
	number of structures demolished during the decommissioning	Whole number	increase in the above ground volumes	m^3	presence of protected areas and constrained at the international, community, national and regional level	YES/NO	
			decrease in the aboveground volumes	m^3			
Ionising radiation	number of waste packages produced as the processes continue of treatment and conditioning of radioactive waste	Whole number	measurement of the activity released in the form of liquid and gaseous effluents	Bq	concentration of artificial radionuclides in the foodstuffs and environmental matrices monitored as part of the radioactivity surveillance network	Bq/m^3 Bq/m^2 Bq/l	Protection against Ionising radiation
Biodiversity	number of waste packages produced as the processes continue of treatment and conditioning of radioactive waste	Whole number	variation of the extension of the buffer zone following the implementation of the radiological practices	hectares	number and surface area of the protected areas at the international, community, national and regional level	(Whole number) (hectares)	Protection of the Biodiversity
					Number of habitats and species of community interest	Whole number	

Action Lines (A5) – Storage on site

Environmental Component	Process Indicator	Unit of Measurement	Contribution Indicator	Unit of Measurement	Context Indicator	Unit of Measurement	General Objective of Environmental Protection
Atmosphere	percentage of the number of stored radioactive waste, not conditioned	%	control of the analyses of the HEPA filters of the flues	Bq	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	Improvement of the air quality
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
Landscape	number of new landscape authorisations acquired	Whole number	increase in the above ground volumes	m3	presence of protected areas and constrained at the international, community, national and regional level	YES/NO	Protection of the Landscape
			decrease in the above ground volumes	m3			
	number of structures demolished during the decommissioning	Whole number	increase in the above ground volumes	m3	presence of protected areas and constrained at the international, community, national and regional level	YES/NO	
			decrease in the above ground volumes	m3			
Ionising radiation	load percentage of the depot	%	measurement of the gamma dose rate in air monitored at the fence of the nuclear power station	µSv/h	measurement of the gamma dose in air characteristic of the natural background radiation	µSv/h	Protection against Ionising radiation
	variation of the area extension of the Controlled Zone	m^2					
Biodiversity	load percentage of the depot	%	variation of the extension of the buffer zone following the implementation of the radiological practices.	hectares	number and surface area of the protected areas at the international, community, national and regional level	(Whole number) (hectares)	Protection of the Biodiversity
					Number of habitats and species of community interest	Whole number	

Saluggia Nuclear complex - SOGIN Site
Action lines – Treatment, conditioning and storing of radioactive waste (A1, A2, A3, A4[91])

Environmental Component	Process Indicator	Unit of Measurement	Contribution Indicator	Unit of Measurement	Context Indicator	Unit of Measurement	General Objective of Environmental Protection
Atmosphere and Water Environment	Number of waste packages produced as the processes continue of treatment and conditioning	Whole number	Percentage increase in the use of the discharge formulae (RAD)	%	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	Improvement of the air quality Improvement of the quality of bodies of water
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
					Capacity of receiving body of water	m3/s	
			Necessity of updating Single Environmental Authorisations (CONV)	Whole number	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
					Capacity of receiving body of water	m3/s	

Atmosphere and Water Environment	Number of new treatment and conditioning plants	Whole number	Percentage increase in the use of the discharge formulae (RAD)	%	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	Improvement of the air quality Improvement of the quality of bodies of water
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	

[91] CEMEX plant

					Capacity of receiving body of water	m3/s	
			Necessity of updating Single Environmental Authorisations (CONV)	Whole number	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
					Capacity of receiving body of water	m3/s	
Landscape	number of new landscape authorisations acquired	Whole number	increase in the above ground volumes	m3	presence of protected areas and constrained at the international, community, national and regional level	YES/NO	Protection of the Landscape
			decrease in the above ground volumes	m3			
	number of structures demolished during the decommissioning	Whole number	increase in the above ground volumes	m3	presence of protected areas and constrained at the international, community, national and regional level	YES/NO	
			decrease in the above ground volumes	m3			
Ionising radiation	number of waste packages produced as the processes continue of treatment and conditioning of radioactive waste	Whole number	measurement of the activity released in the form of liquid and gaseous effluents	Bq	concentration of artificial radionuclides in the foodstuffs and environmental matrices monitored as part of the radioactivity surveillance network	Bq/m3 Bq/m2 Bq/l	Protection against Ionising radiation
Biodiversity	number of waste packages produced as the processes continue of treatment and conditioning of radioactive waste	Whole number	variation of the extension of the buffer zone following the implementation of the radiological practices	hectares	number and surface area of the protected areas at the international, community, national and regional level	(Whole number) (hectares)	Protection of the Biodiversity
					Number of habitats and species of community interest	Whole number	

Action Lines (A5) – Storage on site

Environmental Component	Process Indicator	Unit of Measurement	Contribution Indicator	Unit of Measurement	Context Indicator	Unit of Measurement	General Objective of Environmental Protection
Atmosphere	percentage of the number of stored radioactive waste, not conditioned	%	control of the analyses of the HEPA filters of the flues	Bq	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	Improvement of the air quality
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
Landscape	number of new landscape authorisations acquired	Whole number	increase in the above ground volumes	m3	presence of protected areas and constrained at the international, community, national and regional level	YES/NO	Protection of the Landscape
			decrease in the above ground volumes	m3			
	number of structures demolished during the decommissioning	Whole number	increase in the above ground volumes	m3	presence of protected areas and constrained at the international, community, national and regional level	YES/NO	
			decrease in the above ground volumes	m3			
Ionising radiation	load percentage of the depot	%	measurement of the gamma dose rate in air monitored at the fence of the nuclear power station	µSv/h	measurement of the gamma dose in air characteristic of the natural background radiation	µSv/h	Protection against Ionising radiation
	variation of the area extension of the Controlled Zone	m2					
Biodiversity	load percentage of the depot	%	variation of the extension of the buffer zone following the implementation of the radiological practices	hectares	number and surface area of the protected areas at the international, community, national and regional level	(Whole number) (hectares)	Protection of the Biodiversity
					Number of habitats and species of community interest	Whole number	

Saluggia Nuclear Complex - Avogadro Depot
Action lines – Storage in on-site pool of irradiated fuel (B2-B.2.2)

<table>
<tr><th>Environmental Component</th><th>Process Indicator</th><th>Unit of Measurement</th><th>Contribution Indicator</th><th>Unit of Measurement</th><th>Context Indicator</th><th>Unit of Measurement</th><th>General Objective of Environmental Protection</th></tr>
<tr><td rowspan="4">Atmosphere</td><td rowspan="4">load percentage of the depot</td><td rowspan="4">%</td><td rowspan="4">control of the analyses of the HEPA filters of the flues</td><td rowspan="4">Bq</td><td>climatic conditions (T – UR – Pressure)</td><td>(°C - % - mbar)</td><td rowspan="4">Improvement of the air quality</td></tr>
<tr><td>anemological regime (wind direction and speed)</td><td>(sexagesimal degrees compared to north) – m/s</td></tr>
<tr><td>pluviometrical regime</td><td>mm of rain</td></tr>
<tr><td>atmospheric stability classes</td><td>Letter (A-F)</td></tr>
<tr><td rowspan="2">Ionising radiation</td><td>load percentage of the depot</td><td>%</td><td rowspan="2">measurement of the gamma dose rate in air monitored at the fence of the nuclear power station</td><td rowspan="2">µSv/h</td><td rowspan="2">measurement of the gamma dose in air characteristic of the natural background radiation</td><td rowspan="2">µSv/h</td><td rowspan="2">Protection against Ionising radiation</td></tr>
<tr><td>variation of the area extension of the Controlled Zone</td><td>m2</td></tr>
<tr><td rowspan="2">Biodiversity</td><td rowspan="2">load percentage of the depot</td><td rowspan="2">%</td><td rowspan="2">variation of the extension of the buffer zone following the implementation of the radiological practices</td><td rowspan="2">hectares</td><td>number and surface area of the protected areas at the international, community, national and regional level</td><td>(Whole number)
(hectares)</td><td rowspan="2">Protection of the Biodiversity</td></tr>
<tr><td>Number of habitats and species of community interest</td><td>Whole number</td></tr>
</table>

Bosco Marengo Nuclear Fabrication Plant
Action lines – On-site storage of radioactive waste (A5)

<table>
<tr><th>Environmental Component</th><th>Process Indicator</th><th>Unit of Measurement</th><th>Contribution Indicator</th><th>Unit of Measurement</th><th>Context Indicator</th><th>Unit of Measurement</th><th>General Objective of Environmental Protection</th></tr>
<tr><td rowspan="4">Atmosphere</td><td rowspan="4">percentage of the number of stored radioactive waste, not conditioned</td><td rowspan="4">%</td><td rowspan="4">control of the analyses of the HEPA filters of the flues</td><td rowspan="4">Bq</td><td>climatic conditions (T – UR – Pressure)</td><td>(°C - % - mbar)</td><td rowspan="4">Improvement of the air quality</td></tr>
<tr><td>anemological regime (wind direction and speed)</td><td>(sexagesimal degrees compared to north) – m/s</td></tr>
<tr><td>pluviometrical regime</td><td>mm of rain</td></tr>
<tr><td>atmospheric stability classes</td><td>Letter (A-F)</td></tr>
<tr><td rowspan="2">Ionising radiation</td><td>load percentage of the depot</td><td>%</td><td rowspan="2">measurement of the gamma dose rate in air monitored at the fence of the nuclear power station</td><td rowspan="2">µSv/h</td><td rowspan="2">measurement of the gamma dose in air characteristic of the natural background radiation</td><td rowspan="2">µSv/h</td><td rowspan="2">Protection against Ionising radiation</td></tr>
<tr><td>variation of the area extension of the Controlled Zone</td><td>m2</td></tr>
<tr><td rowspan="2">Biodiversity</td><td rowspan="2">load percentage of the depot</td><td rowspan="2">%</td><td rowspan="2">variation of the extension of the buffer zone following the implementation of the radiological practices</td><td rowspan="2">hectares</td><td>number and surface area of the protected areas at the international, community, national and regional level</td><td>(Whole number)
(hectares)</td><td rowspan="2">Protection of the Biodiversity</td></tr>
<tr><td>Number of habitats and species of community interest</td><td>Whole number</td></tr>
</table>

ENEA RC Casaccia – SOGIN Site
Action lines – Treatment and conditioning of radioactive waste (A1, A2, A3 and A4)

Environmental Component	Process Indicator	Unit of Measurement	Contribution Indicator	Unit of Measurement	Context Indicator	Unit of Measurement	General Objective of Environmental Protection
Atmosphere	*Number of waste packages produced as the processes continue of treatment and conditioning*	*Whole number*	*Percentage increase in the use of the discharge formulae (RAD)*	*%*	*climatic conditions (T – UR – Pressure)*	*(°C - % - mbar)*	*Improvement of the air quality*
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	*mm of rain*	
					atmospheric stability classes	*Letter (A-F)*	
			Necessity of updating Single Environmental Authorisations (CONV)	*Whole number*	*climatic conditions (T – UR – Pressure)*	*(°C - % - mbar)*	
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	*mm of rain*	
					atmospheric stability classes	*Letter (A-F)*	
	Number of new treatment and conditioning plants	*Whole number*	*Percentage increase in the use of the discharge formulae (RAD)*	*%*	*climatic conditions (T – UR – Pressure)*	*(°C - % - mbar)*	
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	*mm of rain*	
					atmospheric stability classes	*Letter (A-F)*	
			Necessity of updating Single Environmental Authorisations (CONV)	*Whole number*	*climatic conditions (T – UR – Pressure)*	*(°C - % - mbar)*	
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	*mm of rain*	
					atmospheric stability classes	*Letter (A-F)*	
Ionising radiation	number of waste packages produced as the processes continue of treatment and conditioning of radioactive waste	*Whole number*	measurement of the activity released in the form of liquid and gaseous effluents	Bq	concentration of artificial radionuclides in the foodstuffs and environmental matrices monitored as part of the radioactivity surveillance network	*Bq/m3 Bq/m2 Bq/l*	*Protection against Ionising radiation*
Biodiversity	number of waste packages produced as the processes continue of treatment and conditioning of radioactive waste	*Whole number*	variation of the extension of the buffer zone following the implementation of the radiological practices	hectares	number and surface area of the protected areas at the international, community, national and regional level	(Whole number) (hectares)	*Protection of the Biodiversity*
					Number of habitats and species of community interest	*Whole number*	

Action lines –Storage of radioactive waste (A5)

Environmental Component	Process Indicator	Unit of Measurement	Contribution Indicator	Unit of Measurement	Context Indicator	Unit of Measurement	General Objective of Environmental Protection
Atmosphere	percentage of the number of stored radioactive waste, not conditioned	%	control of the analyses of the HEPA filters of the flues	Bq	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	Improvement of the air quality
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
Ionising radiation	load percentage of the depot	%	measurement of the gamma dose rate in air monitored at the fence of the nuclear power station	µSv/h	measurement of the gamma dose in air characteristic of the natural background radiation	µSv/h	Protection against Ionising radiation
	variation of the area extension of the Controlled Zone	m2					
Biodiversity	load percentage of the depot	%	variation of the extension of the buffer zone following the implementation of the radiological practices	hectares	number and surface area of the protected areas at the international, community, national and regional level	(Whole number) (hectares)	Protection of the Biodiversity
					Number of habitats and species of community interest	Whole number	

Action lines – Dry storage on-site of irradiated fuel (B2-B.2.1)

Environmental Component	Process Indicator	Unit of Measurement	Contribution Indicator	Unit of Measurement	Context Indicator	Unit of Measurement	General Objective of Environmental Protection
Atmosphere	load percentage of the depot (Cask)	%	control of the analyses of the HEPA filters of the flues	Bq	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	Improvement of the air quality
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
Ionising radiation	load percentage of the depot (Cask)	%	measurement of the gamma dose rate in air monitored at the fence of the nuclear power station	µSv/h	measurement of the gamma dose in air characteristic of the natural background radiation	µSv/h	Protection against Ionising radiation
	variation of the area extension of the Controlled Zone	m2					
Biodiversity	load percentage of the depot (Cask)	%	variation of the extension of the buffer zone following the implementation of the radiological practices	hectares	number and surface area of the protected areas at the international, community, national and regional level	(Whole number) (hectares)	Protection of the Biodiversity
					Number of habitats and species of community interest	Whole number	

Rotondella ITREC Plant
Action lines – Treatment and conditioning of radioactive waste (A1, A2, A3, A4, A4[92])

Environmental Component	Process Indicator	Unit of Measurement	Contribution Indicator	Unit of Measurement	Context Indicator	Unit of Measurement	General Objective of Environmental Protection
Atmosphere and Water Environment	Number of waste packages produced as the processes continue of treatment and conditioning	Whole number	Percentage increase in the use of the discharge formulae (RAD)	%	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	Improvement of the air quality Improvement of the quality of bodies of water
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
					Capacity of receiving body of water	m^3/s	
			Necessity of updating Single Environmental Authorisations (CONV)	Whole number	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
					Capacity of receiving body of water	m3/s	
	Number of new treatment and conditioning plants	Whole number	Percentage increase in the use of the discharge formulae (RAD)	%	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
					Capacity of receiving body of water	m3/s	
			Necessity of updating Single Environmental Authorisations (CONV)	Whole number	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
					Capacity of receiving body of water	m3/s	
Landscape	number of new landscape authorisations acquired	Whole number	increase in the above ground volumes	m3	presence of protected areas and constrained at the international, community, national and regional level	YES/NO	Protection of the Landscape
			decrease in the above ground volumes	m3			
	number of structures demolished during the decommissioning	Whole number	increase in the above ground volumes	m3	presence of protected areas and constrained at the international, community, national and regional level	YES/NO	
			decrease in the above ground volumes	m3			
Ionising radiation	number of waste packages produced as the processes continue of treatment and conditioning of radioactive waste	Whole number	measurement of the activity released in the form of liquid and gaseous effluents	Bq	concentration of artificial radionuclides in the foodstuffs and environmental matrices monitored as part of the radioactivity surveillance network	Bq/m3 Bq/m2 Bq/l	Protection against Ionising radiation
Biodiversity	number of waste packages produced as the processes continue of treatment and conditioning of radioactive waste	Whole number	variation of the extension of the buffer zone following the implementation of the radiological practices	hectares	number and surface area of the protected areas at the international, community, national and regional level	(Whole number) (hectares)	Protection of the Biodiversity
					Number of habitats and species of community interest	Whole number	

[92] ICPF plant

Action lines – Storage of radioactive waste (A5)

Environmental Component	Process Indicator	Unit of Measurement	Contribution Indicator	Unit of Measurement	Context Indicator	Unit of Measurement	General Objective of Environmental Protection
Atmosphere	percentage of the number of stored radioactive waste, not conditioned	%	control of the analyses of the HEPA filters of the flues	Bq	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	Improvement of the air quality
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
Landscape	number of new landscape authorisations acquired	Whole number	increase in the above ground volumes	m3	presence of protected areas and constrained at the international, community, national and regional level	YES/NO	Protection of the Landscape
			decrease in the above ground volumes	m3			
	number of structures demolished during the decommissioning	Whole number	increase in the above ground volumes	m3	presence of protected areas and constrained at the international, community, national and regional level	YES/NO	
			decrease in the above ground volumes	m3			
Ionising radiation	load percentage of the depot	%	measurement of the gamma dose rate in air monitored at the fence of the nuclear power station	µSv/h	measurement of the gamma dose in air characteristic of the natural background radiation	µSv/h	Protection against Ionising radiation
	variation of the area extension of the Controlled Zone	m2					
Biodiversity	load percentage of the depot	%	variation of the extension of the buffer zone following the implementation of the radiological practices	hectares	number and surface area of the protected areas at the international, community, national and regional level	(Whole number) (hectares)	Protection of the Biodiversity
					Number of habitats and species of community interest	Whole number	

Action lines – Dry storage on-site of irradiated fuel (B2-B.2.2)

Environmental Component	Process Indicator	Unit of Measurement	Contribution Indicator	Unit of Measurement	Context Indicator	Unit of Measurement	General Objective of Environmental Protection
Atmosphere	load percentage of the depot (Cask)	%	control of the analyses of the HEPA filters of the flues	Bq	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	Improvement of the air quality
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
Landscape	number of new landscape authorisations acquired	Whole number	increase in the above ground volumes	m3	presence of protected areas and constrained at the international, community, national and regional level	YES/NO	Protection of the Landscape
			decrease in the above ground volumes	m3			
	number of structures demolished during the decommissioning	Whole number	increase in the above ground volumes	m3	presence of protected areas and constrained at the international, community, national and regional level	YES/NO	
			decrease in the above ground volumes	m3			
Ionising radiation	load percentage of the depot (Cask)	%	measurement of the gamma dose rate in air monitored at the fence of the nuclear power station	µSv/h	measurement of the gamma dose in air characteristic of the natural background radiation	µSv/h	Protection against Ionising radiation
	variation of the area extension of the Controlled Zone	m2					
Biodiversity	load percentage of the depot (Cask)	%	variation of the extension of the buffer zone following the implementation of the radiological practices	hectares	number and surface area of the protected areas at the international, community, national and regional level	(Whole number) (hectares)	Protection of the Biodiversity
					Number of habitats and species of community interest	Whole number	

Non-Energy Sector Strategy – Integrated Service

As already described in paragraph 5.1.2, regarding the temporary depots belong to the Integrated Service such as Protex and Campoverde, due to the type of waste stored, no variation of the background radiation related to them is foreseen following direct irradiation.

Moreover, the government's strategy outlined for the management of the nuclear reclamation of the Cemerad Depot does not envisage the construction of on-site treatment/conditioning plants of waste in drums currently stored at Statte, but only the characterisation the drums for the definition of the most appropriate methods of nuclear transport to an already-authorised site, to be identified as part of the Integrated Service.

Therefore, for plants of the non-energy sector, due to the possible effects on the surrounding environment produced by the actions of the NP so far described, only the effects due to NUCLECO have been assessed in this Environmental Report, for which the following indicators were identified:

NUCLECO

Action Lines (A1-A2-A3-A4) – Treatment and Conditioning of Waste

Environmental Component	Process Indicator	Unit of Measurement	Contribution Indicator	Unit of Measurement	Context Indicator	Unit of Measurement	General Objective of Environmental Protection
Atmosphere and Water Environment	Number of waste packages produced as the processes continue of treatment and conditioning	Whole number	Percentage increase in the use of the discharge formulae (RAD)	%	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	Improvement of the air quality Improvement of the quality of bodies of water
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
					Capacity of receiving body of water	m3/s	
			Necessity of updating Single Environmental Authorisations (CONV)	Whole number	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
					Capacity of receiving body of water	m3/s	
	Number of new treatment and conditioning plants	Whole number	Percentage increase in the use of the discharge formulae (RAD)	%	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
					Capacity of receiving body of water	m3/s	
			Necessity of updating Single Environmental Authorisations (CONV)	Whole number	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
					Capacity of receiving body of water	m3/s	
Ionising radiation	number of waste packages produced as the processes continue of treatment and conditioning of radioactive waste	Whole number	measurement of the activity released in the form of liquid and gaseous effluents	Bq	concentration of artificial radionuclides in the foodstuffs and environmental matrices monitored as part of the radioactivity surveillance network	Bq/m3 Bq/m2 Bq/l	Protection against Ionising radiation
Biodiversity	number of waste packages produced as the processes continue of treatment and conditioning of radioactive waste	Whole number	variation of the extension of the buffer zone following the implementation of the radiological practices	hectares	number and surface area of the protected areas at the international, community, national and regional level	(Whole number) (hectares)	Protection of the Biodiversity
					Number of habitats and species of community interest	Whole number	

Action Lines (A5) – Storage on site

Environmental Component	Process Indicator	Unit of Measurement	Contribution Indicator	Unit of Measurement	Context Indicator	Unit of Measurement	General Objective of Environmental Protection
Atmosphere	percentage of the number of stored radioactive waste, not conditioned	%	control of the analyses of the HEPA filters of the flues	Bq	climatic conditions (T – UR – Pressure)	(°C - % - mbar)	Improvement of the air quality
					anemological regime (wind direction and speed)	(sexagesimal degrees compared to north) – m/s	
					pluviometrical regime	mm of rain	
					atmospheric stability classes	Letter (A-F)	
Ionising radiation	load percentage of the depot	%	measurement of the gamma dose rate in air monitored at the fence of the nuclear power station	µSv/h	measurement of the gamma dose in air characteristic of the natural background radiation	µSv/h	Protection against Ionising radiation
	variation of the area extension of the Controlled Zone	m2					
Biodiversity	load percentage of the depot	%	variation of the extension of the buffer zone following the implementation of the radiological practices	hectares	number and surface area of the protected areas at the international, community, national and regional level	(Whole number) (hectares)	Protection of the Biodiversity
					Number of habitats and species of community interest	Whole number	

9.2.2 <u>Objectives 2 – 4 – 8 – 9 – 10</u>

The Process Indicator defined for the aforementioned objectives are given below

Objective		Process Indicator	Unit of Measurement	Data Source
2	Updating the national inventory of radioactive waste and spent fuel with annual frequency	Issuing updated inventory	Whole number	ISPRA
4	Localising, constructing and operating the National Repository, intended to house the radioactive waste generated in the national territory from industrial, research and medical/healthcare activities and the previous management of nuclear plants, when derived from civil activities, included in a Technology Park including a Study and Experimentation Centre, as specifically regulated by article 27 of the Legislative Decree of 15 February 2010, no. 31	NR siting phases (Provision of CNAPI (National Map of Suitable Areas) – Check by ISPRA, MED and MEPLS of the CNAPI and draft project – Public consultation and national seminary – Gathering observations and updating CNAPI – Approval and publication of CNAI – Manifestation of interest and agreement protocols – technical surveys of candidate sites – Siting Decree)	T (months)	ISPRA, MED and MEPLS
		Single Authorisation Procedures	T (months)	ISPRA, MED and MEPLS
		NR working drawings, specifications etc. and construction	T (months)	Operator assigned
		NR operation	T (years)	Operator assigned
8	Guaranteeing respect for the commitments between the Italian Republic and the European Atomic Energy Community (EURATOM) on the radioactive waste management in the site of the Municipal Research Centre located in the Municipality of Ispra (VA)	Number of waste packages managed in a way that differs from the agreement	Whole number	Operator assigned
9	Implementing a research and development programme aimed exclusively at the safe management of spent fuel and radioactive waste in line with the contents of the National Programme	Research Programme Planning and Approval	T (months)	Research Body - University
		Research Programme Implementation	T (months)	Research Body - University
		Research Programme publications	Whole number	Research Body - University
10	Implementing, as a priority to attain the previous objectives, a correct, objective and accurate information in order to guarantee transparency and effective participation by the public in the decision-making processes concerning the management of spent fuel and radioactive waste	Information events	Whole number	Operator assigned

The data concerning the Process and Contribution indicators will be provided annually by the Plant Operators, while those of Context will be taken, annually, from the institutional sources indicated below:

Weather and climate data	Regional ARPA - ISPRA
Capacity Data for bodies of water	Regional ARPA - ISPRA
Landscape Data	MCCHT – Regional Superintendence
Ionising Radiation Data	Regional ARPA - ISPRA
Biodiversity Data	Environment Ministry

The implementation of the NP may lead to a new assessment of the environmental effects associated with it and, if appropriate, additional *contribution indicators* will be identified (for example, specific analytes emitted into the environment), for the purpose of adequately measuring the environmental effects of the NP actions on the development of the state of the environment.

Moreover, because dedicated authorisation procedures are provided at various levels within the sphere of implementation of the NP, the outcomes of the assessments carried out in the course of these procedures may lead to a realignment of the NP and the respective environmental effects.

9.3 Contents and frequency of the monitoring reports

For the purpose of disclosing the outcomes of the monitoring activities, periodical monitoring reports will be drawn up that, in consideration of the nature and contents of the NP and its development over time, can be made up into a complete report, every three years.

A rough outline of the contents of the three-year monitoring report is given below:

- Update of the scenario of reference through:
  a) the description of the development of the NP, the regulatory conditions, the policies and strategies of radioactive waste and spent fuel management;
  b) the analysis of the development of the territorial planning of reference;
  c) compiling and updating of the performance, contribution and context indicators identified in this Environmental Report;
  d) verification of the scenarios drawn up in this Environmental Report.

- Verification of the degree of attainment of the objectives, examining the causes of any deviations from the forecasts.
- Description of any participation programme initiated for the implementation of the NP.
- Indications for the subsequent implementation phases, with reference to any new orientation of the contents, of the structure of the NP or the implementation criteria in all cases in which deviations occur to what was envisaged at the time of planning and the Strategic Environment Assessment (for example, failure to carry out the actions, failure to attain the objectives etc.).

9.4 Communication of the monitoring results

The monitoring results will be made available in appropriate sections of the internet sites of the Ministry of Economic Development and the Ministry of the Environment and the Protection of Land and Sea.

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dello Sviluppo Economico

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