ALLEGATO 5.1

METODOLOGIE DI CALCOLO DELLE EMISSIONI IN ATMOSFERA E DEL SOLLEVAMENTO POLVERI IN FASE DI CANTIERE

1. TRANSITO DI VEICOLI DA/PER L'AREA POZZO - VEICOLI LEGGERI

Da EMEP/Corinair – *GROUP 7 road transport - Diesel Light Duty Vehicles*

Descrizione	Procedura
Procedura per il calcolo emissioni da Diesel Light Duty Vehicles	**8.7 Diesel light duty vehicles** Diesel light duty vehicles are treated as passenger cars. Hot emission factor speed dependencies have been developed in the framework of older COPERT exercises (Conventional vehicles) and in the MEET project (Euro I and later vehicles) and are quoted in Table 8-26 for pollutants of Group 1. Cold start over-emissions up to Euro 1 are calculated by equation (6), where e^{COLD}/e^{HOT} ratios are selected from Table 8-14. Emission factors of post-Euro 1 vehicle classes are calculated by the functions corresponding to Euro I vehicles by introducing the reduction factors given in Table 8-27 both for hot and cold start emissions (equations (25) and (24), respectively).
Calcolo E_{HOT}	$E_{HOT;\,i,\,j,\,k} = N_j \times M_{j,k} \times e_{HOT;\,i,\,j,\,k}$ (4) where, $E_{HOT;\,i,\,j,\,k}$: emissions of the pollutant i in [g], produced in the reference year by vehicles of class j driven on roads of type k with thermally stabilised engine and exhaust aftertreatment system N_j: number of vehicles [veh.] of class j in circulation at the reference year $M_{j,k}$: mileage per vehicle [km/veh.] driven on roads of type k by vehicles of class j $e_{HOT;\,i,\,j,\,k}$: average fleet representative baseline emission factor in [g/km] for the pollutant i, relevant for the vehicle class j, operated on roads of type k, with thermally stabilised engine and exhaust aftertreatment system and, i (pollutants): 1-36 for the pollutants of Group 1 and Group 3 (Section 3.4) j (vehicle class): 1-230 for the vehicle classes defined in the vehicle split (Table 3-6) k (road class): 1-3 for "urban", "rural", and "highway" driving.
Calcolo E_{HOT} **Fattori di emissione ("a caldo") – Euro 1**	**Table 8-26: Speed dependency of emission and consumption factors for diesel light duty vehicles <3.5 t**

Pollutant	Vehicle Class	Speed Range [km/h]	Emission Factor [g/km]	R^2
CO	Conventional	10-110	$20E\text{-}05V^2 - 0.0256V + 1.8281$	0.136
	Euro 1	10-110	$22.3E\text{-}05V^2 - 0.026V + 1.076$	0.301
NOx	Conventional	10-110	$81.6E\text{-}05V^2 - 0.1189V + 5.1234$	0.402
	Euro 1	10-110	$24.1E\text{-}05V^2 - 0.03181V + 2.0247$	0.0723
VOC	Conventional	10-110	$1.75E\text{-}05V^2 - 0.00284V + 0.2162$	0.0373
	Euro 1	10-110	$1.75E\text{-}05V^2 - 0.00284V + 0.2162$	0.0373
PM	Conventional	10-110	$1.25E\text{-}05V^2 - 0.000577V + 0.288$	0.0230
	Euro 1	10-110	$4.5E\text{-}05V^2 - 0.004885V + 0.1932$	0.224
Fuel Consumption	Conventional	10-110	$0.02113V^2 - 2.65V + 148.91$	0.486
	Euro 1	10-110	$0.0198V^2 - 2.506V + 137.42$	0.422

Calcolo E_{HOT} – post Euro 1

$$e_{HOT;\,i,\,j,\,k} = (100\text{-}RF_{i,j}) / 100 \times e_{HOT;\,i,\,Euro\ 1,\,k} \qquad (25)$$

Fattori di riduzione post Euro 1

Table 8-27: Emission reduction percentage for future diesel light duty vehicles applied to vehicles complying with directive 93/59/EEC

Emission Standard	CO [%]	NOx [%]	VOC [%]	PM [%]
Euro 2- 96/69/EC	0	0	0	0
Euro 3 - 98/69/EC Stage 2000	18	16	38	33
Euro 4 - 98/69/EC Stage 2005	35	32	77	65
Euro 5 - EC 715/2007	35	51	77	98.25
Euro 6 – EC715/2007	35	78	77	98.25

Calcolo E_{COLD} – Euro 1

$$E_{COLD;i,j} = \beta_{i,j} \times N_j \times M_j \times (100\text{-}RF_{i,j}) / 100 \times e_{HOT;\,i,\,Euro\ 1} \times (e^{COLD} / e^{HOT}|_{i,Euro\ 1} - 1) \qquad (24)$$

where,

$E_{COLD;\,i,\,j}$: cold start emissions of pollutant *i* (for the reference year), produced by vehicle class *j*,

$\beta_{i,\,j}$: fraction of mileage driven with cold engines or catalyst operated below the light-off temperature for pollutant *i* and vehicle category *j*

N_j : number of vehicles [veh.] of class *j* in circulation,

M_j : total mileage per vehicle [km/veh.] in vehicle class *j*,

$e^{COLD} / e^{HOT}|_{i,j}$: cold over hot ratio for pollutant *i*, relevant to vehicles of class *j*.

Calcolo E_{COLD} - Euro 1

Sovraemissione per avviamento a freddo

Table 8-14: Over-emission ratios e^{COLD} / e^{HOT} for diesel passenger cars (temperature range -10°C to 30°C)

Pollutant	e^{COLD} / e^{HOT}
CO	$1.9 - 0.03\ t_a$
NO_x	$1.3 - 0.013\ t_a$
VOC	$3.1 - 0.09\ t_a$ (1)
PM	$3.1 - 0.1\ t_a$ (2)
Fuel Consumption	$1.34 - 0.008\ t_a$

(1) VOC: if ta > 29°C then $e^{COLD} / e^{HOT} > 0.5$

(2) PM: if ta > 26°C then $e^{COLD} / e^{HOT} > 0.5$

2. TRANSITO DI VEICOLI DA/PER L'AREA POZZO - VEICOLI PESANTI

Da EMEP/Corinair – *GROUP 7 road transport - Diesel heavy duty vehicles*	
Descrizione	**Procedura**
Procedura per il calcolo emissioni da per *diesel heavy duty vehicles*	**8.9 Diesel heavy duty vehicles and busses** Speed dependencies of emission factors for diesel heavy duty vehicles have been built on the results provided by the *Artemis* Project. Similarly, the methodology provides hot emission factors for urban busses and coaches. The emission factors are provided for conventional, Euro I to Euro V standards. Due to the large number of data required to calculate emissions from those categories, all relevant information can be found as an Annex to this guidebook chapter The emissions covered by the methodology are CO, VOC, NOx, PM and Fuel Consumption (FC). Equations (27) to (36) represent the main equations used to calculate the emission factors, while the Annex contains the necessary parameters in a specific structure. The name of the files in the Annex is "EFs_GXX%_LYYY%.xls", where XX is the road gradient and YYY is the load factor of the vehicle. The sheet names correspond to the emission factors described in the file, namely CO, THC (VOC), NOx, and PM. For each sheet, column G describes the function while columns I to M contain the factors used in the equation. As an example, file "EFs_G00%_L050%.xls" contains the emission factors for a road gradient 0% and a load factor of 50%. Sheet "FC" describes the fuel consumption emission functions. The equation for Euro 1, <15t midi Urban Buses is: $EF = 1 / (((c \times (V^2)) + (b \times V)) + a)$ where *EF* is the emission factor, *V* is the vehicle speed and the different parameters are found in the columns I to M in the *Annex* file, namely: a= 0.00094 – b= 0.00017 – c= -0.000001. Equations (27) to (36), describe all the different equations that are potentially used in the *Annex* to calculate heavy duty vehicle and bus emission factors. $EF = (a + (b \times V)) + (((c - b) \times (1-\exp(((-1) \times d) \times V))) / d)$ (27) $EF = (e + (a \times \exp(((-1) \times b) \times V))) + (c \times \exp(((-1) \times d) \times V))$ (28) $EF = 1 / (((c \times (V^2)) + (b \times V)) + a)$ (29) $EF = 1 / (a + (b \times (V^c)))$ (30) $EF = 1 / (a + (b \times V))$ (31) $EF = a - (b \times \exp(((-1) \times c) \times (V^d)))$ (32) $EF = a + (b / (1+\exp((((-1) \times c) + (d \times \ln(x))) + (e \times V))))$ (33) $EF = c + (a \times \exp(((-1) \times b) \times V))$ (34) $EF = c + (a \times \exp(b \times V))$ (35) $EF = \exp(a + (b / V)) + (c \times \ln(V))$ (36)
Calcolo fattori di emissione da *diesel heavy duty vehicles*	**Cfr Tab. seguente**

Da EMEP/Corinair – *Group 7 road transport – Diesel heavy duty vehicles*
Road Transport Annex: HDV accompanying files
Formule e Parametri

ID Subsegment	Subsegment	Gradient (%)	Load (%)	Pollutant	Formula (y: g/km; x: km/h)	a	b	c	d	e
1423710	RT >28-32t Euro-1	0	0	CO	y=((e+(a*exp(((-1)*b)*x)))+(c*exp(((-1)*d)*x)))	6.25104	0.053778	6.411478	0.245642	1.208688
1423710	RT >28-32t Euro-1	0	0	THC	y=(a+(b/(1+exp((((-1)*c)+(d*ln(x)))+(e*x)))))	0.390063	6.184444	1.576362	0.913504	0.020659
1423710	RT >28-32t Euro-1	0	0	NOx	y=((e+(a*exp(((-1)*b)*x)))+(c*exp(((-1)*d)*x)))	16.46951	0.065776	89.12681	0.549641	7.047358
1423710	RT >28-32t Euro-1	0	0	PM	y=((e+(a*exp(((-1)*b)*x)))+(c*exp(((-1)*d)*x)))	1.248691	0.051176	2.001457	0.185037	0.235349
1423710	RT >28-32t Euro-1	0	0	FC	y=(1/(((c*(x^2))+(b*x))+a))	0.00095	0.000109	-7.6E-07	#N/A	#N/A
1423710	RT >28-32t Euro-1	0	1	CO	y=((e+(a*exp(((-1)*b)*x)))+(c*exp(((-1)*d)*x)))	6.850895	0.047597	20.21805	0.394769	1.845905
1423710	RT >28-32t Euro-1	0	1	THC	y=((e+(a*exp(((-1)*b)*x)))+(c*exp(((-1)*d)*x)))	2.221232	0.047428	2.811216	0.170428	0.469402
1423710	RT >28-32t Euro-1	0	1	NOx	y=((((a*(x^3))+(b*(x^2)))+(c*x))+d)	-4.7E-05	0.008683	-0.60659	26.09428	#N/A
1423710	RT >28-32t Euro-1	0	1	PM	y=((e+(a*exp(((-1)*b)*x)))+(c*exp(((-1)*d)*x)))	1.369503	0.049874	2.880008	0.288299	0.349348
1423710	RT >28-32t Euro-1	0	1	FC	y=((e+(a*exp(((-1)*b)*x)))+(c*exp(((-1)*d)*x)))	538.1442	0.035916	1841399	1.635556	252.8507

Legenda
RT : tipologia veicoli = non articolato
>28-38 t : capacità veicoli = tra 28 e 32 t
Gradient : pendenza strada (%)
Load: carico (0 = carico a vuoto; 1 = pieno carico)
x = Velocità veicoli (km/h)
y = Fattore di emissione (g/km)
Pollutant: inquinanti considerati (CO, THC, NOx, PM) e consumo gasolio (FC)

3. FUNZIONAMENTO MEZZI IN CANTIERE

Da EMEP/Corinair – *GROUP 8 road transport - Diesel Light Duty Vehicles*	
Descrizione	**Procedura**
Procedura per il calcolo emissioni da *Other mobile sources & machinery*	**5 DETAILED METHODOLOGY** The simple methodology outlined under section 4 makes use of fuel statistics, to be multiplied with bulk emission factors accordingly expressed. In fact, at first glance it seems to be an easy way to estimate (by order of magnitude) the emissions of off-road machinery and equipment taking estimated average emission factors (see, for example, OECD 1991) and to multiply them by the statistical fuel consumption. Unfortunately, this is quite often not feasible, because the statistical fuel consumption data are not available in the required detail. For most countries, only for the sector 'Railways' and the sub-part 'Goods Carrying Vessels', which is part of the sector 'Inland Waterways', fuel consumption data seem to be specific enough to be used for an order of magnitude estimate. Therefore, in the following, a more detailed methodology is described, which is mainly based on the US-EPA method for estimating off-road emissions (US-EPA 1991). The following basic formula is used to calculate emissions: $E = N \times HRS \times HP \times LF \times EF_i$ (5) where: E = mass of emissions of pollutant i during inventory period N = source population (units) HRS = annual hours of use HP = average rated horsepower LF = typical load factor EF_i = average emissions of pollutant i per unit of use (e.g. [g/kWh])

Scelta del livello di controllo delle emissioni da considerare nei calcoli

Analisi delle direttive comunitarie applicabili

Table 8-2b: EU Emission directives pertinent to various source categories of mobile sources and machinery.

Source Category	EU Regulation(s)	Implementation date
Road transport	91/441/EEC, 94/12/EEC & 98/69/EC for Euro I to IV for vehicles < 3.5 tonnes 91/542/EEC & 99/69/EC for Euro I to IV for vehicles >3.5 tonnes	
Industry	Non-road mobile machinery regs apply Directive 97/68/EC (Stages I and II) Directive 2004/26/EC (Stage IIIa)	 1/7/98 (I); 1/1/00 - 1/1/03 (II) 1/7/05 – 1/1/07 (IIIa)
Agriculture	Dominated by agricultural tractor regs Directive 2000/25/EC (Stages I and II) Directive 2005/13/EC (Stage IIIa)	 1/1/01 (I); 1/1/01 - 1/1/03 (II) 1/1/06 – 1/1/07 (IIIa)
Inland navigation	Non-road mobile machinery regs apply from stage IIIa (2004/26/EC)	1/7/05 – 1/1/07
Railways	Non-road mobile machinery regs apply from stage IIIa (2004/26/EC)	1/7/05 for Railcars 1/1/06 – 1/1/08 for locomotives

The consequence of the above is that the emission factors best suited to other mobile sources and machinery, when using the advanced approach, depend on the source category and its year of manufacture. The data are in the tables as summarised below.

Industry	Pre July 1998, i.e. pre Stage I	Table 8.3
	July 1998 – around Jan 2001, i.e. Stage I	Table 8.4
	Around Jan 2001 – around Jan 2006, Stage II	Table 8.5
	After around Jan 2006, Stage IIIa	Table 8.5b
Agriculture	Pre Jan 2001, i.e. pre Stage I	Table 8.3
	Jan 2001 – around Jan 2002, i.e. Stage I	Table 8.5c
	Around Jan 2002 – around Jan 2006, Stage II	Table 8.5c
	After around Jan 2006, Stage IIIa	Table 8.5d
Inland Navigation	Before around July 2005, i.e. pre Stage I	Table 8.3
	After around Jan 2006, Stage IIIa	Table 8.5e
Railways	Before around Jan 2006, i.e. pre Stage I	Table 8.3

Calcolo emissioni

Fattori di emissione per macchine che rispondano alla Direttiva europea 97/68/EC (Stage II)

Table 8-5: Baseline emission factors for NRMM stage II (for 20 ≤ P < 560 kW) controlled diesel engines in [g/kWh], irrespective of engine type

POLLUTANT	Power Range in kW							
[g/kWh]	0-20 0-18	20-37 18-37	37-75	75-130	130-300	300-560	560-1000	>1000
Implementation date (see footnote)	N/A	1/1/ 2000	1/1/ 2003	1/1/ 2002	1/1/ 2001	1/1/ 2001	N/A	N/A
NO_x	14.4	*8.50*	*8.00*	*7.00*	*7.00*	*7.00*	14.4	14.4
N_2O	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
CH_4	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
CO	8.38	*5.50*	*5.00*	*5.00*	*3.50*	*3.50*	3.00	3.00
NMVOC	3.82	*1.50*	*1.30*	*1.00*	*1.00*	*1.00*	1.30	1.30
PM	2.22	*0.80*	*0.40*	*0.30*	*0.20*	*0.20*	1.10	1.10
$PM_{2.5}$	2.09	0.75	*0.38*	*0.28*	*0.19*	*0.19*	1.03	1.03
NH_3	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
FC	271	269	265	260	254	254	254	254

4. EMISSIONI POLVERI

4.1 SINTESI RISULTATI

Cod. Attività	Descrizione Attività	Riferimento	Parametri	Fattore di emissione				A Fattore d'attività	Emissione Complessiva (kg)		
				PTS	PM10	PM2.5	u.m.		PTS	PM10	PM2.5
A01	Scotico	AP-42 11.9-4 Topsoil removal	-	2.90E-02	1.74E-02	1.74E-02	kg/Mg rimosso	12800	371.20	222.72	222.72
A02	Movimentazione scotico	AP-42 13.2.4 (Material handling)	M=18% u=2,2 m/s	5.46E-05	2.58E-05	3.91E-06	Kg/Mg movimentati	12800	0.70	0.33	0.05
A03	Trasporto scotico all'interno del cantiere *	AP-42 13.2.2-4 (Unpaved Road)	s=5% w=20 t	1.76E+00	4.52E-01	4.52E-02	kg/VKT	213	161.12	41.40	4.14
A04	Accumulo scotico	AP-42 13.2.4 (Material handling)	M=18% u=2,2 m/s	5.46E-05	2.58E-05	3.91E-06	Kg/Mg movimentati	12800	0.70	0.33	0.05
A05a	Trasporto materiale (strada) *	AP-42 13.2.2-4 (Unpaved Road)	s=2% w=20 t	9.25E-01	1.98E-01	1.98E-02	kg/VKT	2686	1068.85	228.66	22.87
A05b	Trasporto materiale (interno) *	AP-42 13.2.2-4 (Unpaved Road)	s=5% w=20 t	1.76E+00	4.52E-01	4.52E-02	kg/VKT	537	405.98	104.32	10.43
A06	Movimentazione materiale da cava	AP-42 13.2.4 (Material handling)	M=0,5% u=2,2 m/s	8.25E-03	3.90E-03	5.91E-04	Kg/Mg movimentati	30600	252.32	119.34	18.07
A07	Livellamento e compattazione	13.2.3-1 (Bulldozing equation 11.9-2)	s=2%; M=2%	2.39E+00	3.62E-01	2.51E-01	kg/h di attività	150	358.98	54.26	37.69
A08	Scavo Cantina e Vasconi	AP-42 13.2.4 (Material handling)	M=18% u=2,2 m/s	5.46E-05	2.58E-05	3.91E-06	Kg/Mg movimentati	1499	0.08	0.04	0.01
A09	Realizzazione argini in terra	AP-42 13.2.4 (Material handling)	M=18% u=2,2 m/s	5.46E-05	2.58E-05	3.91E-06	Kg/Mg movimentati	725	0.04	0.02	0.00
A10	Transito betoniere per calcestruzzo *	AP-42 13.2.2-4 (Unpaved Road)	s=2% w=15 t	8.13E-01	1.74E-01	1.74E-02	kg/VKT	720	251.72	53.85	5.39
A11a	Erosione del vento 1	USEPA, 1989	s = 5% f = 4% A=4ha	1.69E+00	8.44E-01	1.33E-01	kg/ha/day	30	202.67	101.33	16.00
A11b	Erosione del vento 2	USEPA, 1989	s = 2% f = 4% A=4ha	6.76E-01	3.38E-01	5.33E-02	kg/ha/day	30	81.07	40.53	6.40
A11c	Erosione del vento 3	USEPA, 1989	s = 2% f = 4% A=3ha	6.76E-01	3.38E-01	5.33E-02	kg/ha/day	30	60.80	30.40	4.80
A12	Emissione dai veicoli a motore	EMEP/CorinAir, 2007 - Other mobile sources & machinery (Cfr. Stima impatti)							52.9	52.9	49.9

* emissioni mitigate tramite moderazione della velocità di transito

Area Postazione + parcheggio (m^2):	28430
Area strada sterrata di accesso (m^2):	5000
Area Complessiva (m^2):	33430
Durata complessiva attività (giorni):	90

	PTS	PM10	PM2.5
Emissione Complessiva (kg)	3269	1050	399
Emissione Specifica (kg/m^2/mese)	0.027	0.009	0.003

4.2 ATTIVITÀ DI COMPATTAZIONE

Heavy Construction Operation - Site Preparation (earth moving) - compacting/bulldozing

Emission Factor Equation	Riferimento
E_{TSP} = k * 0.45 * 5.7 * s^1.2 / M^1.3	AP-42 11.9-2 (November 2006)
E_{PM15} = k * 0.45 * s^1.5 / M^1.4	AP-42 11.9-2 (November 2006)

E = fattore di emissione in kg/h di attività di bulldozing
k = fattore di moltiplicazione in funzione del diametro particelle considerato
s = contenuto di limo (<0.075mm)
M = umidità terreno (%)

Parametri	k
PM2.5	0.105
PM10	0.75

Attività	k				s (%)	M (%)	Fattore di emissione (kg/h)			
	TSP	PM15	PM10	PM2.5			TSP	PM15	PM10	PM2.5
A07 Livellamento e	1	1	0.75	0.105	2.00	2.00	2.39	0.48	0.36	0.25

Attività	h complessive di attività di bulldozing	Emissione - Uncontrolled				Efficienza di controllo (%)	Emissione - Controlled (kg)			
		TSP	PM15	PM10	PM2.5		TSP	PM15	PM10	PM2.5
A07 Livellamento e	150.0	359	72	54	38	0	359	72	54	38
totale	**150.0**	**359.0**	**72.3**	**54.3**	**37.7**		**359.0**	**72.3**	**54.3**	**37.7**

4.3 TRANSITO DI MEZZI SU FONDO STERRATO

On-Site Unpaved Haul Roads Particulate Matter Emissions

Emission Factor Equation	Riferimento
$E_{unpaved}$ =0.2819 k x (s/12)^a x (W/3)^b	AP-42 13.2.2-4, November 2006
E = s fattore di emissione in kg/VKT	
VKT = totale km percorsi in cantiere	
s = contenuto in limo del fondo stradale (%)	
W = peso medio dei veicoli in transito (t)	
Eext= E x [(365-P)/365]	
Eext = fattore di emissione corretto in funzione delle mitigazioni naturali (precipitazioni annue)	
P = numero di giorni con almeno 0,254 mm di precipitazione	

	Industrial Roads		
Constant	TSP	PM_{10}	$PM_{2.5}$
k (lb/VMT)	4.9	1.5	0.15
a	0.7	0.9	0.9
b	0.45	0.45	0.45

Attività	s (%)	Peso medio Veicoli (t)	n. giorni piovosi	Fattore di emissione TSP	PM10	PM2.5
A03 Trasporto scotico all'interno del cantiere	5	20	0	1.76	0.45	0.05
A05a Trasporto materiale (strada)	2	20	0	0.93	0.20	0.02
A05b Trasporto materiale (interno)	5	20	0	1.76	0.45	0.05
A10 Transito betoniere per calcestruzzo	2	15	0	0.81	0.17	0.02
		10	0	0.00	0.00	0.00

Attività	n. viaggi	trasporto (m)	VKT	Non mitigato (kg) TSP	PM10	PM2.5	controllo (%)	Mitigato (kg) TSP	PM10	PM2.5
A03 Trasporto scotico all'interno del cantiere	533	200	213.2	375	96	10	57%	161	41	4
A05a Trasporto materiale (strada)	1343	1000	2686	2486	532	53	57%	1069	229	23
A05b Trasporto materiale (interno)	1343	200	537.2	944	243	24	57%	406	104	10
A10 Transito betoniere per calcestruzzo	300	1200	720	585.40	125.23	12.52	57%	251.72	53.85	5.39
totale				**4390**	**996**	**100**		**1888**	**428**	**43**

Note:
In via cautelativa non sono state considerate riduzioni alle emissioni dovute a precipitazioni

4.4 MOVIMENTAZIONI DI TERRA, OPERAZIONI DI CARICO/SCARICO

Material Handling

Emission Factor Equation	Reference
E = k x (0.0016) x (U/2.2)1.3/ (M/2)1.4	AP-42 13.2.4 (November 2006)

E = emission factor in kg/t di terreno movimentato
k = particle size multiplier for particulate size range and units of interest
U = mean w ind speed (m/s)
M = material moisture content (%)

Parametro	TSP	PM10	PM2.5
k	0.74	0.35	0.053

Attività	k			M (%)	U (m/s)	Emission Factor in kg/t		
	TSP	PM10	PM2.5			TSP	PM10	PM2.5
A02 Movimentazione scotico	0.74	0.35	0.053	18.00	2.2	5.46E-05	2.58E-05	3.91E-06
A04 Accumulo scotico	0.74	0.35	0.053	18.00	2.2	5.46E-05	2.58E-05	3.91E-06
A06 Movimentazione materiale da cava	0.74	0.35	0.053	0.50	2.2	8.25E-03	3.90E-03	5.91E-04
A08 Scavo Cantina e Vasconi	0.74	0.35	0.053	18.00	2.2	5.46E-05	2.58E-05	3.91E-06
A09 Realizzazione argini in terra	0.74	0.35	0.053	18.00	2.2	5.46E-05	2.58E-05	3.91E-06

	Terreno movime	Uncontrolled (kg)			Assumed Control Efficiency	Controlled (kg)		
		TSP	PM10	PM2.5		TSP	PM10	PM2.5
A02 Movimentazione scotico	12800.0	0.699	0.3307	0.05	0%	0.70	0.33	0.05
A04 Accumulo scotico	12800.0	0.699	0.3307	0.05	0%	0.70	0.33	0.05
A06 Movimentazione materiale da cava	30600.0	252.3	119.34	18.07	0%	252.32	119.34	18.07
A08 Scavo Cantina e Vasconi	1499.4	0.082	0.0387	0.006	0%	0.08	0.04	0.01
A09 Realizzazione argini in terra	725.4	0.04	0.0187	0.003	0%	0.04	0.02	0.00
totale	**58424.8**	**253.8**	**120.1**	**18.2**		**253.8**	**120.1**	**18.2**

4.5 SOLLEVAMENTO EOLICO

Wind Erosion Particulate Matter Emissions

Equation	Reference
EF = k*1.9 *(s/1.5) *(f / 15)	USEPA, 1989

costant	TSP	PM10	PM2.5
k	1.9	0.95	0.15

EF = emission factor (kg/day)
k = particle size multilier for particulate size range of interest
f = Percentage of the time that the wind speed is > 5.4 m/s
s = Silt Content in %
Eext= E x [(365-P)/365]
Eext = fattore di emissione corretto in funzione delle mitigazioni naturali (precipitazioni annue)
P = numero di giorni con almeno 0,254 mm di precipitazione

Attività	s %	f %	EF (kg/ha/day) TSP	PM10	PM2.5
A11a Erosione del vento 1	5.00	4.00	1.69	0.84	0.13
A11b Erosione del vento 2	2.00	4.00	0.68	0.34	0.05
A11c Erosione del vento 3	2.00	4.00	0.68	0.34	0.05

Attività	durata attività	Area (ha)	Emissions (kg) TSP	PM10	PM2.5	Efficienza di controllo (%)	Mitigato (kg) TSP	PM10	PM2.5
A11a Erosione del vento 1	30	3	152.00	76.00	12.00	0%	152	76	12
A11b Erosione del vento 2	30	3	60.80	30.40	4.80	0%	61	30	5
A11c Erosione del vento 3	30	2.5	50.67	25.33	4.00	0%	51	25	4
totale	**90**		**263**	**132**	**21**		**263**	**132**	**21**

In via cautelativa non sono state considerate riduzioni alle emissioni dovute a precipitazioni