

Table 1. Emission inventory and mathematical expressions for calculating LFM activities emission rates.

Activity	Source type	Parameter			Equation
		Symbol	Name	Unit	
Cover removal loading	Point	m	Moisture content of waste	%	$E = \left[0.0081 \left\{ \frac{(100 - m)}{m} \right\}^{1.4} \left\{ \frac{s}{(100 - s)} \right\}^{0.3} (u)^{1.1} (h * f * l)^{0.1} \right]$
		s	Silt content of loading waste material	%	
		u	Wind speed	m s ⁻¹	
		h	Drop height	M	
		l	Size of loader	m ³	
		f	Frequency of loading	no. h ⁻¹	
		E	Emission rate	g s ⁻¹	
Recovered waste loading	Point	m	Moisture content of waste	%	$E = \left[h \left\{ \frac{(100 - m)}{m} \right\}^{0.4} \left\{ \frac{0.555 * s}{(100 - s)} \right\} (u^2 * f * l)^{0.1} \right]$
		s	Silt content of loading waste material	%	
		u	Wind speed	m s ⁻¹	
		h	Drop height	m	
		l	Size of loader	m ³	
		f	Frequency of loading	no. h ⁻¹	
		E	Emission rate	g s ⁻¹	
Haul road	Line	m	Moisture content of haul road dust	%	$E = \left[\left\{ \frac{(100 - m)}{m} \right\}^{0.7} \left\{ \frac{u * S}{(100 - s)} \right\}^{0.1} (41.6 + 0.03 * f * c + 108 * v) 10^{-5} \right]$
		s	Silt content of haul road dust	%	
		u	Wind speed	m s ⁻¹	
		v	Average vehicle speed	m s ⁻¹	
		f	Frequency of vehicle movement	no. h ⁻¹	
		c	Capacity of dumpers	t	
		E	Emission rate	g s ⁻¹ m ¹	
Transport road	Line	m	Moisture content of road dust	%	$E = \left[\left\{ \frac{(100 - m)}{m} \right\}^{0.35} \left\{ \frac{u * s}{(100 - s)} \right\}^{0.7} \{ 0.5 + 0.1(f + 0.42 * v) \} 10^{-3} \right]$
		s	Silt content of transport road dust	%	
		u	Wind speed	m s ⁻¹	
		v	Average vehicle speed	m s ⁻¹	
		f	Frequency of vehicle movement	no. h ⁻¹	
		E	Emission rate	g s ⁻¹ m ¹	
Cover removal unloading	Point	m	Moisture content of waste	%	$E = \left[0.33 \left\{ u * h \frac{(100 - m)}{m} \right\}^{0.1} \left\{ \frac{s}{(100 - s)} \right\}^{0.3} (f * c)^{0.15} \right]$
		s	Silt content of unloading waste material	%	
		u	Wind speed	m s ⁻¹	
		h	Drop height	m	
		c	Capacity of unloader	t	
		f	Frequency of unloading	no. h ⁻¹	

		E	Emission rate	g s ⁻¹	
Activity	Source type	Parameter			Equation
		Symbol	Name	Unit	
Recovered waste unloading	Point	m	Moisture content of waste	%	$E = 0.156 * h^{0.6} \left[\left\{ \frac{(100 - m) * s * u * c * f}{m(100 - s)} \right\} \right]^{0.1}$
		s	Silt content of unloading waste material	%	
		u	Wind speed	m s ⁻¹	
		h	Drop height	m	
		c	Capacity of unloader	t	
		f	Frequency of unloading	no. h ⁻¹	
		E	Emission rate	g s ⁻¹	
Exposed cover removal waste	Area	m	Moisture content of exposed material	%	$E = \left[\left\{ \frac{(100 - m)}{m} \right\}^{0.1} \left\{ \frac{s}{(100 - s)} \right\}^{0.6} \left\{ \frac{u}{(19 + 0.01 * u)} \right\} \left\{ \frac{a}{(6 + 256 * a)} \right\} \right]$
		s	Silt content content of exposed material	%	
		u	Wind speed	m s ⁻¹	
		a	Area of active dump	km ²	
		E	Emission rate	g s ⁻¹ m ⁻²	
Screening plant	Area	m	Moisture content of waste	%	$E = \left[\left\{ \frac{(100 - m)}{m} \right\}^{0.5} \left\{ \frac{s * a}{(100 - s)} \right\}^{0.1} \left\{ \frac{u}{(20 + 3300 * u)} \right\} \right]$
		s	Silt content of screening material	%	
		u	Wind speed	m s ⁻¹	
		a	Area	km ²	
		E	Emission rate	g s ⁻¹ m ⁻²	
Exposed pit surface	Area	m	Moisture content of surface material	%	$E = \left[\left\{ \frac{(100 - m)}{m} \right\}^{0.1} \left\{ \frac{s}{(100 - s)} \right\}^{0.3} a^{1.6} \left\{ \frac{u}{(10 + 125 * u)} \right\} \right]$
		s	Silt content surface material	%	
		u	Wind speed	m s ⁻¹	
		a	Area	km ²	
		E	Emission rate	g s ⁻¹ m ⁻²	

Table 2. Descriptive statistical results of emission estimation for 9 different LFM activities.

Activity	Source type	Emission rate calculation	Unit	Equation
Cover removal loading				
Min.	Point	0.02	g s ⁻¹	$E = \left[0.0081 \left\{ \frac{(100 - m)}{m} \right\}^{1.4} \left\{ \frac{s}{(100 - s)} \right\}^{0.3} (u)^{1.1} (h * f * l)^{0.1} \right]$
Mean		0.45		
Max.		1.11		
Recovered waste loading				
Min.	Point	0.06	g s ⁻¹	$E = \left[h \left\{ \frac{(100 - m)}{m} \right\}^{0.4} \left\{ \frac{0.555 * s}{(100 - s)} \right\} (u^2 * f * l)^{0.1} \right]$
Mean		0.13		
Max.		0.19		
Haul road				
Min.	Line	0.006	g s ⁻¹ m ⁻¹	$E = \left[\left\{ \frac{(100 - m)}{m} \right\}^{0.7} \left\{ \frac{u * S}{(100 - s)} \right\}^{0.1} (41.6 + 0.03 * f * c + 108 * v) 10^{-5} \right]$
Mean		0.008		
Max.		0.010		
Transport road				
Min.	Line	0.002	g s ⁻¹ m ⁻¹	$E = \left[\left\{ \frac{(100 - m)}{m} \right\}^{0.35} \left\{ \frac{u * s}{(100 - s)} \right\}^{0.7} \{0.5 + 0.1(f + 0.42 * v)\} 10^{-3} \right]$
Mean		0.01		
Max.		0.04		
Cover removal unloading				
Min.	Point	0.31	g s ⁻¹	$E = \left[0.33 \left\{ u * h \frac{(100 - m)}{m} \right\}^{0.1} \left\{ \frac{s}{(100 - s)} \right\}^{0.3} (f * c)^{0.15} \right]$
Mean		0.43		
Max.		0.52		
Recovered waste unloading				
Min.	Point	0.45	g s ⁻¹	$E = 0.156 * h^{0.6} \left[\left\{ \frac{(100 - m) * s * u * c * f}{m(100 - s)} \right\}^{0.1} \right]$
Mean		0.58		
Max.		0.66		
Exposed cover removal waste				
Min.	Area	0.00001	g s ⁻¹ m ⁻²	$E = \left[\left\{ \frac{(100 - m)}{m} \right\}^{0.1} \left\{ \frac{s}{(100 - s)} \right\}^{0.6} \left\{ \frac{u}{(19 + 0.01 * u)} \right\} \left\{ \frac{a}{(6 + 256 * a)} \right\} \right]$
Mean		0.0001		
Max.		0.0002		
Screening plant				
Min.	Area	0.00020	g s ⁻¹ m ⁻²	$E = \left[\left\{ \frac{(100 - m)}{m} \right\}^{0.5} \left\{ \frac{s * a}{(100 - s)} \right\}^{0.1} \left\{ \frac{u}{(20 + 3300 * u)} \right\} \right]$
Mean		0.00021		
Max.		0.00022		
Exposed pit surface				
Min.	Area	0.00000057	g s ⁻¹ m ⁻²	$E = \left[\left\{ \frac{(100 - m)}{m} \right\}^{0.1} \left\{ \frac{s}{(100 - s)} \right\}^{0.3} a^{1.6} \left\{ \frac{u}{(10 + 125 * u)} \right\} \right]$
Mean		0.00000067		
Max.		0.00000073		