Matrix for assessing UK Minerals sector carbon emissions (operational - transport emissions calculations on next tab)

Mineral Sector **2007 data**

			Assumed non-product ratio to product or feedstock used to calculate total extraction	
		CO2 emissions		
	Excavated Volume	**Operational**		***Assumed***
	tonnes	**tonnes (estimated)**	**Product:non-product**	***Kg CO2 per tonne***
Aggregates				
Crushed Rock	157,143,000	628,572	21:1	*4*
Sand and Gravel	94,562,000	378,248	16:1	*4*
Industrial limestone	22,000,000	88,000	21:1	*4*
Silica sand	6,933,600	41,602	05:01	*6*
Coal Open Cast	115,110,000	491,136	1:15	*4*
Coal Deep Mined	11,821,333	47,285	3:1	*4*
Clay and Shale	13,333,000	53,332	3:1	*4*
Chalk	7,752,000	31,008	21:1	*4*
Ball Clay	3,066,000	12,264	1:2	*4*
Barytes	56,000	224	21:1	*4*
China Clay	16,710,000	66,840	01:09	*4*
Fireclay	200,000	800	1:0	*4*
Fluorspar	47,000	188	21:1	*4*
Gypsum	1,781,000	7,124	21:1	*4*
Peat	1,536,000	6,144	1:0	*4*
Potash	2,506,000	10,024	1:2.5	*4*
Rock Salt	2,000,000	8,000	1:0	*4*
Salt	3,800,000	15,200	1:0	*4*
Slate	9,515,000	38,060	1:10	*4*
sub total		1,924,051		
Asphalt		716,094		*27*
Ready mixed concrete		90,000		*1.8*
		0		
TOTAL		**2,730,145**		

notes

1 Emissions data calculated on the basis of mineral excavation, not sold production, in order to capture emissions related to moving overburden, soils, non-product material etc. This is likely to underestimate total emissions, e.g. on crushing/screening, pumping water and liquid wastes, site lighting, energy use in buildings/workshops, wheel and road washing. This is an area requiring further work.
2 CO2 emissions data is available for Crushed Rock and Sand and Gravel, same operational figure applied to almost other minerals (4 kg CO2/tonne of output) Minerals specific emissions data for these other minerals is another area requiring further detailed survey work. Deep mining is unlikely to have the same profile as surface quarrying.
3 Other kg/CO2 figures (Asphalt, ready mixed concrete) from QPA survey data. Silica sand data supplied by Sibelco
4 Sales volumes from AMRI/BGS Yearbook
5 Product/non-product ratios based on information from relevant trade associations and BGS
6 Clay and shale (row 18) is used to make bricks, pipes, tiles and cement. Some goes direct into construction. See BGS Yearbook

Transport Emissions associated with the delivery of minerals

emissions factors					
road		0.969 kg CO2	per vehicle km	(defra)	assuming 17 tonne plus GVW rigid hgv as standard sector delivery vehicle
road					
rail		0.021 kg CO2	rail freight	(defra)	
Aggregates					
av load	21.3 t				
av del distance	35km				
Asphalt					
av load	18.4t				
av del distance	28km				
Ready mixed concrete					
av load	6 cu m				
av del distance	8.3km				

Product	Aggregates	Asphalt	RMC	Coal -open cast	Coal - deep mined	Coal - imported	Industrial Limestone	Silica sand	Chalk	Peat imports	Other Minerals	Aggregates	Deep mined Coal	Open cast coal	Imported Coal	TOTAL
mode	Road	Road	Road	Road	Road	Road	Road	Road	Road	Road	Road	*Rail*	*Rail*	*Rail*	*Rail*	
volume (tonnes)	231,000,000	26,700,000	50,000,000	2,302,200	886,600	5,000,000	16,000,000	5,778,000	5,000,000	433,000	17,833,000	15,000,000	7,979,400	5,371,800	25,000,000	413,706,000
av vehicle load (tonnes)	21.3	18.4	12	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	1726	1726	1726	1726	
av delivery distance (km)	58.5	56	16.6	58.5	58.5	58.5	75	240	58.5	200	58.5	287.8	287.8	287.8	287.8	
vehicle km	634,436,620	81,260,870	69,166,667	6,322,944	2,435,028	13,732,394	56,338,028	65,104,224	13,732,394	4,065,728	48,977,958					
Tonnes km												4,317,000,000	2,296,471,320	1,546,004,040	7,195,000,000	
kgCO2 per vehicle km	0.969	0.969	0.969	0.969	0.969	0.969	0.969	0.969	0.969	0.969	0.969					
KgCO2 per tonne km												0.021	0.021	0.021	0.021	
kgCO2 Total	614,769,085	78,741,783	67,022,500	6,126,932	2,359,542	13,306,690	54,591,549	63,085,993	13,306,690	3,939,690	47,459,641	90,657,000	48,225,898	32,466,085	151,095,000	1,287,154,078
kgCarbon total	167,512,012	21,455,527	18,262,262	1,669,464	642,927	3,625,801	14,875,082	6,445,869	3,625,801	1,073,485	12,931,782	24,702,180	13,140,572	8,846,345	41,170,300	
Tonnes Carbon	**167,512**	**21,456**	**18,262**	**1,669**	**643**	**3,626**	**14,875**	**17,190**	**3,626**	**1,073**	**12,932**	**24,702**	**13,141**	**8,846**	**41,170**	**350,724**
Tonnes CO2	**614,769**	**78,742**	**67,023**	**6,127**	**2,360**	**13,307**	**54,592**	**63,086**	**13,307**	**3,940**	**47,460**	**90,657**	**48,226**	**32,466**	**151,095**	**1,287,154**

Notes/Assumptions

Volume is delivery volumes, to internal or external customers. Aggregates vol assumes 25% of aggregates stay on site (for value added processes).
Av vehicle load (21.3 tonnes the QPA aggregates average)
Av delivery distance includes delivery and return trips.(based on QPA returns, assumes some backloading so overall delivery distance per load/tonne is reduced - 35km delivery, 22.5km "return" trip)
Vehicle km - volume divided by average load and multiplied by av delivery distance
tonnes Km - volume multiplied by av delivery distance, f**RAIL** use only
KgCO2 per vehicle km - Defra conversion factor for rigid HGVs above 17 tonne gross vehicle weight, with "average" loading
KgCO2 per tonne km - Defra conversion factor fo**RAIL** freight
KgCO2 Total - vehicle km multiplied by Defra conversion factor
KgCO2 per tonne - total KgCO2 divide by total volume
KgCarbon total - KgCO2 divided by 3.67 to convert CO2 to Carbon
Tonnes Carbon - KG Carbon total divided by 1000

COAL assumptions

Deep mined deliveries are split 10/90 road/rail, open cast 30/70 road/rail
Imported volume is 50 million tonnes, of which 30 mt is transported away from coastal sites (steelworks, power stations). Of the 30 mt, 25 mt by rail, 5 mt by road (assumed)

Aggregates = UK primary + recycling - 25% for aggs staying on original site
Asphalt = assume UK market 1 mil tonnes higher than 25.7 mt
RMC = assume UK market is 1.5 m cu m higher than 23.5 m cu m