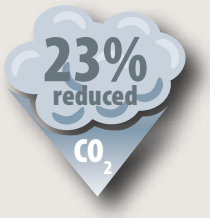
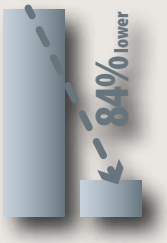
mpa
essential materials
sustainable solutions

Cement market: Domestic cement sales **improved 30%** since 2012 but sales still **15% lower** than 2007

Decarbonisation: CO_2 emissions **reduced** by **23%** compared with a 1998 baseline



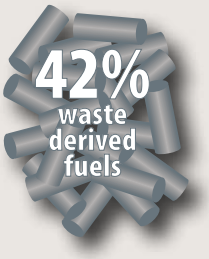
Waste diverted: zero process waste sent to landfill

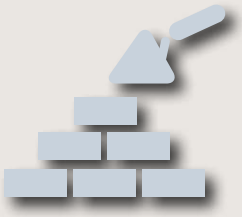


Health and safety: lost time injuries **84% lower** than in 2005 in pursuit of zero harm

Recycling: 1.6Mt of waste and by-products from other sectors recycled

Fossil fuel replaced: **42%** of the thermal input **replaced** by waste derived fuels



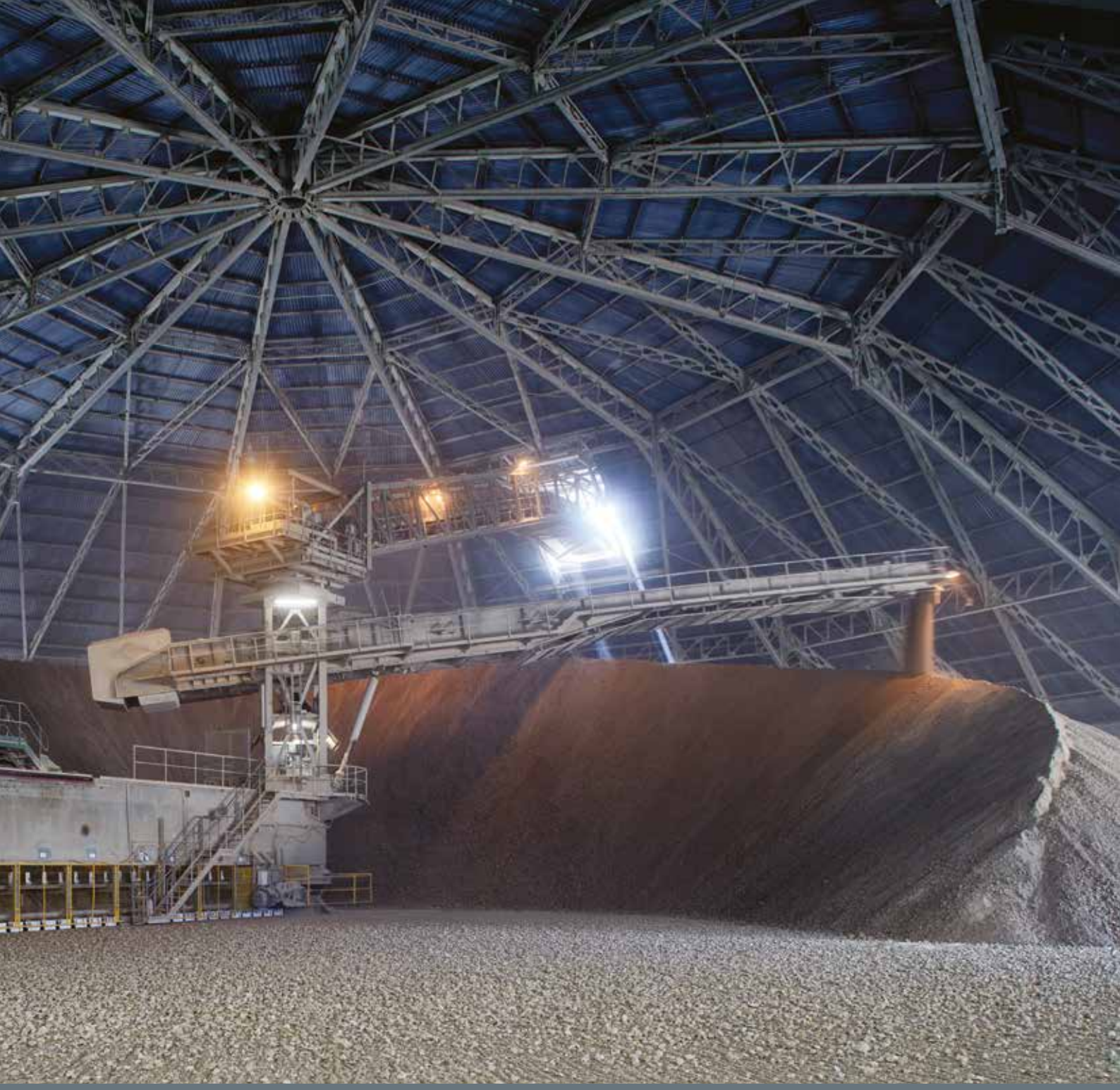


Building a Better Britain: every **£1.00 invested** in construction **generates** nearly **£3.00** in economic activity

MPA Cement

Sustainable Development Report 2016

cement in the circular economy



Reflecting on 2015

2015 provided further evidence of the sector's slow and steady recovery from the 2008 economic recession. Domestic production of cement increased to 9.2 million tonnes and there is evidence that cement sales in the South-East of England (including London) are growing faster than the rest of the UK.

Further structural changes took place in the cement sector, with Aggregate Industries taking ownership of two kiln sites, CRH taking ownership of Tarmac and, more recently in 2016, Breedon took ownership of Hope Construction Materials (now trading as Hope Cement). This results in five Portland cement manufacturing companies in the UK: Aggregate Industries operating as Lafarge Cement, CEMEX, Hanson, Hope Cement and Tarmac (a CRH company).

With increasing interest in progressive sustainable development themes, such as the 'circular economy', our new style sustainable development report highlights the contribution of domestic cement production to the environment and the economy.

Material flow in the UK cement industry

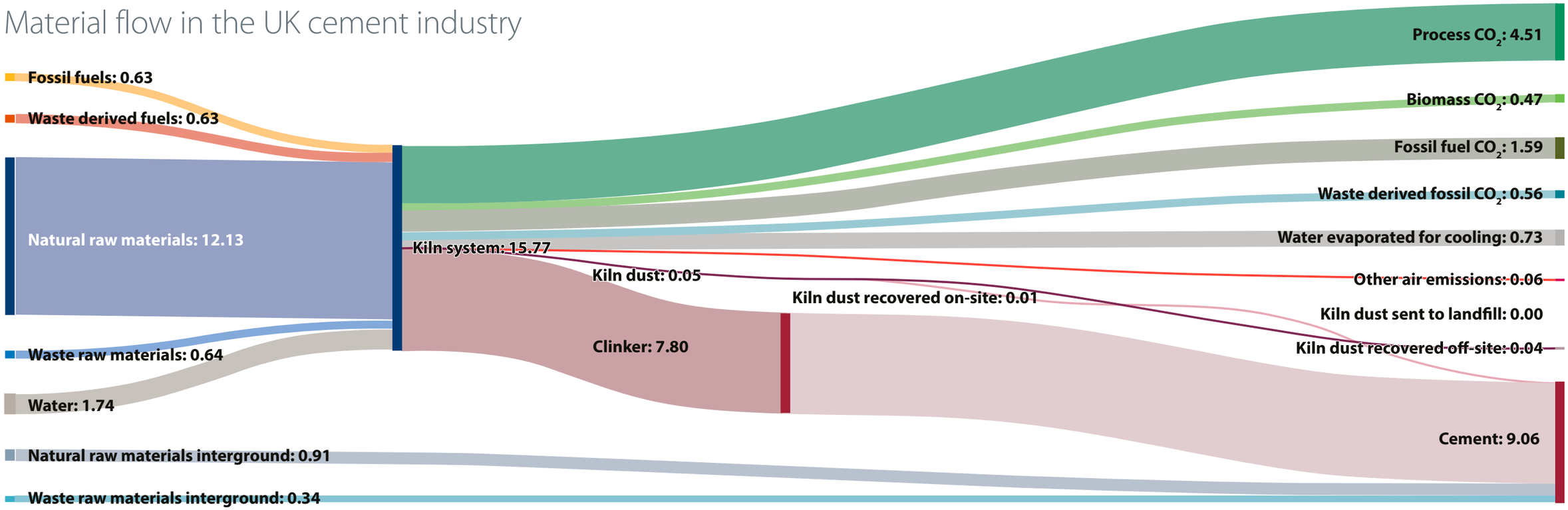


Figure 1: Shows the material flow in cement manufacture in 2015 (in million tonnes).

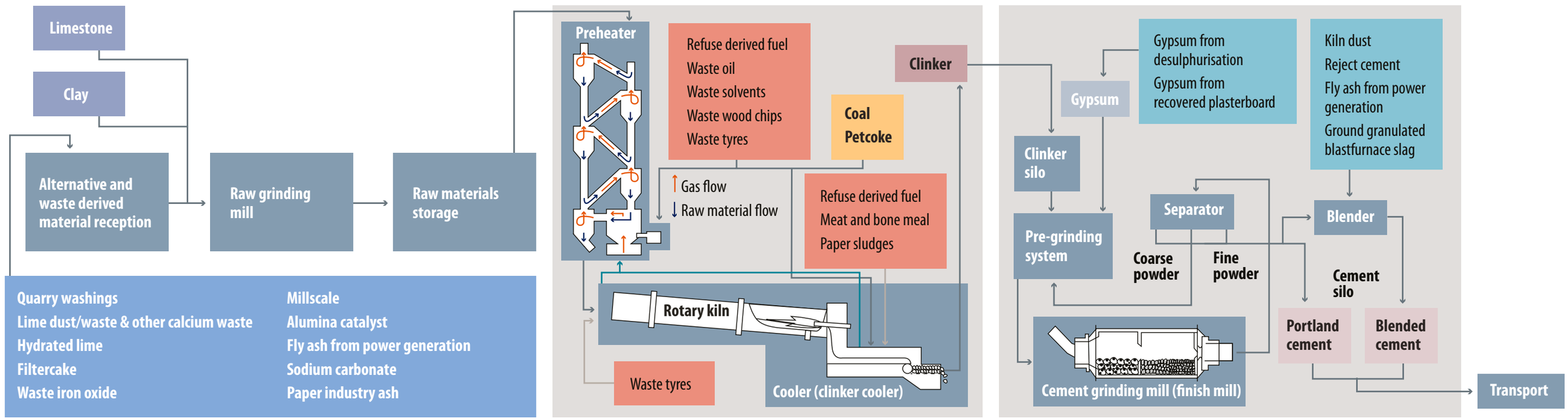


Figure 2: The cement manufacturing process highlighting the different input points of waste as fuel and raw material (images adapted from the Japan Cement Association (http://www.jcassoc.or.jp/cement/2eng/e_01a.html).

Cement in the circular economy

RECYCLING: 1.6MT OF WASTE AND BY-PRODUCTS FROM OTHER SECTORS RECYCLED

The material flow diagram (Figure 1) shows where cement already contributes to the circular economy. In particular cement manufacturing:

- recycles mineral and metal content as well as recovering energy from fuels
- takes wastes at the end of their valuable life
- adds value via a quality product
- restarts the value chain and
- is mainly used in durable and 100% recyclable concrete products.

The recycling of mineral and metal content in UK cement production is not counted towards UK and EU recycling statistics. The evidence in Figure 3 shows that the UK cement sector makes a valuable contribution to recycling and MPA believe this should be formally recognised.

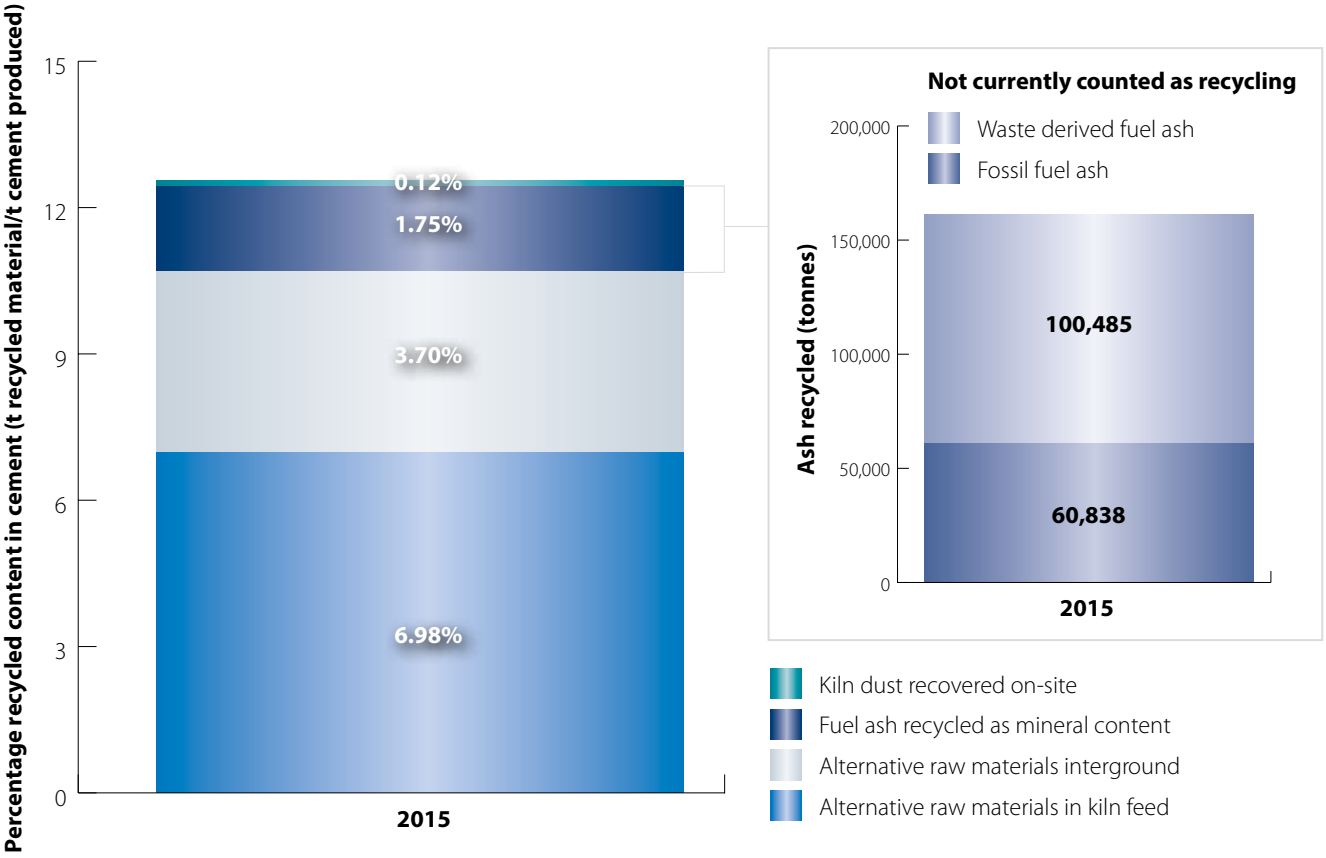


Figure 3: The total recycled content of UK produced cement. This illustrates that there is an aspect of recycling that is not counted towards UK and EU recycling statistics. An anomaly that MPA believes has been created by a rigid interpretation of the EU's Waste Framework Directive.

Cement in the circular economy

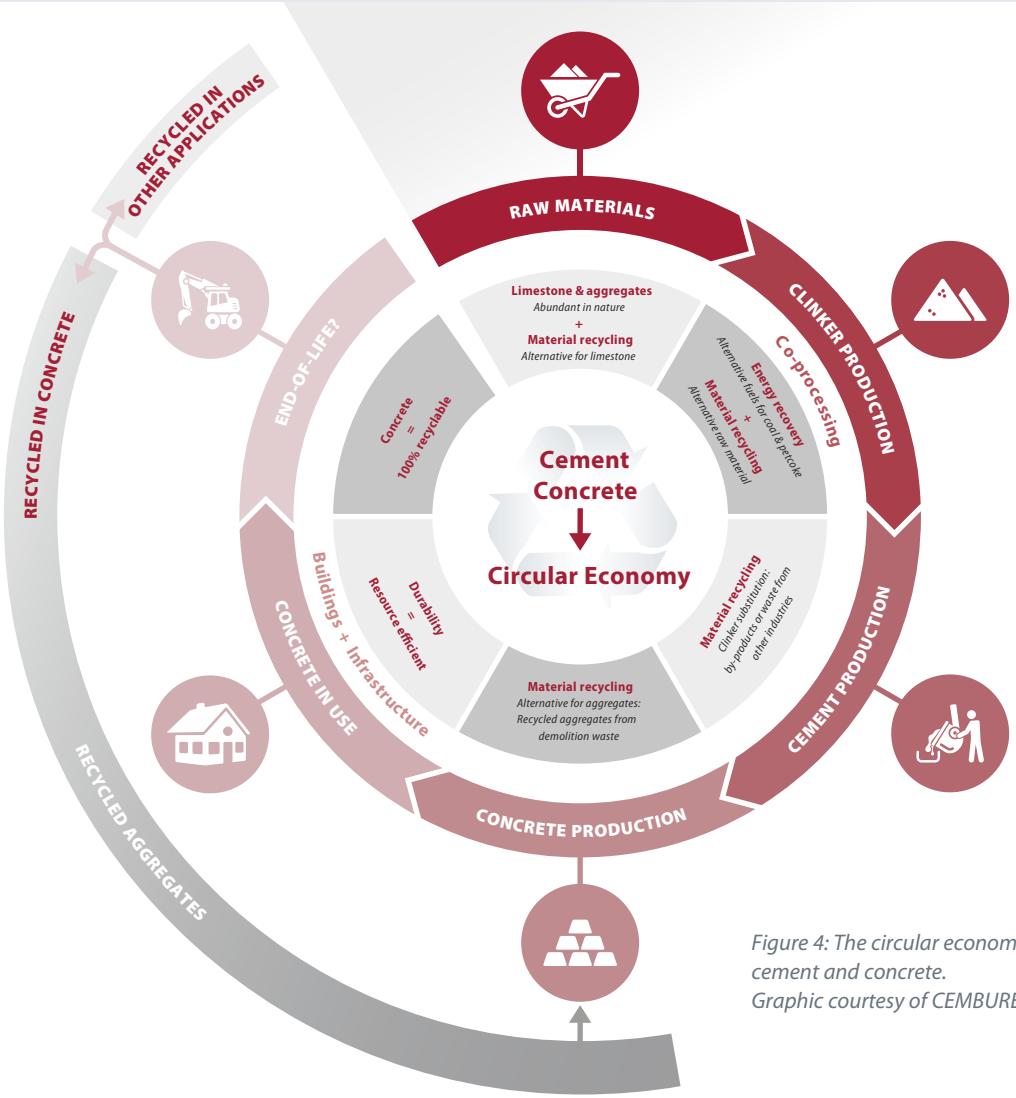
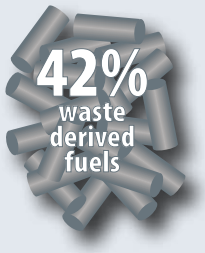


Figure 4: The circular economy of cement and concrete.
Graphic courtesy of CEMBUREAU.

Cement in the circular economy

FOSSIL FUEL REPLACED: 42% OF THE THERMAL INPUT REPLACED BY WASTE DERIVED FUELS



The cement sector is a significant contributor to the circular economy, by:

- Using 7.4% alternative raw materials including quarry washings, lime dust, hydrated lime, filtercake, millscale and iron oxide. This has almost doubled from a contribution of 4.0% in 1998.
- Recovering all (46kt) process waste back into the product or into off-site uses. No process waste has been sent to landfill in the last four years.
- Making 342kt cementitious additions at the cement plant including kiln dust, incinerator bottom ash, recovered plasterboard, fly ash from power generation and ground granulated blastfurnace slag. Further additions are made by concrete producers at concrete plants.
- Replacing 42% of thermal input with waste derived fuels including waste oils, solvents and tyres, refuse derived fuel, and waste sludges, meat and bone meal, and wood. This is a significant increase from 5.7% in 1998 but there has been a levelling off in recent years. MPA is concerned that policy drivers such as those incentivising the use of biomass in other sectors is increasing the competition for limited biomass resource, resulting in a market distortion with the potential to drive cement manufacture back towards coal use.

WASTE DIVERTED: ZERO PROCESS WASTE SENT TO LANDFILL

PROPORTION OF FUEL COMPRISING WASTE MATERIAL

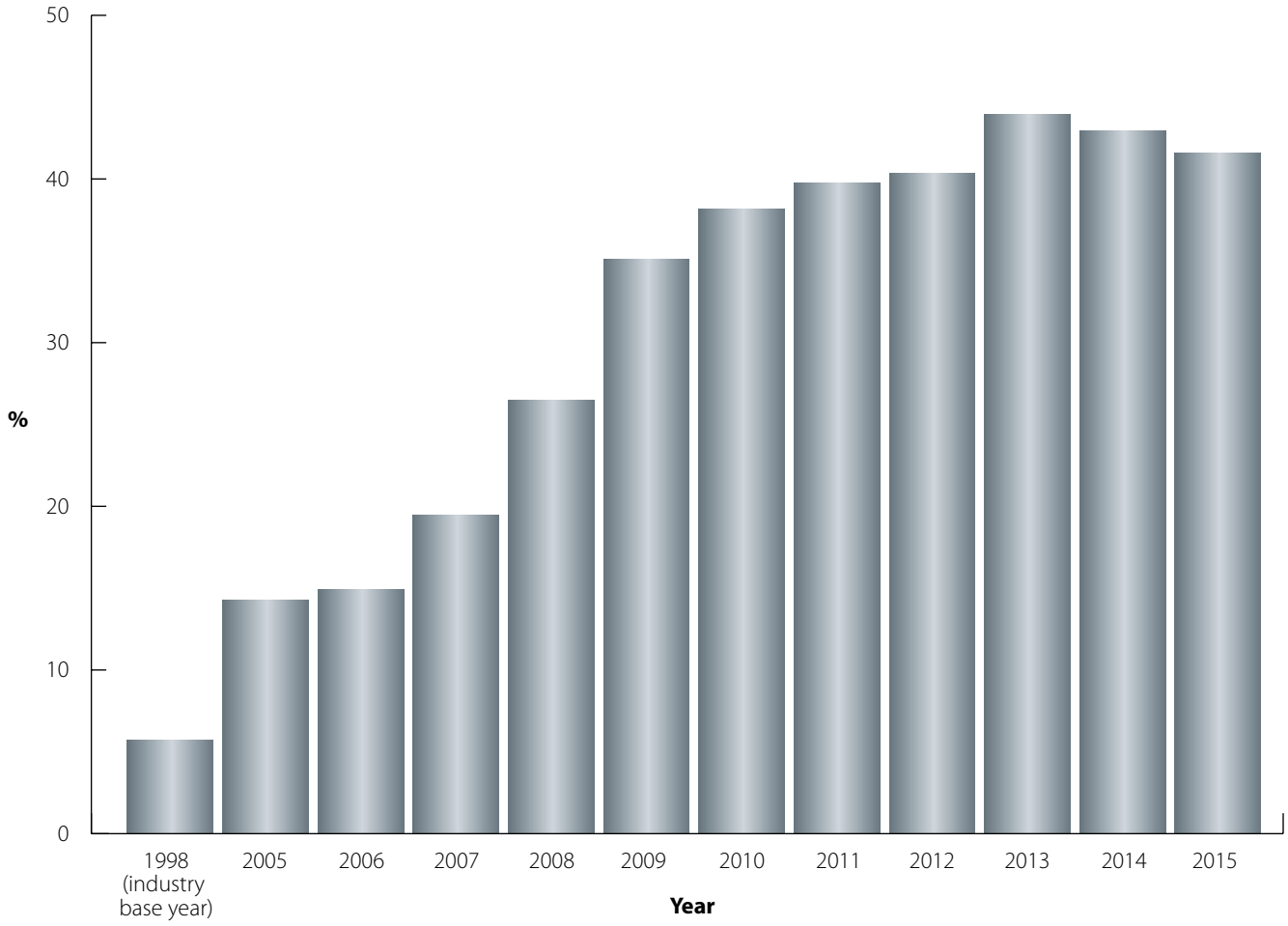


Figure 5: Waste derived fuel use in the base year 1998 and from 2005 – 2015.

Building Britain

BUILDING A BETTER BRITAIN: EVERY £1.00 INVESTED IN CONSTRUCTION GENERATES NEARLY £3.00 IN ECONOMIC ACTIVITY

Key infrastructure projects like Hinkley Point C nuclear power station will depend upon UK cement.

Image: EDF Energy

Economic sustainability

CEMENT MARKET: DOMESTIC CEMENT SALES IMPROVED 30% SINCE 2012 BUT SALES STILL 15% LOWER THAN 2007

- Cement is the key component in producing ready-mixed concrete, precast concrete and mortar.
- Following a stable market in the early and mid-2000s, the economic recession saw domestic cement sales drop by 30% between 2007 and 2009. Since 2012, markets have improved by 30%, but sales are still 15% lower than in 2007.
- One of the greatest threats to the UK cement industry currently and in the near future is the considerable cumulative cost burden from the implementation of climate change policies.
- Cement manufacture is energy and electro-intensive. Energy costs are 40% of sector GVA and electricity costs alone are 25% of sector GVA.
- In 2015, direct plus indirect climate change policy cost in the cement sector was £3.24 per tonne of cement. MPA estimates that this will rise to £4 per tonne of cement in 2020 and could reach as much as £17 per tonne of cement by 2030.
- If action is not taken to protect the UK cement sector from these rising costs, imports will increase, jobs will be lost and security of supply will be threatened.

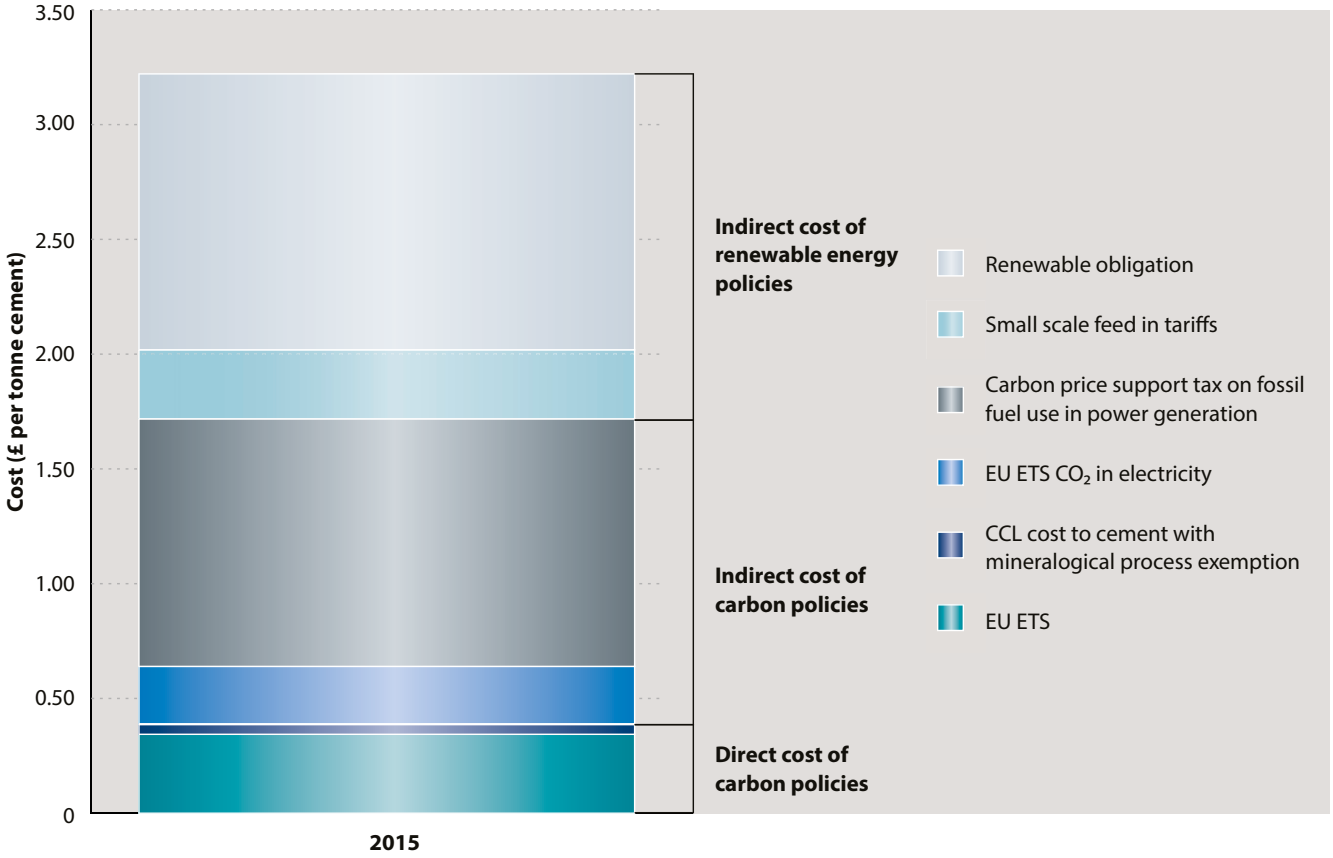
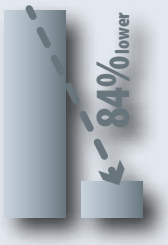


Figure 6: The cumulative burden of direct and indirect cost of climate change policies on the cement sector (per tonne of cement).

Social sustainability

HEALTH AND SAFETY: LOST TIME INJURIES 84% LOWER THAN IN 2005 IN PURSUIT OF ZERO HARM



Local communities

- Cement plants, mainly located in rural areas, are important to the communities in which they operate. They provide jobs and make a major contribution to the local economy.
- Local liaison: Recognising that their operations have the potential to impact on their neighbours, cement companies take the need for local liaison very seriously. Liaison meetings are attended by local councillors, local residents, site representatives, and the Environment Agency. The meetings allow local communities to raise any concerns and allow the site to communicate any changes taking place. Newsletters are also produced by many sites and circulated to local residents.

Health and safety

- 'Zero Harm' is the overriding health and safety priority for MPA Cement. Our safety targets are to:
  - Reduce the 2013 rate of lost time injuries by 65% by the end of 2018 for employees and;
  - Reduce the 2013 number of lost time injuries by 65% by the end of 2018 for contractors.
- MPA Cement members meet regularly to share information on their health and safety initiatives and to share details of any incidents that have occurred. MPA Cement shares details of its programmes with the glass, ceramic and concrete industries through the CHARGE network and participates with the rail, nuclear, chemical and petrochemical industries in the Process Safety Forum. An example of a topic discussed in 2015 is the relining of cement mills which poses a number of challenges, particularly the repetitive handling of steel relining plates, some as heavy as 55kg. Good practice was shared on opening up mill access e.g. by increasing the mill door size, the use of roller conveyors to get the plates up to mill and the sourcing/use of lighter plates.

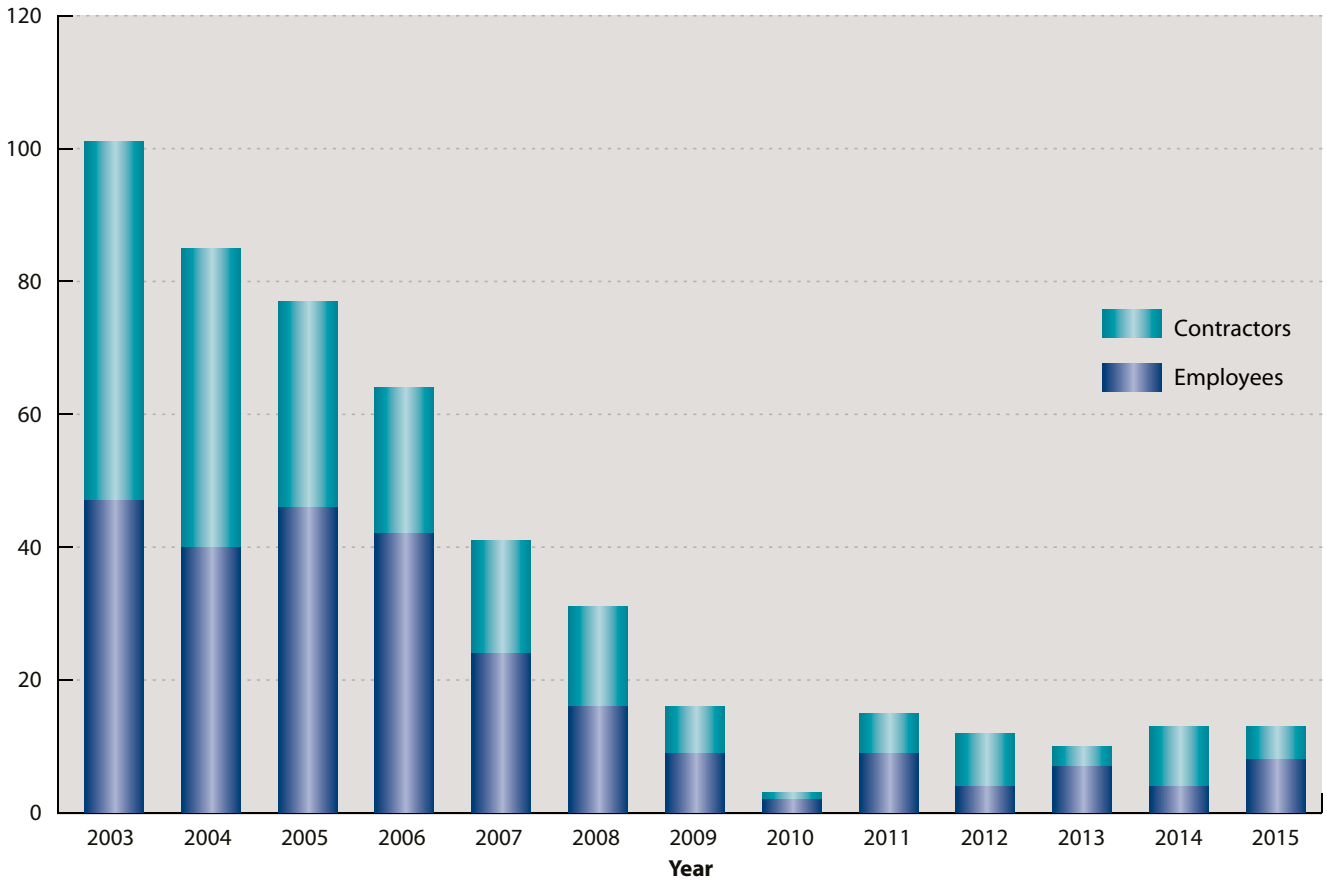
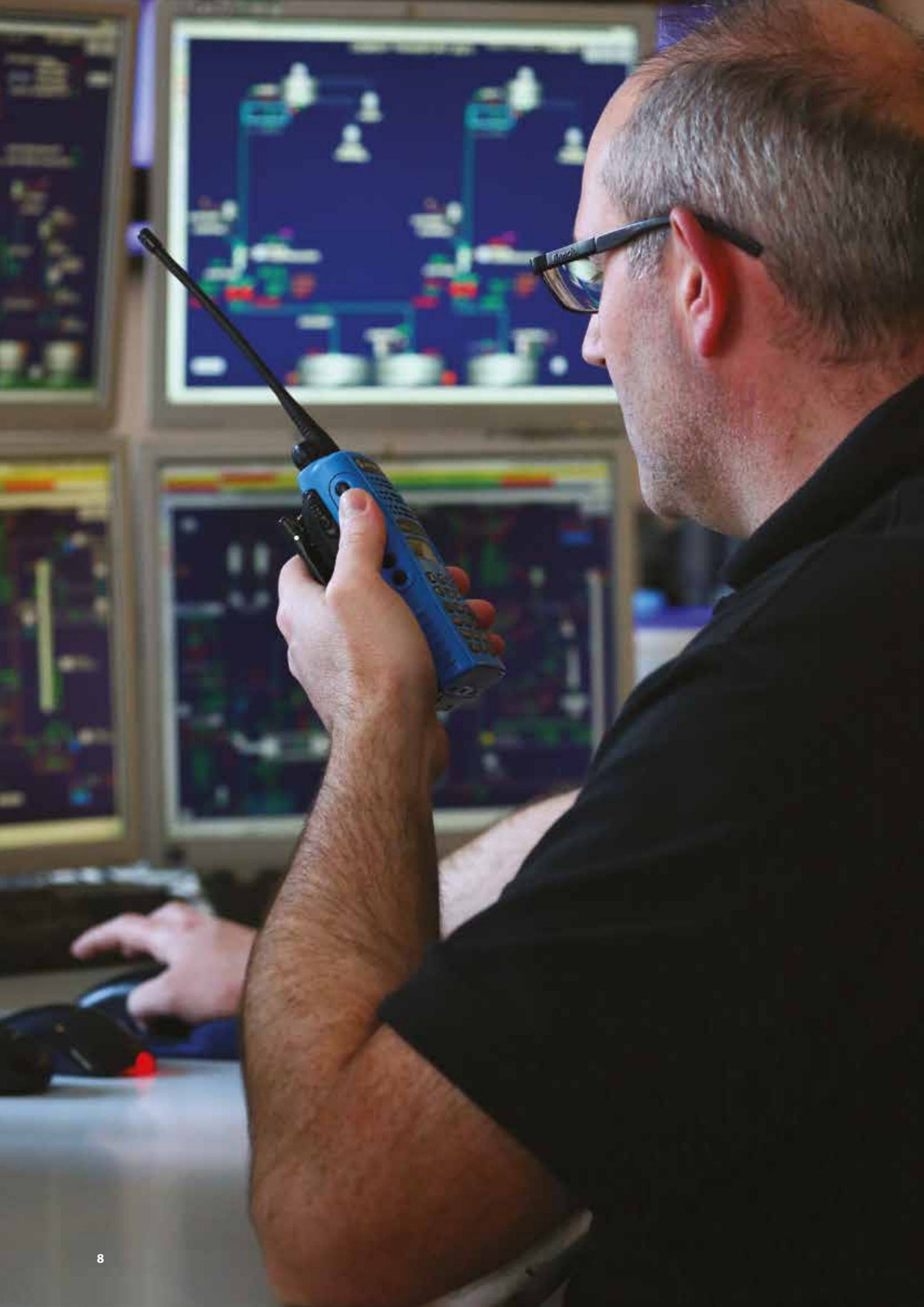


Figure 7: MPA Cement lost time injuries 2003 – 2015.



Environmental sustainability

Non-CO_2 emissions

- Measured against a 1998 baseline and on a per-tonne of Portland cement equivalent (PCe)* basis, non-CO_2 emissions in 2015 were:
  - Dust emissions: 82% reduction on 1998
  - Oxides of nitrogen emissions: 69% reduction on 1998
  - Sulphur dioxide emissions: 88% reduction on 1998

Responsible sourcing

- 100% of cement produced in the UK is certified to very good or excellent level under the BES 6001 responsible sourcing scheme. Certification to BES 6001 requires companies to demonstrate (and have verified by an independent third party) that organisational governance, supply chain management and environmental and social responsibilities have been responsibly managed.

Water consumption

- Climate change is expected to result in significant impacts on water availability whilst population growth will place increased demand on water supplies. Both of these factors have serious implications for the long term management of water availability for industry and public use.
- Therefore, in 2012, MPA initiated to gather detailed information on water inputs, consumption and outputs. Measurement of water consumption in the production of cement is complex due to the number of different water input, losses/consumption and discharge points:
  - Inputs – abstracted from groundwater and surface water, potable water, harvested rainfall and external waste water
  - Losses/consumption – evaporation for cooling equipment, evaporation from water storage, water used directly
  - Discharges – surface water, to water treatment and to sewer or ocean
- The measuring system is still in its infancy, however MPA is able to report on the use of potable water (Figure 8) and a considerable decrease of 24% has been measured between 2012 and 2015.

**Portland cement equivalent (PCe) is a normalising factor related to cement output, which enables a comparison of impacts, such as environmental impacts, between sites whilst taking into consideration differing production methods, cement product types and movement of intermediate products.*

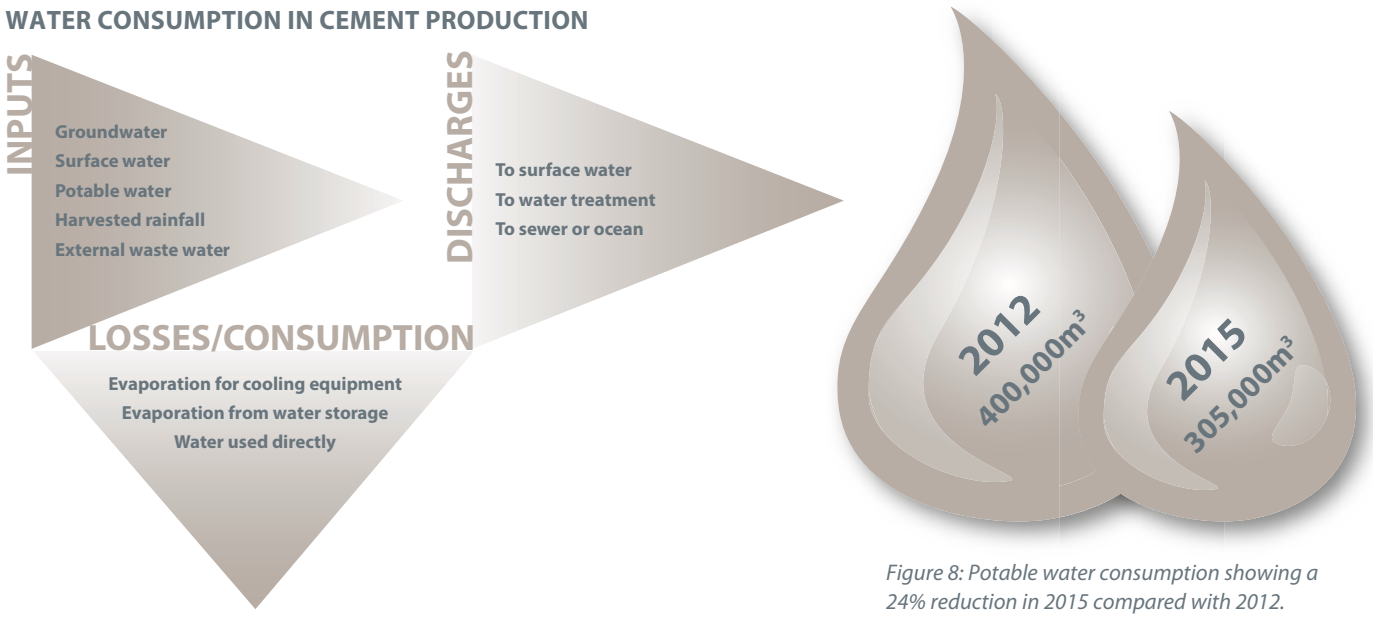
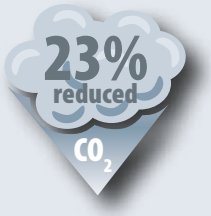


Figure 8: Potable water consumption showing a 24% reduction in 2015 compared with 2012.

Environmental sustainability



DECARBONISATION: CO_2 EMISSIONS REDUCED BY 23% COMPARED WITH A 1998 BASELINE

Decarbonisation

- Emissions of CO_2 directly from cement plants per tonne of Portland cement equivalent (PCe): 23% reduction on 1998.
- In 2013, MPA was the first national cement sector association to publish a decarbonisation strategy. This set out how the UK cement sector could reduce emissions of CO_2 to 2050 with industry investment and help from Government policy and funding.
- The roadmap has two scenarios, showing what is possible with and without carbon capture and storage/use.
- In 2015, MPA worked with Government to produce an industrial decarbonisation and energy efficiency roadmap to 2050 for the cement sector.
- In 2017, the aim is to publish a plan detailing the actions required by industry, Government, research institutions and investors to deeply decarbonise the cement sector.
- Key issues for the action plan are costing the work required as well as sourcing and funding decarbonisation technologies. The actions of most significance for decarbonisation are around the use of biomass fuels, clinker substitutes and carbon capture and storage/use.
- Government support is needed to fund and help implement the actions identified.

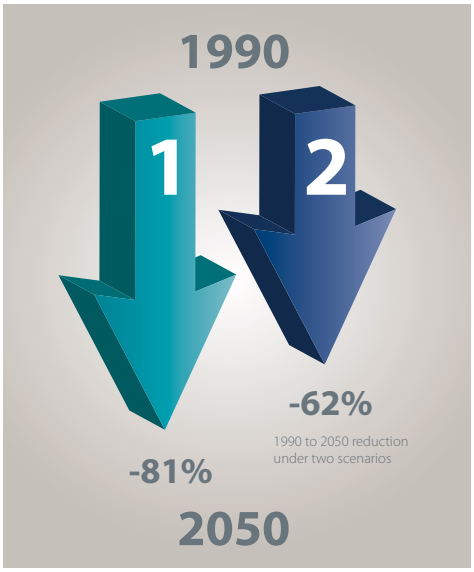


Figure 9: MPA scenarios for greenhouse gas reduction to 2050.

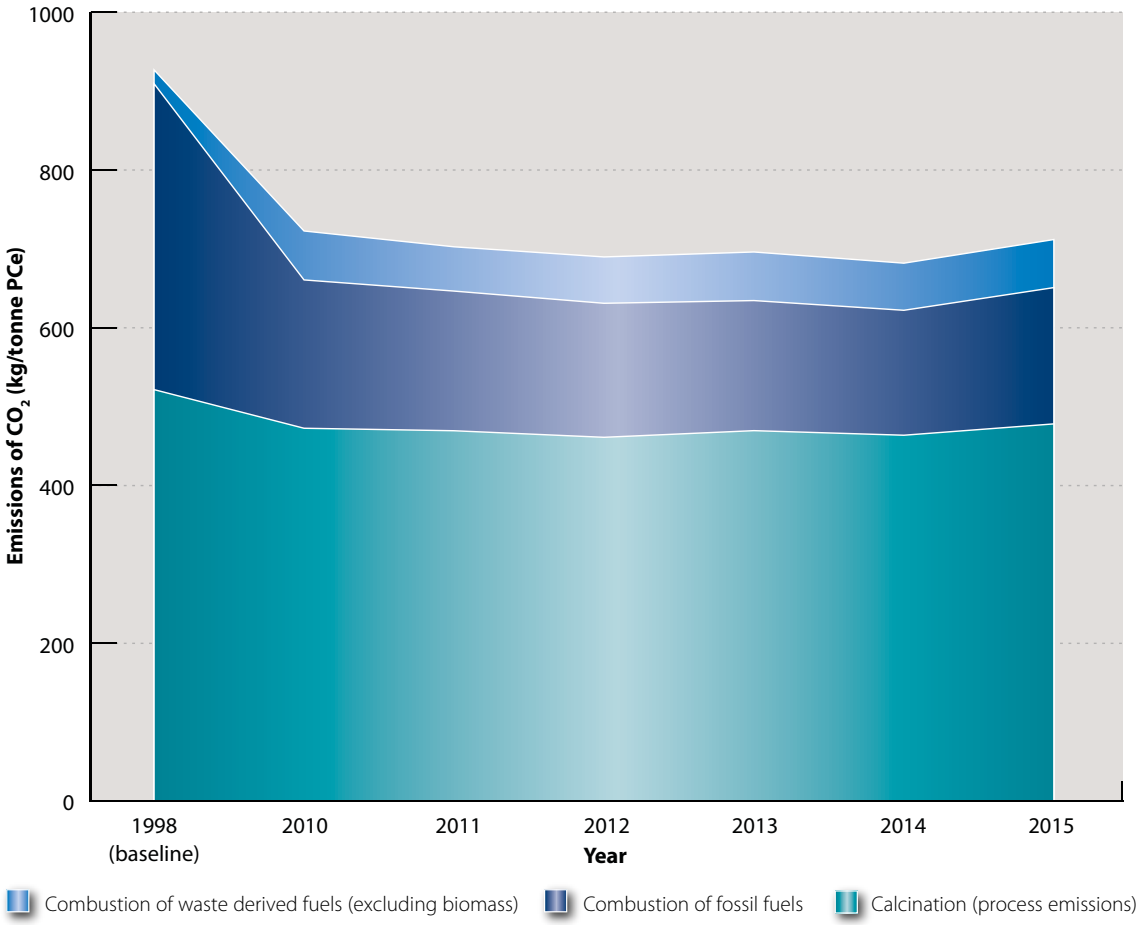


Figure 10: Reduction in direct emissions of CO_2 in 1998 (base year) and 2005 – 2015.


LLAR

Data tables

CIRCULAR ECONOMY

	Units	1998	2010	2011	2012	2013	2014	2015
Total waste and by-products used as fuel and raw materials	**tonnes**	446,511	1,528,315	2,481,106	1,811,200	1,452,553	1,612,584	1,619,766
Proportion of fuel thermal input comprising waste material	**% thermal input**	5.7	38.2	39.7	40.4	44.0	43.0	41.6
Proportion of fuel thermal input comprising biomass	**% thermal input**	Not available	10.2	11.3	11.5	13.5	13.6	12.9
Proportion of raw material mass comprising waste and by-products	**%**	4.0	7.2	7.6	7.6	7.0	7.7	7.4
Process waste recovered on-site	**tonnes**	Not available	11,379	9,195	2,819	10,390	1,513	11,009
Process waste recovered off-site	**tonnes**	nil	36,945	47,796	57,471	47,238	33,988	35,103
Process waste sent to landfill	**tonnes**	289,207	14,021	4,631	nil	nil	nil	nil

Data tables

DECARBONISATION

	Units	1998	2010	2011	2012	2013	2014	2015
CO_2 emissions from calcination (process emissions)	**$kgCO_2$/tPCe**	520	471	468	459	468	462	476
CO_2 emissions from combustion of fossil fuels	**$kgCO_2$/tPCe**	387	187	177	169	164	158	172
Indirect CO_2 emissions from electricity use	**$kgCO_2$/tPCe**	Not available	55	61	56	44	58	57

ENVIRONMENTAL

	Units	1998	2010	2011	2012	2013	2014	2015
Emissions of NO_x	**$kgNO_x$/tPCe**	3.34	1.35	1.31	1.31	1.25	1.27	1.04
Emissions of SO_2	**$kgSO_2$/tPCe**	2.56	0.33	0.40	0.48	0.48	0.41	0.31
Emissions of dust	**kgdust/tPCe**	0.33	0.06	0.06	0.06	0.05	0.06	0.06
Potable water use	**m^3/tPCe**	Not available	0.05	0.05	0.05	0.04	0.04	0.03
Licensed abstraction	**m^3/tPCe**	Not available	Not available	Not available	0.04	0.04	0.05	0.07

make the link
to mineral products

MPA Cement site locations

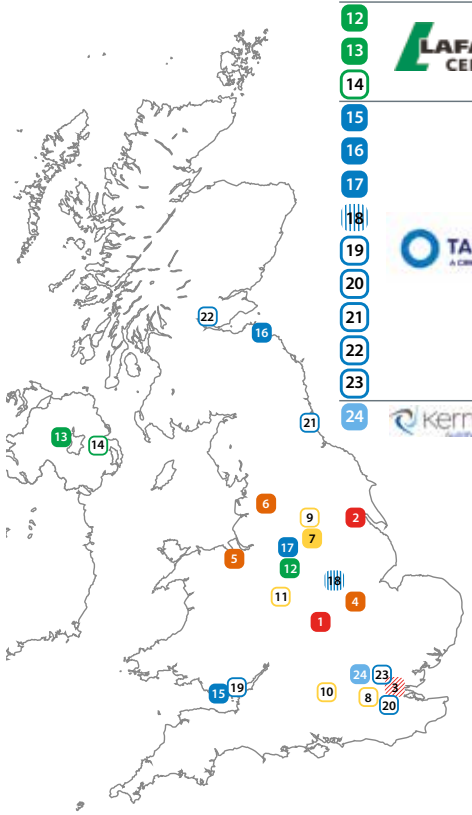
Key

Kiln sites

Grinding and blending sites

Grinding only sites

Blending only sites



1	CEMEX	Rugby
2		South Ferriby
3		Tilbury
4	Hanson	Ketton
5		Padeswood
6		Ribblesdale
7	HOPE Cement	Hope
8		Dagenham
9		Dewsbury
10		Theale
11		Walsall
12	LAFARGE CEMENT	Cauldon
13		Cookstown
14		Belfast
15	TARMAC	Aberthaw
16		Dunbar
17		Tunstead
18		Barnstone
19		Celtic Ash
20		Northfleet
21		Seaham
22		Scotash
23		West Thurrock
24	kerneos	Purfleet

mpa cement members

CEMEX UK
Hanson
Hope Cement
Kerneos*
Lafarge Cement
Tarmac (a CRH company)

This report has been titled as 2016 to follow the general MPA nomenclature to use the year of data collection rather than the year of performance.

**Kerneos are members of MPA but data from their operations has not been included in this report because they produce calcium aluminate cements rather than Portland cement.*

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The Mineral Products Association is the trade association for the aggregates, asphalt, cement, concrete, dimension stone, lime, mortar and silica sand industries.

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