



***make the link  
to mineral products***



essential materials  
sustainable solutions

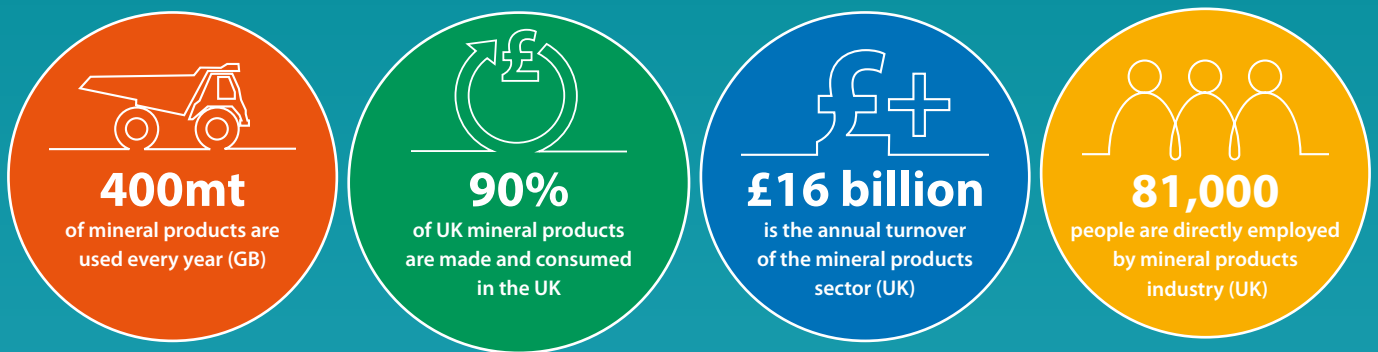
# Essential for life

Everything we use in daily life - from our homes to our mobile phones - is made with minerals that are quarried or mined. The places we live, learn, work and play, how we travel, and the way we receive goods and services depend on mineral products.

These materials provide safety, shelter, comfort and convenience, and each year 400 million tonnes (mt) of mineral products are made and transported around the country – the biggest flow of materials in the economy. The £16 billion mineral products industry is one of the largest manufacturing sectors.

More than 90% of minerals used in the UK are extracted and processed here. Our mineral products industry is seen as 'world class' and also ranks among the most responsible and sustainable manufacturing sectors, economically and environmentally.

This document outlines the products, processes, benefits and achievements of one of the oldest and most essential industries without which many other sectors could not exist.



# Essential to the economy

The UK has a long history of turning raw minerals into products that help to drive economic growth. Minerals have played a part in making our country one of the world's most prosperous nations.

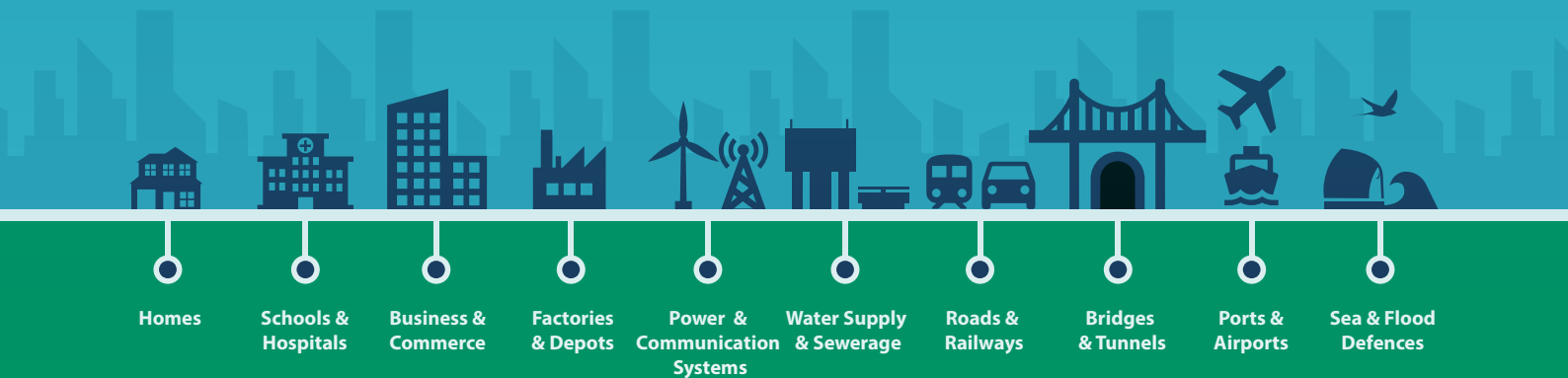
Today, the UK mineral products industry is a world leader, whether that's in operational performance, environmental excellence or any other aspect of quarrying – that's why the sector is able to export talent and best practice all over the globe.

Combined, the industry generates almost £6 billion in GVA (Gross Value Added, a measure of contribution to the economy).

The industries that directly depend on mineral products turnover nearly £600 billion, and 3.5 million jobs are supported through our supply chain.

The significance of the contribution made by the mineral products industry cannot be overstated. Yet this essential industry, its responsibly-sourced products and its dedicated workforce are often overlooked and misunderstood.

'Making the link' to mineral products is the first step towards understanding and appreciating the essentials that make our way of life comfortable, convenient, safe and sustainable.





# Essential for living

The built environment – our towns, cities and entire infrastructure – is made from mineral products like aggregates, concrete, asphalt and other materials which come from the ground. Even steel and glass cannot be made without essential minerals like limestone and high-purity sand.

Of all the mineral products used in the UK, around half go to publicly-funded projects for schools, hospitals and social housing, roads, railways, ports and airports, utilities infrastructure and flood defences. The other half goes to the private sector for private housing, retail and commercial development, and sports and leisure facilities.



**Homes** – up to 200 tonnes of aggregate are required to build a typical family house.

**Shops** – your nearest supermarket would have needed over 2,000 tonnes of concrete.

**Hospitals** – a community hospital can use 50,000 tonnes of mineral products.

**Offices** – an average 6-storey office block requires around 16,000 tonnes of concrete.

**Manufacturing** – a factory or warehouse can easily consume 50,000 tonnes of mineral products.

**Roads & railways** – a mile of motorway contains more than 20,000 tonnes of aggregate, asphalt and concrete, while a bridge can require tens of thousands of tonnes of material.

**Ports & airports** – a typical airport runway is made with around 100,000 tonnes of aggregates.

**Energy** – a wind turbine has a concrete base of up to 1,000 tonnes (and at sea each base can be 10,000 tonnes). A new nuclear power station requires over 3 million tonnes of mineral products.

**Water systems** – concrete is needed at high volumes to capture and contain water resources.

**Flood defences** – mineral products are essential for managing rising sea levels and reducing flooding.

## ESSENTIAL FOR EVERYTHING

Mineral products are also essential for making hundreds of everyday items – from steel and glass, paints, paper and plastics, to foods and medicines. These vital products can be produced thanks to the extraction and processing of minerals.



# Essential materials

## AGGREGATES

Most mineral products begin with aggregates – stone broken down into smaller pieces either by industrial process (crushed rock) or by nature over thousands of years (sand and gravel).

Rock such as granite and limestone is blasted and crushed, usually at large, deep quarries, while sand and gravel are dug from sites that are typically shallower, but are also sourced by dredgers from licensed areas on the seabed. Extracted materials are usually washed to remove silt then screened into different sizes ranging from fine sands to coarse aggregates.

Different aggregate types have distinct uses – some aggregates are highly versatile (like limestone which has numerous uses) while others have specific applications (such as skid-resistant gritstone for road surfaces).

Crushed rock is used throughout construction for foundations while gravels are used to protect underground pipes and cables, to provide land drainage, and for decorative landscaping. Natural primary aggregates are often combined with recycled or secondary aggregates which account for almost 30% of the total aggregates used in the UK.



## BUILDING STONE

Building stone is natural quarried stone that is cut or carved to the desired shape for certain types of building. Stone is a traditional building material which is still used in places where local architectural heritage must be maintained or where a prestige finish is desired. Most of the country's most famous monuments and historic buildings were built with building stone, and new stone from the same sources is needed for renovation. The UK produces around 1 million tonnes of building stone each year but there are also significant imports from Asia.

## CEMENT

Cement is the active ingredient in concrete, the most widely used of all man-made materials thanks to its versatile properties and widespread availability. Cement is also used in mortars, renders, screeds and tile adhesives.

Cement is made at 10 locations in the UK. The process involves combining finely ground limestone and clay at 1450°C in a huge rotary kiln to produce 'clinker'. The clinker is then ground and blended with more limestone and gypsum, to produce the fine grey powder known as cement.

A lot of energy is needed to make cement, and the chemical reaction that produces clinker also generates carbon dioxide. The UK cement industry accounts for around 1.5% of the country's carbon emissions and the sector has halved emissions in the past 30 years – faster than the UK as a whole – and is working to go beyond net zero carbon by 2050.

Large quantities of secondary materials with 'cementitious' properties are also used in cement. These are by-products of other industries, including fly ash from coal-fired power stations and slag, the unwanted residue from steel making. Using these materials helps to reduce carbon emissions and eases the demand for primary mineral resources.



## MORTAR

Mortar plays an essential role in building – made from sand, cement and water, it's the glue that bonds bricks, blocks and stone together. Whilst mortar can be mixed in small quantities on building sites, around 70% of mortars used in the UK are factory mixed which ensures quality.

## LIFECYCLE OF MINERAL PRODUCTS



1. Plan & Prepare Land



2. Extract & Haul



3. Crush, Wash & Screen



4. Load & Transport

## CONCRETE

Almost every structure needs concrete for its foundations and strength – from the garden shed to The Shard!

Concrete is a combination of cement or cementitious materials, aggregates, water and additives to enhance its performance in different ways. Concrete is sometimes called ‘liquid stone’ thanks to its amazing ability to be poured into any shape to form a structure.

There are hundreds of different types, but concrete is essentially supplied in one of two forms:

- **Ready-mixed concrete** – delivered ‘wet’ in mixer trucks and poured into place for foundations and floor slabs, plus walls and columns in tall structures.
- **Precast concrete** – produced in factories by forming into moulds. Concrete masonry and precast products include building blocks, roof tiles, beams, paving, kerbs, pipes, bridge and tunnel sections.

Concrete has innate properties of strength, durability, resilience and versatility and each year in the UK more than 20 million cubic metres are supplied from over 1,000 concrete plants.

Concrete has thermal mass properties that help to lower the energy needs of buildings. Concrete also absorbs carbon dioxide during its lifespan and, at the end of life, can be recycled and reused again and again.



## INDUSTRIAL SAND

Industrial or silica sand is a specific type of high-purity sand that has a critical role to play in the manufacture of glass, paints, plastics, rubber, chemicals and cosmetics.

Silica sand is also used in foundries for making high quality metal castings and has properties that mean it’s essential for making ceramics as well as sealants and adhesives. The material also has uses in horticulture, agriculture, outside sports and leisure applications and that’s why almost 4 million tonnes of silica sand is used in the UK every year.

## ASPHALT

Asphalt forms the surface of our roads, runways, car parks, playgrounds and more. A mixture of aggregates and bitumen, asphalt creates a hard-wearing, flexible surface.

By using certain types of aggregates, asphalt provides excellent skid-resistance, ensuring safe braking and cornering. As well as being long-lasting, asphalt is also 100% recyclable – road surfaces can be planed off and reused to make new asphalt.

There are 300 asphalt plants in the UK supplying around 20 million tonnes of asphalt every year. To reduce its carbon footprint, the asphalt industry has developed warm-mix asphalts which use significantly less energy to manufacture.



## LIME

Lime is a versatile product which is essential to a number of industries. More than 1 million tonnes of lime products are made in the UK each year.

- Construction – lime is used in mortar, render, plaster and plasterboard, and is essential for renovation of historic buildings.
- Industrial – making steel, glass, paper, plastics and medicines relies on lime. Lime is also used in production of sugar, purification of water, desulphurisation of gases from industry and treatment of contaminated land and sewage.
- Agricultural – ‘aglime’ helps to control soil acidity and enhances nutrients to ensure healthy and abundant crops.

## INDUSTRIAL CLAYS

Industrial clays have numerous applications in everyday products. The UK is a leading producer and exporter of two types of clay:

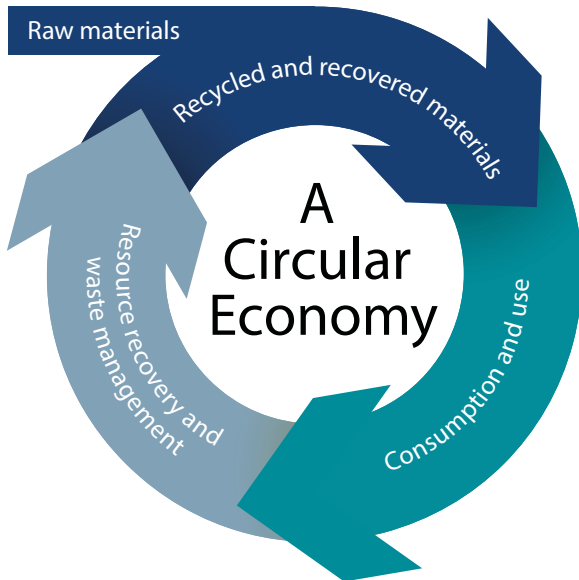
- China clay (or Kaolin) – used in ceramics and paper, plus pharmaceuticals, paints, adhesives and animal feeds.
- Ball clays (or plastic clays) – used for making sinks, toilets, wall and floor tiles, and tableware.





# Sustainable solutions

## RECYCLING & REUSE



**Making efficient use of the available resources is well-established in the UK mineral products industry. Today operators make good use of virtually all recyclable materials, reprocessing them into usable products. This means that almost 30% of all construction aggregates (around 120 million tonnes) comes from recycled or secondary sources – three times the European average.**

Recycled sources typically include waste from construction, demolition or excavation, including things like crushed concrete, road planings and old rail ballast. These are used to produce aggregates that are suitable for some, but not all, uses in construction.

Secondary aggregates are by-products from other sectors such as china clay mining, steel manufacture, power generation and even glass recycling. Each of these materials has different properties but with the right consistency and availability they can be turned into aggregates. Some materials, such as steel slag and fly ash, also have cementitious properties and can be used to replace manufactured 'Portland' cement in some applications.

As long as quality is maintained and specifications can be met, recycled materials will continue to play a vital part in meeting the demand for mineral products. Equally, materials that cannot be recycled are typically used in land reclamation and quarry restoration, turning brownfield land into farmland or new habitats for nature.

## LOGICAL LOGISTICS

**Mineral products represent the biggest flow of materials in the UK economy. The main reason is that these materials are bulky and are rarely needed at the places where they are extracted so they must be transported – locally, nationally and, for some products, globally. A network of road, rail, river and sea freight is used to get products from where they are made to where they will be used as efficiently as possible.**

Sometimes materials have to be moved two or more times using different modes of transport. For example, aggregates and cement are brought to local ready-mixed concrete plants where wet concrete is freshly-mixed and loaded into mixer trucks for delivery to local building sites before it sets.



**RAIL** – The mineral products industry moves more materials by rail than any other sector. One train can typically replace 75 lorries but facilities for loading and unloading (known as railheads) are required close to where materials are needed. Mineral products operators are working hard to retain and expand the network of railheads to improve transport efficiency, decrease carbon emissions and reduce lorry traffic.



**WATER** – There are many excellent examples of water-borne transport being used to move bulk mineral products, around the coast of the UK (marine aggregates, of course, but also crushed rock) as well as major rivers, especially the Thames which is an important thoroughfare for moving products into London but also recyclable materials out. As with rail freight, use of water-based transport relies on the availability of marine wharves at the right locations for loading and unloading.



**ROAD** – For transporting most materials, road haulage remains the only option. The industry has pioneered the use of vehicles that are ever more efficient and works closely with lorry manufacturers to adopt new greener technologies as they become available, including the potential for electric trucks. Systems for optimising routing and minimising empty journeys have been in place for many years. Road safety has long been a focus of the industry and companies have invested in initiatives, systems and training to improve safety for all road users.

## QUARRIES & NATURE

Few industries have such a profoundly positive impact both in the products they make and the legacy of their operations. One of the mineral product industry's best kept secrets is the huge and unique contribution that quarry restoration makes to long-term nature recovery, habitat creation and biodiversity gain.

By the time a quarry restoration scheme has come to fruition, many people have forgotten that the site once provided materials for the places where they live, work and play.

Enhancing biodiversity is key to the design of virtually every quarry restoration scheme, and many leading conservation bodies – including Natural England, RSPB and The Wildlife Trusts – recognise the importance of mineral extraction and have long-standing partnerships with quarry operators.

From wetlands to heathlands, grasslands to woodlands, many of our most cherished nature reserves and country parks have been created through mineral extraction. More than 80km<sup>2</sup> of priority habitat, an area the size of Nottingham, has been created through restoration of quarries. And a further 110km<sup>2</sup> of habitat, an area the size of Liverpool, is already in the pipeline for the years ahead. This award-winning achievement is one of the biggest contributions to UK biodiversity targets of any industry.



## CLIMATE AND THE FUTURE

**The mineral products industry was among the first to recognise the need to mitigate its impacts and adapt to ensure future material needs could be met sustainably.**

The UK concrete and cement sector started to decarbonise in the 1990s and reduced net carbon emissions by 53% from 1990 to 2018 – faster than the UK as a whole. That was achieved by switching away from fossil fuels plus changes in product formulation and energy efficiency. Today the sector accounts for around 1.5% of the country's greenhouse gas emissions, significantly less than the global average of 7%.

In 2020, the concrete and cement industry launched a credible roadmap to go beyond net zero carbon by 2050, removing more carbon dioxide from the atmosphere than it emits each year. This is to be delivered through more fuel switching, decarbonised electricity and transport, greater use of alternative raw materials and carbon capture, usage and storage (CCUS). Great progress has already been made with live trials showing how net zero is achievable with the right investment and Government policies.

Other areas of the mineral products industry are also reducing carbon emissions. For example the asphalt industry has invested in technologies to be able to make 'warm mix' asphalts which have lower energy use and lower emissions than traditional hot mixes.

And given that mineral products are bulky to transport, every part of the industry is looking to move materials with the lowest possible carbon emissions. The challenge to achieve net zero is huge, yet the work that's underway is wide-ranging and far-reaching, and is already showing how manufacturing mineral products can become sustainable.



# Essential minerals

## MINERAL RESOURCES

The UK's diverse geology gives rise to a wide range of raw minerals. These include durable granite, versatile limestone, sandstone, gravels and sands with numerous applications, plus specialist industrial sand, lime and clay minerals. Each has unique properties and can be put to different uses in construction, manufacturing and agriculture.

The geology of the country also dictates where the minerals lay in the ground and they are not evenly distributed – for example rock tends to be located to the west and north of the British Isles. So quarries and mines need to be in places where specific minerals are located and, once processed, those materials must be transported to where they are needed.

There are around 660 quarries across the country and 1,500 other sites that process mineral products, covering around 0.1% of the country's land area. Marine sand and gravel is sourced from the seabed.

The size, shape, design and duration of each quarry depends on the type of mineral, the way it is deposited in the ground, the demand for the products it's used to make, and a whole host of conditions and regulations.

## LONG TERM INVESTMENT

The scale and complexity of turning raw minerals into essential products for construction and manufacturing requires long-term thinking and major investment. It takes detailed planning and millions of pounds to establish a new quarry, and can take between 5 and 15 years.

Like all businesses, mineral products companies need the right economic, political and regulatory conditions to ensure their businesses remain viable and can meet the needs of other sectors and society. Here are just some of the areas where long-term commitment is required:

- Researching locations and working with landowners
- Carrying out environmental reviews and assessments
- Working with stakeholders to gain workable permissions
- Recruiting people and developing their competencies
- Designing, sourcing and building plant and machinery
- Developing products to meet market demands
- Organising efficient transport by road, rail and marine
- Restoring quarries to achieve a positive long-term legacy

## BEING A GOOD NEIGHBOUR

**With more than 2,000 mineral products sites across the country most people live near to a quarry or other production facility.**

The industry is sensitive to the concerns of local communities and works hard to address the impacts of its activities to the extent that many people are unaware of the mineral products operations in their neighbourhood.

Quarry operators prefer to have open dialogue with their communities. When they need to extend or develop their operations they engage with interested parties, taking into consideration local opinion when finalising their proposals.



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

For further MPA information visit [www.mineralproducts.org](http://www.mineralproducts.org)  
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