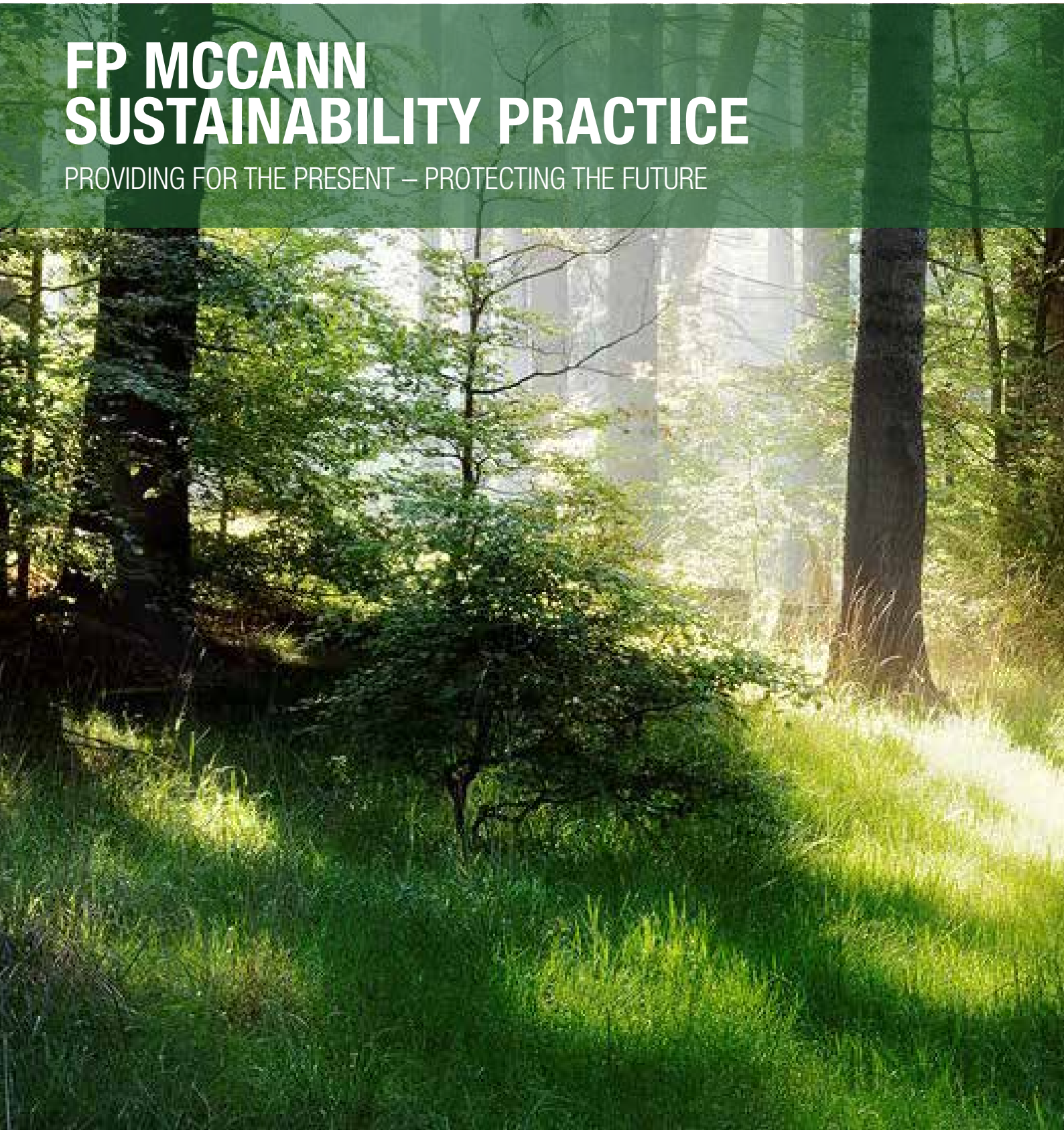
FP MCCANN SUSTAINABILITY PRACTICE

PROVIDING FOR THE PRESENT – PROTECTING THE FUTURE



INTRODUCTION

There is a widespread global awareness of the impacts of climate change and the effects of ever increasing levels of CO_2 in our atmosphere. As a global population, it is our collective responsibility to ensure that our CO_2 emissions are significantly reduced. This is not an issue unique to our industry; however, we have the ability to make a significant positive impact by reducing our energy use. This can be achieved through increased monitoring and mindful sourcing of materials and suppliers. Indeed, technologies are also being developed to capture and store CO_2 as part of the manufacturing process, thus removing it from the atmosphere entirely.

Whilst levels of CO_2 in our atmosphere are at an all-time high and need to be reduced, it is also important to understand that CO_2 is an essential part of our atmosphere which stabilises the temperature of our planet and supports all plant life on earth.

WHAT IS CARBON DIOXIDE?

The negative connotations of Carbon Dioxide (CO_2) often lead to the misconception of it being harmful. However, a natural amount of CO_2 actually plays a crucial part in maintaining our ecosystem. It only causes damage to the environment when there is an excess of CO_2, usually generated by man-made activities.

WHY IS CARBON DIOXIDE HARMFUL?

Although there are high levels of atmospheric CO_2, it isn't enough to cause detrimental damage to the human body or any other living organisms. So why is it deemed to be bad for us?

Like other greenhouse gases, CO_2 absorbs radiation and prevents heat from escaping from our atmosphere. The high amounts of atmospheric CO_2 collects and stores heat in turn, disrupting weather patterns and causing global temperatures to increase, along with other climate changes. There are many gases that trap heat as well, like methane and water vapour, but CO_2 puts us at the greatest risk of irreversible changes if it continues to accumulate unabated in the atmosphere.

HUMAN CO_2

Human activities like extracting, refining, transporting and burning fossil fuels emit too much greenhouse gases, including CO_2, for the ecosystem to remove accordingly. The CO_2 generated by us relies on the same ecosystem to be removed, however, with mass amounts of deforestation happening at the same time, the imbalance is becoming more apparent and is causing damage to our environment.

NATURAL CO_2

Life on earth relies on a constant carbon cycle through the air, water and land. Living things like animals and plants release CO_2 when they respire (i.e.) breathing in oxygen and exhaling CO_2 and nature maintains a balance by absorbing and therefore removing the CO_2 via plants and the ocean.

OUR TARGET IS TO REDUCE OUR CARBON EMISSIONS BY 50% IN THE NEXT 5 YEARS

IN LINE WITH NEW GOVERNMENT GUIDANCE, FP MCCANN PLEDGE TO ACHIEVE NET ZERO BY 2050

COMPANY SUSTAINABILITY POLICY

FP McCann is committed to promoting sustainability. Concern for the environment and promoting a broader sustainability agenda are integral to FP McCann's professional activities and the management of the organisation.

We aim to follow and to promote good sustainability practice, to reduce the environmental impacts of all our activities and to help our clients to do the same.

OUR SUSTAINABILITY POLICY IS BASED UPON THE FOLLOWING PRINCIPLES:

- To comply with, and exceed where practicable, all applicable legislation, regulations and codes of practice
- To make clients and suppliers aware of our Sustainability Policy, and encourage them to adopt sound sustainable management practices
- To ensure that all staff are fully aware of our Sustainability Policy and are committed to implementing and improving it
- To minimise the impact on sustainability of all office and transportation activities
- To review, annually report, and to continually strive to improve our sustainability performance
- To integrate sustainability considerations into all our business decisions

IN ORDER TO PUT THESE PRINCIPLES INTO PRACTICE WE WILL:

- Avoid physically traveling to meetings etc. where alternatives are available and practical, such as using teleconferencing, video conferencing, spark boards or web cams, along with efficient timing of meetings to avoid multiple trips. These options are also often more time efficient, while not sacrificing the benefits of regular contact with clients and partners.
- Reduce the need for our staff to travel by supporting alternative working arrangements, including home working etc.
- Minimise our use of paper and other office consumables, for example by double-siding all paper used, and identifying opportunities to reduce waste.
- As far as possible arrange for the reuse or recycling of office waste, including paper, computer supplies and redundant equipment.
- Reduce the energy consumption of office equipment by purchasing energy efficient equipment and implementing good housekeeping.
- Purchase electricity from a supplier committed to renewable energy. Seek to maximise the proportion from renewable energy sources, whilst also supporting investment in new renewable energy schemes.
- Ensure that timber furniture, and any other timber products, are recycled or are from well-managed, sustainable sources and are Forest Stewardship Council (FSC) certified.
- Purchase fair-trade and/or organic beverages.
- Undertake voluntary work with the local community and/or environmental organisations and make donations to seek to offset carbon emissions from our activities.
- Ensure that any subcontractors, suppliers or designers that we employ take account of sustainability issues.
- Where possible deploy "Virtualisation" technology in the IT Department to ensure that the company's energy consumption requirements are minimised by reducing the amount of physical machines required to mount IT solutions onto.
- Strive to achieve a more paperless office. To this end several document management systems have been developed that allow employees and customers retrieve and transmit documents electronically e.g. PODs Invoices etc.
- Through our "LoadTracker" Load Building and Satellite Tracking software continually monitor all vehicle journeys and optimise load-building to ensure that all vehicle movements and volumes are minimised, thereby reducing our CO_2 emissions.
- We will actively investigate and use renewable sources of energy for our manufacturing processes. We will ensure that our equipment makes the most sustainable use of this energy and that our processes are as efficient as possible.
- We will pursue options to reduce/remove the use of fossil fuels in our processes, including transportation.
- We will investigate the use of alternative raw materials, including recycled products, in our production processes.
- When renewing or replacing our plant, equipment and vehicles we will select those which are least harmful in terms of energy consumption and emissions.

SUSTAINABLE AGGREGATES PROCUREMENT

In line with the commitment to promote sustainability and minimise the environmental impact of our activities, FP McCann will endeavour to procure aggregates that have been responsibly sourced.

- Where suitable recycled or secondary aggregates are not available and, whenever reasonably practical, aggregates will be procured from sources accredited to the BRE environmental and Sustainability Standard BES6001:2008 Framework Standard for the Responsible Sourcing of Construction Products.
- Where aggregates are not available from BES 6001:2008 accredited sources, we will require the supplier to provide evidence to demonstrate the aggregate was responsibly sourced.
- When sourcing aggregates, preference will be given to recycled or secondary aggregates, wherever permissible by contract specification.

OUR CONTRIBUTIONS TO DATE

Planting trees is a great way to help sequester carbon emissions. Through photosynthesis trees absorb carbon dioxide to produce oxygen and wood. To aid our energy management plans we will ensure that the trees planted are native broad leaf species, in doing so, we can help to preserve the UK's environment and biodiversity.

Tree planting and habitat creation are an integral part of responsible mineral restoration. Significant areas at our quarry locations have already been planted to enhance bio-diversity and to provide visual screening. Most importantly, these initiatives also offset the carbon emissions which result from our manufacturing activities and energy use.

FP McCann have a considerable land portfolio, extending far beyond the boundaries of its manufacturing sites. To help reduce carbon emissions we have already planted a significant number of new trees in all depots and quarries. We have also planted many trees on our residential development sites, creating new habitats and providing essential outdoor amenity space. This year alone, we have planted almost 18 acres of native woodland, equating to more than 8,000 individual new broad-leaved trees. In this current planting season we have also created nearly 90 acres of new, sustainably grown commercial forestry. In the future FP McCann plan to embark on further tree planting and replanting programmes on lands & embankments within all our properties.

TREE PLANTING AND HABITAT CREATION

We have already planted thousands of trees at our operational sites across the UK. Conservatively, we estimate that this initiative equates to more than 50 acres of mature and semi-mature woodland.

Additional tree planting schemes are currently underway and significant opportunities for further planting schemes are being actively investigated at present.

BIOMASS HEATING PROJECTS

Biomass heating facilities have been installed at our Knockloughrim, Lisnaskea, Weston Underwood, Lydney and Uddingston sites.

The heat produced from these installations is fed directly into our manufacturing processes. It contributes to the product curing process and significantly reduces our demand for electricity and fossil fuel heat sources thus greatly reducing our energy use.

NEW LED LIGHTING

LED lights use 90% less energy than a typical incandescent bulb, which will greatly decrease your primary footprint, as less fossil fuel needs to be burned in order to produce it.

Across all our depots, FP McCann have installed energy efficient LED lighting which is coupled to motion sensors and other automated controls. LED light bulbs have a life-expectancy 20 times longer than a traditional incandescent bulb, they will also help you reduce our energy use as they only have to be replaced once every 50,000 hours, or 17.12 years in simpler terms. Over the course of a year it is projected that FP McCann will save 71,776kWh of energy with a total cost saving of approximately £11,276 . The simple payback of transitioning to motion sensor LED lighting will take approximately 1 year.

GEOTHERMAL ENERGY

Geothermal harnesses the heat which is contained in the below the earth's surface – capturing it does not directly emit carbon dioxide or other air pollutants.

FP McCann is currently investigating the use of geothermal energy to replace/offset the energy which it used to manufacture its precast products. These investigations are at an early stage but initial studies have identified a viable thermal resource which could be used to provide heat our curing processes and possibly, green electricity generation.

SOLAR PANELS

Installing solar panels to lower our carbon footprint. Solar energy is a natural, renewable source because it can be replenished unlike fossil fuels which are finite. Solar energy produces little or no emissions when it's converted to electricity.

We have now began to install solar panels around various locations and sites in our company to use alongside our current energy supply. As we use more electricity throughout the day solar panels are a very effective solution to reducing our carbon footprint and energy use.

- Solar panel installation at Kilrea Facility
- Solar panels used at various construction site locations
- Mini solar panels installed to power remote storage buildings / containers
- Test systems have already been installed at some of our largest manufacturing facilities.
- These test systems will allow us to optimise the design of solar arrays, ensuring that maximise the potential benefits of this green energy resource.
- FP McCann are committed to installing a minimum of 500kWp of solar generation capacity by the end of 2022.

OUR CONTRIBUTIONS TO DATE

REDUCING THE IMPACT ON THE ENVIRONMENT DURING PRECAST PRODUCTION

Across all our business disciplines we have implemented improvements to reduce embodied carbon in precast concrete. The use of a nominal 30% cement replacement using Pulverised Fuel Ash is adopted; a by-product from coal-fuelled power stations. Where this is not practicable, a 20% replacement of limestone fines is used as a cement replacement.

FP McCann are active members of the British Precast trade association; where objectives and key performance indicators are regularly set for carbon footprint and sustainability. The manufacturing process and energy sourcing for precast concrete products is becoming more efficient with a number key ingredients:

- 40% reduction in water use
- 26% drop in usage of fossil fuels
- 95% reduction in waste to landfill since 2008;

Carbon emissions have been significantly reduced by 30% since 2012 (See section on 'Existing Achievements by our Industry' for further information on low carbon production).

During its lifetime precast concrete will effectively re-absorb much of the carbon dioxide that was used to create it; a process called carbonation that accelerates when products are crushed for recycling at end of life.

RECYCLED MATERIALS IN PRODUCTION

Many of our precast products use recycled materials such as plastics and recycled aggregates. Our energy management plans include actively investigating the use of other recycled materials in our production processes.

We operate a number of recycling facilities which process construction and demolition waste to produce a recycled aggregate product. These facilities also process waste concrete material from our precast production processes, ensuring that virtually all of the concrete we manufacture is used either within our precast products or as a recycled aggregate material. Where possible, we recycle surface water runoff for use in production processes, cleaning and for dust suppression within our depots. Plans have recently been submitted for a significant rainwater harvesting system at our largest precast depot, Ellistown.

Non-concrete waste materials such as steel, wood and plastics are sorted, separated and sent to licenced recycling centres.

PROCESS IMPROVEMENTS

Over the past 3 years, our Company has embraced the concept of LEAN manufacturing and has incorporated hundreds of process improvements as a result. The principles of LEAN manufacturing focus on a number of key aspects which include:-

- Increased process efficiency
- Increased productivity
- Reduced waste
- Continuous improvement

These continual LEAN improvements are now an integral part of our production processes and they are completely aligned with our targets to reduce carbon emissions and production waste over the next 5 years and beyond.

INVESTMENT IN SMARTER, MORE EFFICIENT TECHNOLOGY

All compatible precast machines have been fitted with Programmable Logic Controllers (PLC). These controllers have a variety of benefits and they improve process efficiency in our precast manufacturing. Most importantly, these smart controllers replace electromechanical relays. This aspect alone results in a significant reduction in our electrical energy demands.

Takt time monitors have been installed to provide constant monitoring of our precast machines. This provides a measurement of Overall Equipment Effectiveness (OEE) and identifies areas where energy efficiency may be improved.

Aging control systems have been upgraded and replaced to reduce energy demands. New material storage and handling systems have been installed which significantly reduced fossil fuel usage in the production process. FP McCann has also invested in new, more efficient, mixing technology and control systems. We have invested heavily in new/improved insulation, thus ensuring that the energy required to cure our products is significantly reduced.

Inverter drive motors have been installed throughout the precast division. These motors allow variable drive speeds, reducing electrical energy consumption and extending the life of equipment.

Acoustic sensors have been installed to detect machine faults/ inefficiencies. Shut-off sensors have also been fitted to a number of precast machines. These sensors automatically shut down production machinery when not in use. These sensors ensure that our demand for electrical energy is closely monitored and controlled.

"ALL PRODUCTS WE MANUFACTURE ARE 100% RECYCLABLE"

OUR CONTRIBUTIONS TO DATE

TREMENDOUS ACHIEVEMENT FOR FP MCCANN ON THE ROAD TO NET ZERO

FP McCann has undertaken the planting of almost 30,000 native trees across six locations in Northern Ireland as part of the company's ongoing sustainability strategy and pledge to meet net zero by 2050.

The total includes over 13,600 Sitka Spruce trees, as well as Norway Spruce, Whitethorn, Alder, Rowan, Crab Apple, and varieties of Pine, Birch, and Oak.

Almost 50 acres of land have been planted during 2022.

OUR CONTRIBUTIONS TO DATE

FP MCCANN DRIVING CARBON REDUCTION WITH ELECTRIC & GAS POWERED VEHICLES

As part of FP McCann's ongoing sustainability strategy to achieve net zero, we continue to take steps to replace our fleet of diesel fuel vehicles with more environmentally friendly, low-polluting alternatives.

We have recently purchased several new forklift trucks to add to the existing fleet of low emission vehicles. Electric forklift trucks for our Byley depot in Cheshire and for our Knockloughrim facility in Magherafelt, as well as gas forklift trucks for our Weston Underwood manufacturing facility in Derbyshire and for our Cadeby site in Warwickshire.

As well as significantly reduced running costs, LPG produces up to 45% less CO2 than diesel. The electric truck omits zero emissions and noise pollution is significantly lower in comparison to diesel engines. Electric trucks also have fewer moving parts that can break or get damaged, reducing downtime and maintenance costs.

OUR CONTRIBUTIONS TO DATE

FP MCCANN TRIALS START ON PRECAST EARTH FRIENDLY CONCRETE PIPES AND MANHOLES

FP McCann has manufactured the UK's first cement-free precast manhole rings and pipes at the company's Knockloughrim precast factory using Earth Friendly Concrete (EFC) from Wagners. Instead of Portland cement, FP McCann worked with international partners to introduce a geopolymer low-carbon binder that is formed from the chemical activation of Fly Ash and Ground Granulated Blast-furnace Slag.

It is claimed that replacing the Portland cement with this geopolymer binder, made using the materials from recycling streams, can reduce the overall environmental impact and the CO_2 emissions of the concrete by up to 80%.

In addition to its low carbon credentials, high performance concrete made with this novel material is achieving similar strengths to traditional concrete while, due to the chemistry of the geopolymer binder, providing improved durability in many aggressive environments.

After extensive research and use in the UK's ready-mix industry, the next step will be an introduction of the geopolymer concrete in the precast sector. Here, the low carbon alternatives can combine with modern manufacturing methods to provide a truly innovative solution for the construction sector.

This work is carried out in conjunction with FP McCann's wider low carbon initiative, working closely with suppliers and customers to provide economical, high-quality, and sustainable products.

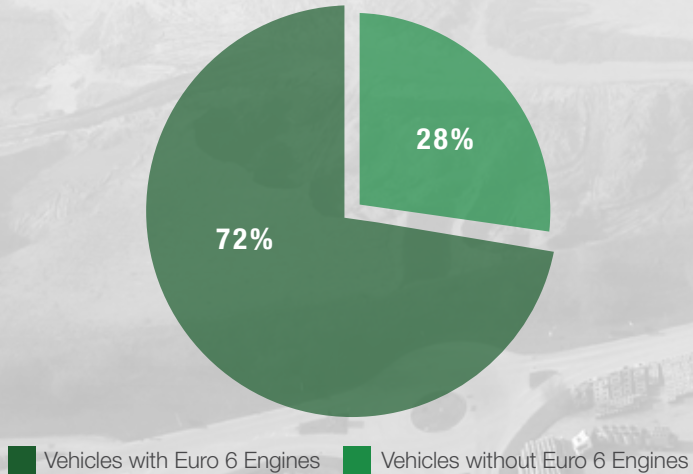
OUR FUTURE PLANS

TRANSPORT OWNED

With the potential area of change in transport carbon emissions FP McCann have put in place a plan that all new vehicles now must obtain the following;

- All vehicles must have Euro 6 engines
- HGV driver training to reduce fuel consumption
- Low engine emissions
- New lorries must now be fitted with a GPS system and have trackers to help eliminate unnecessary millage on deliveries
- New vehicles have a potential 30% reduction in fuel saving from the vehicles that they will be replacing
- Precast operations using electric trucks were possible as opposed to diesel. 6no. New electric forklifts have been purchased in the past year, replacing existing diesel machines.
- New pavers fitted with electric heated screeds as opposed to gas burners

EURO 6 VEHICLE ENGINES



SMART SYSTEMS / CONTROLS

FP McCann views the use of smart technology as playing a pivotal part in our energy management efforts to measure resource usage.

The company's strategy is to continue searching for new technology and where applicable, make the investment to ensure our company is doing all we can to reduce carbon output and minimise our environmental impact.

ELLISTOWN POWER SWITCH TO GREEN SOURCES

Total Gas & Power, FP McCann's Ellistown energy supplier, says that its Pure Green energy tariff guarantees electricity only from solar, wind or hydro sources. The generation mix of Total's Pure Green power is typically 75% wind, 24.7% solar and 0.3% hydro/wave power.

FP McCann's largest precast depot in Ellistown uses electricity which is generated by 100% renewable sources. Notably, our Ellistown depot has the greatest energy usage within our Company. Similarly, our Lydney depot, which is supplied by Haven Power Ltd, uses electricity which is also supplied from 100% renewable sources.

At present, a high percentage of our total electricity usage is provided by renewable sources. With the electricity matched to Renewable Energy Guarantee of Origin (REGO) certificates, this enables our Ellistown and Lydney depots to report zero emissions for electricity under the Greenhouse Gas Protocol Corporate Standards, Scope 2.

ADDITIONAL IMPROVEMENTS

- Reuse of recycled materials in our products
- Recycling waste timber
- Return loads – loaded v empty miles
- Power Factor Correction
- Improved insulation in curing chambers & bitumen storage tanks

FUTURE INNOVATIONS

Work is continually being undertaken by the research and development team at FP McCann in order to identify innovative new materials and methods that can further improve the effect precast concrete has on the ecology.

FP McCann are currently engaging with a UK leading university and a third party company on the development of an innovative technology that will facilitate the adding of carbon dioxide (CO_2 into the concrete during mixing.) This causes the CO_2 to react with the calcium ions from the cement content to form a nano-sized mineral called Calcium Carbonate, which becomes embedded in the concrete. Injected CO_2 improves the compressive strength of precast concrete, which allows us to further optimise mix designs and dramatically reduces the carbon footprint of the precast products being produced.

WHAT MAKES OUR PRODUCTS SUSTAINABLE

Concrete is a friend of the environment in all stages of its life span, from raw material production to demolition, making it a natural choice for sustainable home construction. Here are some of the reasons why, according to the Portland Cement Association and the Environmental Council of Concrete Organisations:

RESOURCE EFFICIENCY

The predominant raw material for the cement in concrete is limestone, the most abundant mineral on earth. Concrete can also be made with fly ash, slag cement, and silica fume, all waste by-products from power plants, steel mills, and other manufacturing facilities.

REFLECTIVITY

Concrete minimises the effects that produce urban heat islands. Light-coloured concrete pavements and roofs absorb less heat and reflect more solar radiation than dark-coloured materials, such as asphalt, reducing air conditioning demands in the summer.

THERMAL MASS

Homes built with concrete walls, foundations, and floors are highly energy efficient because they take advantage of concrete's inherent thermal mass or ability to absorb and retain heat. This means homeowners can significantly cut their heating and cooling bills and install smaller-capacity HVAC equipment.

MINIMAL WASTE

Concrete can be produced in the quantities needed for each project, reducing waste. After a concrete structure has served its original purpose, the concrete can be crushed and recycled into aggregate for use in new concrete pavements or as backfill or road base.

DURABILITY

Concrete builds durable, long-lasting structures that will not rust, rot, or burn. Life spans for concrete building products can be double or triple those of other common building materials.

STORMWATER RETENTION

Pervious concrete is a special type of structural concrete with a sponge-like network of voids that water passes through readily. When used for driveways, footpaths, carparks, and other pavements, pervious concrete can help to retain storm water runoff and replenish local water supplies.

EXISTING ACHIEVEMENTS BY OUR INDUSTRY

LOW CARBON PRODUCTION

The precast concrete sector, and the UK concrete industry, has targets to reduce the carbon emissions of production, or embedded carbon, from its products. The manufacturing carbon emissions of the UK precast concrete sector has dropped by 30% since 2012 and 43% since 2008. Factory carbon emissions equate to 10kgCO_2/t. The rapid reductions over the last decade have been achieved from efficiency improvements and the use of low carbon energy switching from fossil fuels.

LOW CARBON CONCRETE

Ground granulated blast-furnace slag (GGBS), fly ash and powdered limestone can reduce the carbon footprint of concrete. In the precast concrete sector, over 20% of cement has been replaced with alternative cementitious materials. The precast sector has also published a number of generic Environmental Product Declarations (EPD) and 70% of British Precast members have their products covered by valid third party certified EPDs. These EPDs support the use of Building Information Modelling (BIM) and manufacturers can also provide further information to support BIM.

POTENTIAL AREAS OF CHANGE

INDIRECT EMISSIONS FROM DECARBONISED ELECTRICITY

-4%

CO_2 reduction

Decarbonising the electricity grid encourages the electrification of the industry. Decarbonising technologies that require electricity include plasma energy and CCUS. Using technologies such as these could increase electricity use by 80% to 130%.

Advanced manufacturing techniques, such as artificial intelligence (AI) and automation, will deliver efficiencies in the operation of concrete and cement plants.

TRANSPORT

-7%

CO_2 reduction

Decarbonising delivery transport is realised through a move away from petrol and diesel. Investment in new fleet and reducing road transport miles reduces carbon emissions.

Through investment in infrastructure, the industry has increased its use of rail freight, supporting a modal shift from road to rail and a reduction in transport emissions.

THERMAL MASS

-44%

CO_2 reduction

Thermal mass is a property of heavyweight materials like concrete and masonry where heat can be absorbed, stored and released, reducing the energy needed to heat and cool buildings. The use of lifecycle assessment and post-occupancy evaluations demonstrate the carbon and energy savings from smart thermal mass contributing to the demand side response to climate change.

The cumulative deployment of concrete's thermal mass produces a building stock which has an estimated 14% saving of 2050 UK electricity consumption from avoided heating and cooling. This equates to 44% of 2018 concrete and cement emissions levels.

LOW CARBO AND CONCR

-12%

CO_2 reduction

Innovations in con design, to utilise lo constituents, are e revisions to produc standards. These l products are adop increasingly in our

Research and dev clinker content, alt and cement formu carbon emissions.

EXISTING ACHIEVEMENTS BY OUR INDUSTRY

RESPONSIBLY SOURCED TO BES 6001

FP McCann are currently working towards obtaining accreditation for BES 6001 due in early 2021. The concrete industry adopted independent certification to the responsible sourcing standard BES 6001 from its launch in 2008. Constituent materials such as cement and aggregates are now 100% responsibly sourced to BES 6001 (see www.sustainableconcrete.org.uk). The latest published data from British Precast shows that 76% of all concrete produced by their members is certified to responsible sourcing standard BES 6001. This standard gives confidence of the ethical sourcing and traceability of concrete products, another advantage of a UK supply chain.

MATERIAL EFFICIENT PRODUCTION

The manufacturing process for precast concrete products is becoming more efficient with a 40% reduction in water use and a 95% reduction in waste to landfill since 2008, now down to 0.25 kg/t. As well as ensuring that any production concrete waste is recycled on site, precast concrete also utilises secondary and recycled aggregates with this representing around a fifth of the aggregates used. Concrete waste is minimised during manufacture due to efficient processes in the factory and the control of materials. As precast concrete elements and systems are typically made to order this reduces waste in production.

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CARBON CAPTURE, USAGE AND STORAGE (CCUS)

-61%
CO_2 reduction

UK investment in infrastructure and successful industry research enables the use of CCUS technologies.
This transformative technology represents the most significant and technically disruptive investment in the roadmap.

The CO_2 reduction of 61% will enable the industry to achieve net zero manufacture by 2050. The use of CCUS and biomass have the potential to make a greater contribution to the roadmap and achieve net negative emissions.

CARBONATION

-12%
CO_2 reduction

Carbonation, the process where concrete absorbs CO_2 from the atmosphere throughout its lifetime, is recognised in UK accounting of greenhouse gases.

When the global average carbonation rate of 23% is applied to the UK this means that it can contribute to a further 12% CO_2 reduction. By 2050, techniques to optimise and accelerate carbonation could be used to increase its contribution.

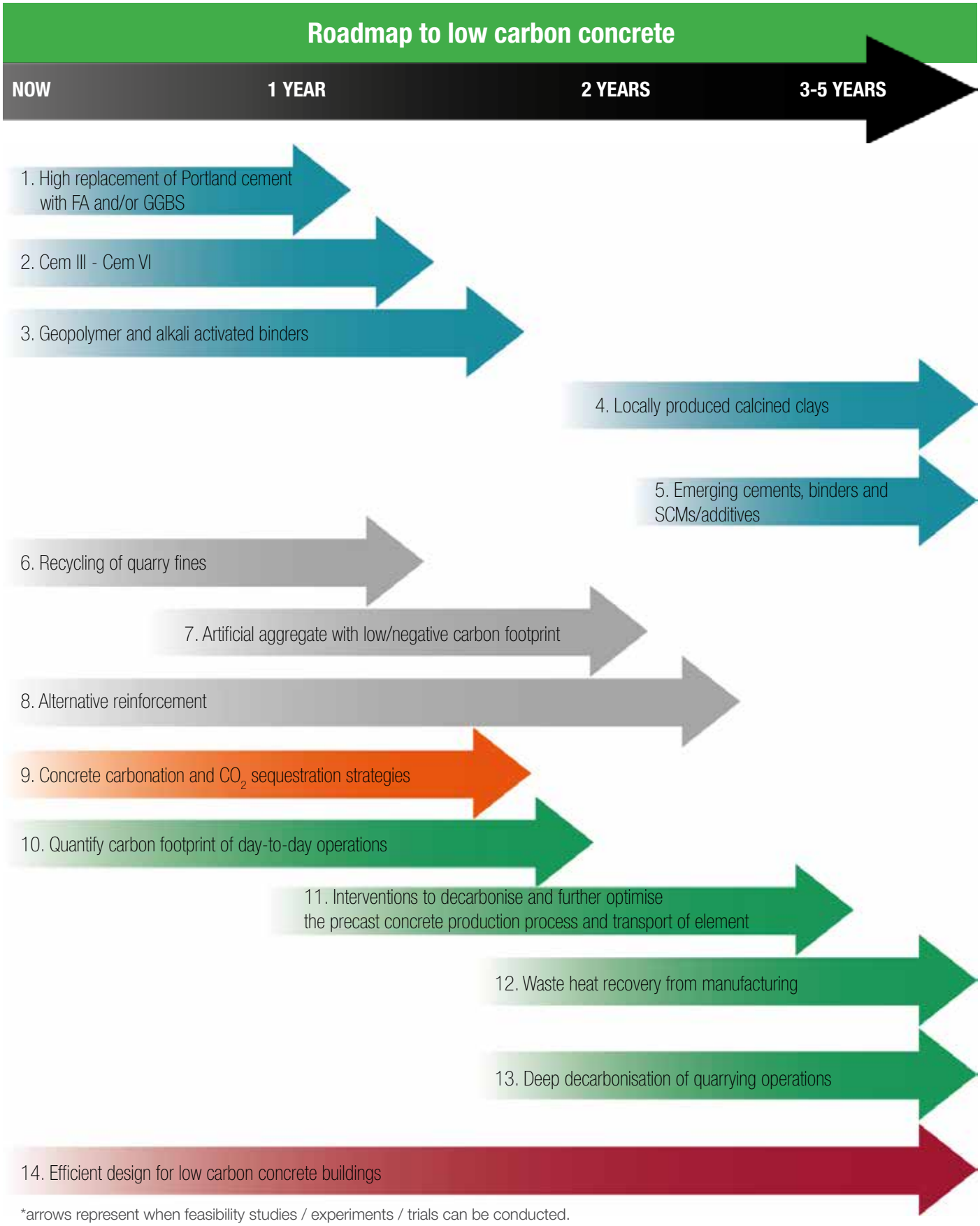
FUEL SWITCHING

-16%
CO_2 reduction

The availability of biomass wastes is sufficient to generate over 70% of the heat used for cement production.

UK investment in hydrogen production, delivery networks and successful industry research enables the use of hydrogen, plasma or other new heating technologies.

ROADMAP TO NET ZERO

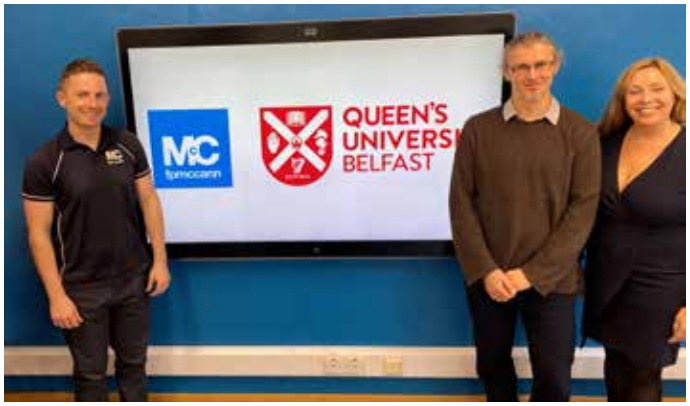


*arrows represent when feasibility studies / experiments / trials can be conducted.

ROADMAP TO NET ZERO

OUR LOW CARBON JOURNEY

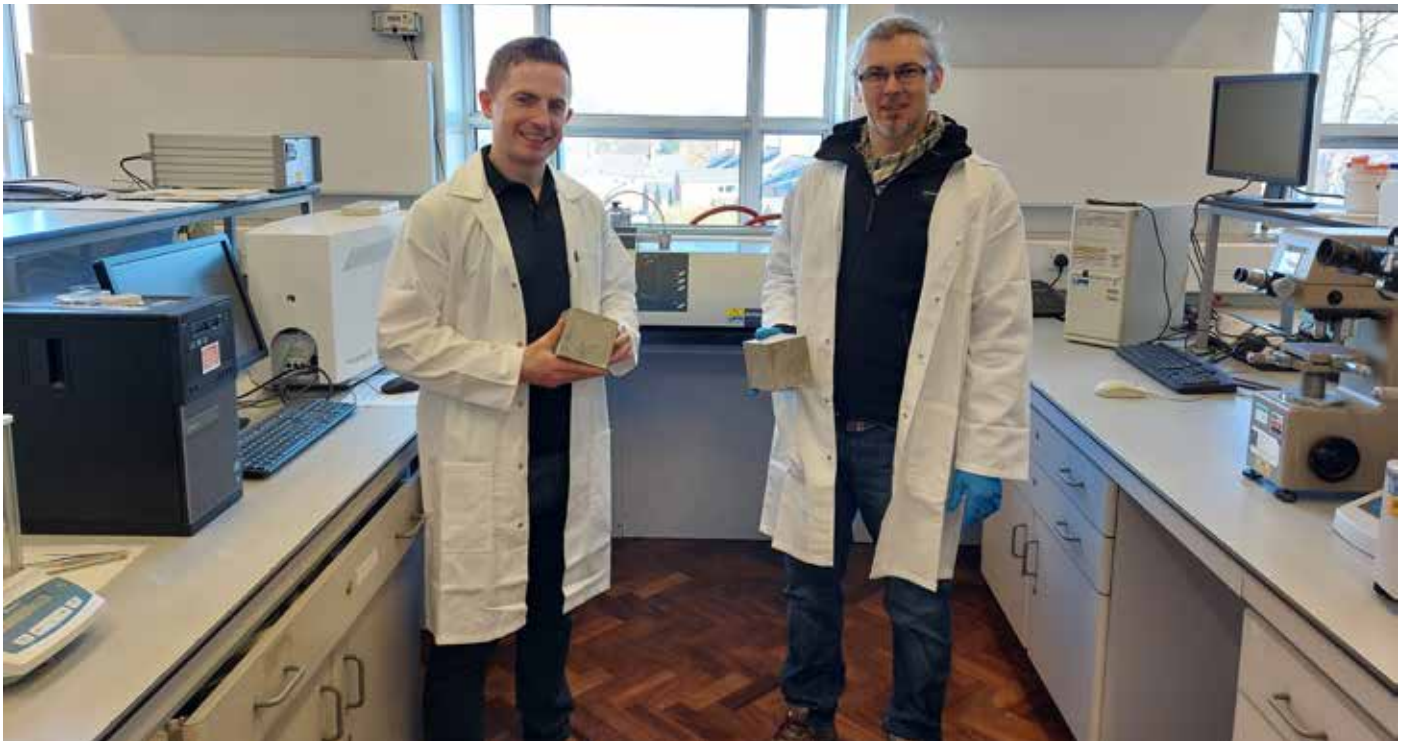
1. FP McCann plans to build upon the successful introduction of alternative materials with a lower carbon footprint than CEM I by further utilising Supplementary Cementitious Materials (SCM's) in the manufacturing of precast concrete including Fly Ash (FA) and Ground Granulated Blast Furnace Slag (GGBS).
2. New multi-component cements including CEM III – VI will be trialled providing increased dosages of SCM's further replacing Portland cement and therefore significantly reduce the carbon footprint.
3. Geopolymer and Alkali Activated Binders (AABs) offer an alternative approach by removing cement from the concrete mix design. Binder is formed by reacting an alumino-silicate precursor, often a waste or a by-product material (typically comprising FA, GGBS and/or calcined clay), with a chemical activator.
4. The introduction of Calcined Clays to partially replace clinker in cement production is widely believed to represent the best long term solution for the concrete industry. As stockpiles of FA and GGBS continue to diminish, Calcined Clays may represent a more reliable and sustainable SCM source for use in both Portland cement-based binders and the alternative binders (geopolymer/AABs).
5. It is expected that as various industries alter their operations and collectively move towards a greener future that new by-products providing a cementitious behaviour may become more widely available. These emerging materials can then be incorporated into concrete mix designs.
6. The recycling of quarry fines has been broadly adopted in the concrete industry significantly reducing the dependency on virgin materials. The proportion of these materials can be optimised to further enhance the performance of concrete.
7. Low carbon aggregates offer another pathway to sequester carbon permanently. A variety of companies are currently developing technologies where a carbonation process is utilised to treat waste materials to form artificial aggregate and permanently store carbon dioxide.
8. Steel reinforcement contributes significantly to the carbon footprint of reinforced concrete structures. Alternative reinforcing materials can be considered including Fibre Reinforced Polymers (FRP) and a wide range of fibre reinforcement. These materials have the additional benefit of prolonging the life of a structure and requiring less concrete cover as they are non-corrosive unlike steel.
9. A range of options for carbon sequestration are becoming available to the market enabling carbon dioxide to enhance the mechanical properties of concrete. Some solutions involve the use of emissions from the cement industry to be reused in the production of concrete.
10. Critical to assessing performance is quantifying the associated emissions of our daily operations and the materials used. This information will contribute to the creation of Environmental Product Declarations while also highlighting key areas for further reductions.
11. Interventions to decarbonise and further optimise the precast concrete production process and transport of element including fuel switching and alternative curing methods. These innovations must ensure that current rates of production are not compromised to ensure the long term success of low carbon concrete.
12. Waste heat from manufacturing can be recovered with a variety of possible applications in the daily operations of factories including drying aggregates or heating buildings.
13. Deep decarbonisation of quarry operations will involve exploring alternative energy sources including renewables across multiple sites.
14. Introducing optimisation techniques in design will play an important role in providing the most efficient combination of material type, deployed concrete structural systems, element thickness and reinforcement content, reducing material consumption and minimising the associated emissions while providing more economically viable solutions.

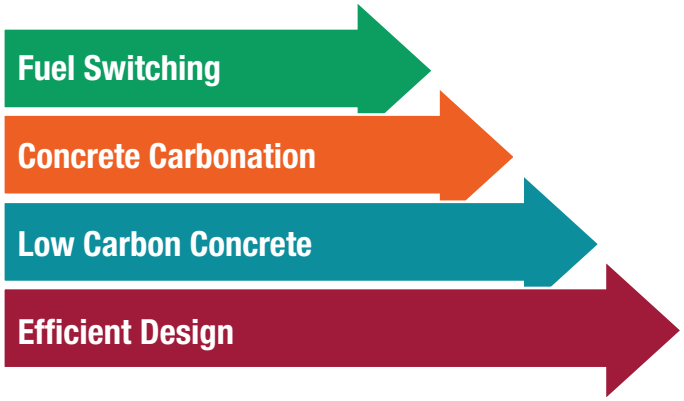


ROADMAP TO NET ZERO

OUR LOW CARBON JOURNEY

With an industry wide focus on reducing carbon emissions, FP McCann has begun its low carbon journey assessing the state of the art research. A multifaceted approach is to be applied as the various materials, technologies and required manufacturing standards continue to develop over the coming years. Key areas to be investigated are the use of higher dosages of supplementary cementitious materials to partially replace Portland cement, trialling newly developed cement blends, alternative binders, concrete carbonation and sequestration, carbon negative aggregates, and alternative reinforcement. This research will assess the feasibility of moving away from traditional reinforced concrete design and manufacturing processes while reviewing the solutions required to overcome technical issues currently impeding their introduction. Changes to existing practices will impact the carbon footprint of FP McCann's extensive product portfolio and will be reflected in updated Environmental Product Declarations (EPDs) as suitable innovations are introduced into daily manufacturing operations.





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CURRENT CARBON EMISSIONS FROM OUR INDUSTRY

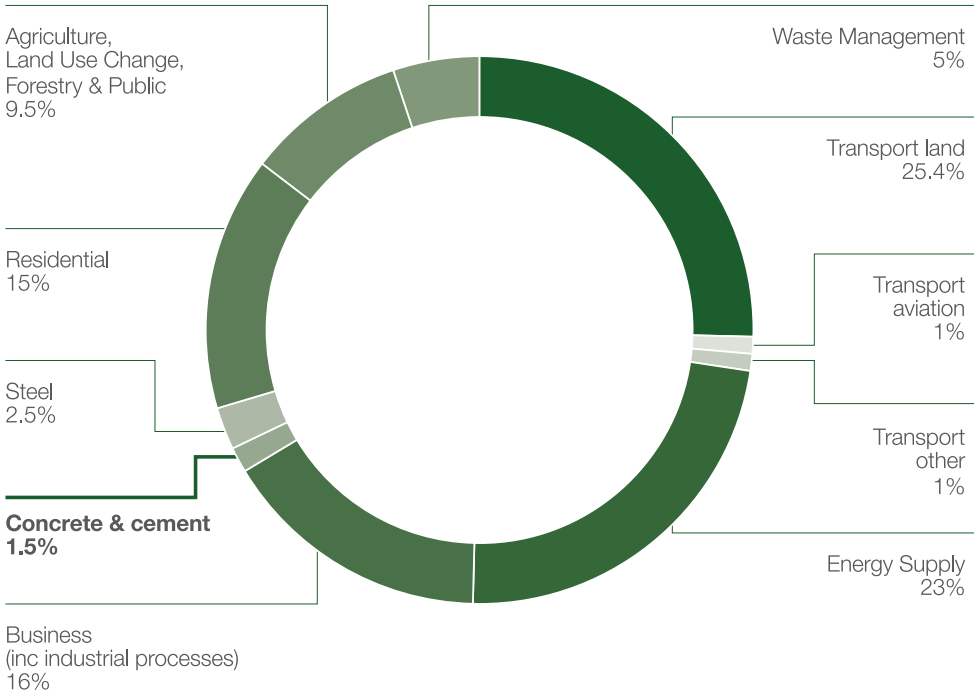
UK concrete and cement currently account for around 1.5% of UK carbon dioxide emissions, five times lower than the global average where cement accounts for around 7% of emissions. Early action by the UK concrete and cement industry has resulted in emissions already being 53% lower than 1990.

UK carbon dioxide emissions from concrete and cement were 7.3 million tonnes in 2018; around 4.4 million tonnes of this was 'process emissions' from clinker production, 2.2 million tonnes from fuel combustion and the remainder from electricity use and transport. Concrete is a mix of aggregates, cement and water.

The principal ingredient in cement is clinker. Clinker production is the main source of carbon dioxide emissions. These arise from the combustion of fuels in the kiln and from 'process emissions' which are a by-product of the chemical reaction that makes clinker. This makes decarbonisation more challenging than simply switching fuel sources, which is the only option for many other industries.

The industry has taken considerable early action and due to investment in fuel switching, changes in product formulation, and energy efficiency including plant rationalisation, direct and indirect emissions are 53% lower than 1990.

SECTOR CONTRIBUTIONS TO 2018 UK GREENHOUSE GAS EMISSIONS



UK cement manufacturers have already invested hundreds of millions of pounds in decarbonising by:

- Adopting the latest available technology
- Developing lower carbon cements and concretes, for example, by replacing clinker with lower carbon cementitious materials
- Switching from traditional fossil fuels such as coal and petrol to the use of waste, waste biomass and waste partbiomass fuels. These alternative fuels now account for 43 per cent of the fuel used, replacing the equivalent of half a million tonnes of coal every year.

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CURRENT CARBON EMISSIONS FROM OUR INDUSTRY

In addition to the significant efforts to reduce carbon emissions, the concrete and cement industry has made significant progress in other areas to enhance its sustainability credentials:

- Concrete is a locally produced material with an established, national supply chain – the average delivery distance for ready-mixed concrete is only 12km
- Over 95% of UK concrete is produced in the UK. By comparison, 67% of timber and 60% of steel is imported from around the world.
- Over 90% of UK concrete is certified as 'very good' or 'excellent' by the 'BES 6001 Responsible Sourcing of Construction Products' framework.
- Concrete is 100 per cent recyclable. Almost none goes to landfill and 90% of hard construction and demolition waste is recycled as aggregates.
- The industry is a responsible landowner, working closely with bodies including Natural England, the Wildlife Trusts and the RSPB to enhance biodiversity. Between 2009 and 2019 MPA members planted 1.5 million trees and 100km of hedgerows and have created 8,000 hectares of priority habitats.
- The concrete industry is a net consumer of waste, using over 200 times more waste and by-products from other industries than the waste it sends to landfill.

CONCRETE AND CEMENT MANUFACTURE, TRANSPORT AND USE TODAY

QUARRYING RAW MATERIALS

Limestone and other raw materials are quarried onsite or nearby. Emissions arise mainly from fuel and electricity for transport, quarry machinery, crushing and processing.

CLINKER FORMATION IN THE KILN

Clinker is produced by further heating the raw materials to 1,450°C. The main emissions arise from fuel combustion and electricity needed for fans and motors.

CEMENT DESPATCH

Cement is stored in silos then despatched in bulk tankers or in bags by road or rail. Emissions arise mainly from transport fuel.

RAW MATERIAL CO_2 PREPARATION

The raw materials are combined by grinding. Emissions arise mainly from electricity for grinding and conveying.

CLINKER COOLING AND STORAGE

Air is used to cool the clinker. Recovered heat is used for preheating, avoiding additional emissions.

CONCRETE PRODUCTION AND DELIVERY

Cement and other cementitious materials are combined with water and aggregates to produce a range of concrete products. Emissions mainly arise from electricity and transport fuel.

PREHEATING AND CALCINATION

The raw materials are preheated to around 900°C using recovered heat and fuel. The main emissions are from fuel combustion and the calcination process when CO_2 separates from the limestone.

MILLING AND BLENDING

Clinker is ground with gypsum and other materials to produce cement. Emissions arise from electricity needed to grind and blend the hard clinker and cementitious materials.

CONCRETE USE, END OF LIFE AND RECYCLABILITY

Concrete is 100% recyclable and naturally absorbs atmospheric CO_2 throughout its lifetime, a process called carbonation. Carbonation is increased when concrete is crushed for reuse at the end of its life and during any secondary use but can also be accelerated during concrete production.

BUILT ENVIRONMENT

Concrete's thermal performance properties are helping construct highly energy efficient buildings and infrastructure. Thermal mass is a property of concrete and masonry, where heat can be absorbed, stored and released slowly. Concrete buildings with high thermal mass generally have lower energy requirements and emissions from heating and cooling.

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