

LOW CARBON INFRASTRUCTURE

SOLUTION GUIDE



**SOLUTION
GUIDES**

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GLOSSARY

Capital Carbon

Greenhouse gas emissions associated with the creation, refurbishment and end of life treatment of an asset^[1].

Embodied Carbon

Related to Capital Carbon and previously used interchangeably with Capital Carbon. However, Capital Carbon is now the accepted term at asset level and Embodied Carbon now encompasses greenhouse gas emissions at product and material level^[1].

Operational Carbon

Greenhouse gas emissions associated with an infrastructure asset enabling it to operate and deliver its service^[1]. The use of transport infrastructure, for example by cars, is excluded.

Net Zero

Net zero carbon refers to achieving an overall balance between Greenhouse Gas emissions produced and emissions taken out of the atmosphere. This takes into account that some emissions are produced by 'hard-to-treat' sectors, where reducing emissions is either too expensive, technologically too complex or simply not possible. In a net-zero scenario the residual emissions from these sectors are allowed as long as they are offset by removing emissions using natural or engineered sinks.

Whole Life Carbon

All greenhouse gas emissions across an asset's life, incorporating capital and operational emissions.



INTRODUCTION

Our approach to construction encompasses innovative sustainable products, sustainable systems and practical solutions. We recognise the important role we have in promoting sustainable construction by optimising our products, their use and whole life performance. This guide summarises how Tarmac's innovative products, solutions and services can be utilised to support the delivery of low carbon infrastructure assets across their entire life cycle.

WHY LOW CARBON?

Infrastructure in the UK, encompassing communications, energy, transport, waste and water accounts for over 50%^[2] of carbon emissions.

These emissions have and continue to play a role in global climate change and the resultant impacts that are seen across the UK, including more frequent intense rainfall events, increased flood risk and counter intuitively longer and drier summers leading to drought risk^[3]. These extreme events in tandem with global megatrends^[4], are increasing the pressure on our infrastructure.

The impact of Infrastructure on UK emissions, both direct and indirect, must be addressed if the UK is to successfully transition to a net zero carbon economy and meet the Government's climate

change commitment to a 100% reduction in emissions by 2050 (net zero carbon), compared to the previous 80% reduction target^[5]. In support of this, carbon budgets have been set capping the amount of carbon allowed to be emitted year on year and this can only be met through a whole life approach.

Tarmac recognises through its role as a major provider and installer of infrastructure solutions that it has a responsibility to help deliver the low carbon infrastructure of the future. Tarmac employs a whole life approach enabling a balanced assessment of carbon emissions including capital and operational to be made over the life of an asset. Whole life places capital and operational emissions in context across the life of an asset, product or material.



TARMAC TAKING ACTION

Solutions, products and approaches are often cited as being low carbon. However, if only one stage of the lifecycle is considered it may not necessarily deliver the lowest possible carbon outcome.

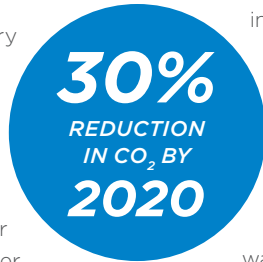
Tarmac's commitment to delivering low carbon infrastructure is demonstrated through our longstanding sustainability strategy and adherence to and support of the Government's leading schemes to support the delivery of low carbon infrastructure. Our strategy sets out our ambition to design out CO₂ from our products and services as one of our many far reaching commitments. Our 2020 target is to reduce CO₂ per unit of production by 30% (based on 1990).

Jointly developed by Government and industry the Infrastructure Carbon Review (ICR)^[2] forms part of the initiative to save

valuable resources and reduce emissions by using new technologies, construction techniques and low carbon materials.

The ICR sets out actions to reduce carbon in both capital and operational phases, with organisations committing to the approach required to set out specific actions. Tarmac became the first signatory within its sector.

A key output from the ICR was the world's first standard for managing carbon, reducing cost and improving efficiency in the construction of infrastructure projects, PAS 2080:2016, Carbon Management in Infrastructure^[1], whose development was supported by



Tarmac. Taking a leadership position in the management of 'whole life' carbon, by measuring the emissions of our production and products and setting targets to reduce these, Tarmac is ready to deliver on the objectives of PAS 2080^[1]. A business culture of change and communication, internally and with our customers, helps us to develop the next innovations and commercial solutions to enable customers to achieve real carbon savings and whole life performance benefits.

Whilst carbon remains a key driver for delivering a more sustainable built environment it should always be remembered that the sustainability challenge is broader than this and these other aspects must be taken into account.

OUR INFRASTRUCTURE CARBON REVIEW COMMITMENTS

Tarmac commits to:

1. Design CO₂ out of our products and services.
2. Provide product carbon footprints for all products from all production facilities.
3. Provide tools and information to support customers to adopt low carbon solutions.

DELIVERING SUSTAINABLE CONSTRUCTION

Tarmac's approach to carbon and sustainable construction is to follow the principles of whole life, ensuring that the impacts of a product, solution or asset are minimised at every stage of its life and are considered in context with each other. Based upon this Tarmac has developed a four-faceted life-cycle approach considering the expertise and benefits that can be delivered, In Built, In Construction, In Use and In Support.

These incorporate characteristics such as robustness, durability, maintenance, reuse, longevity, repair, recycling, aesthetics, performance and resilience, providing significant opportunities for performance improvement.

IN BUILT

This is all of the things we do within our business to continuously improve the sustainability performance of our business and products.

IN CONSTRUCTION

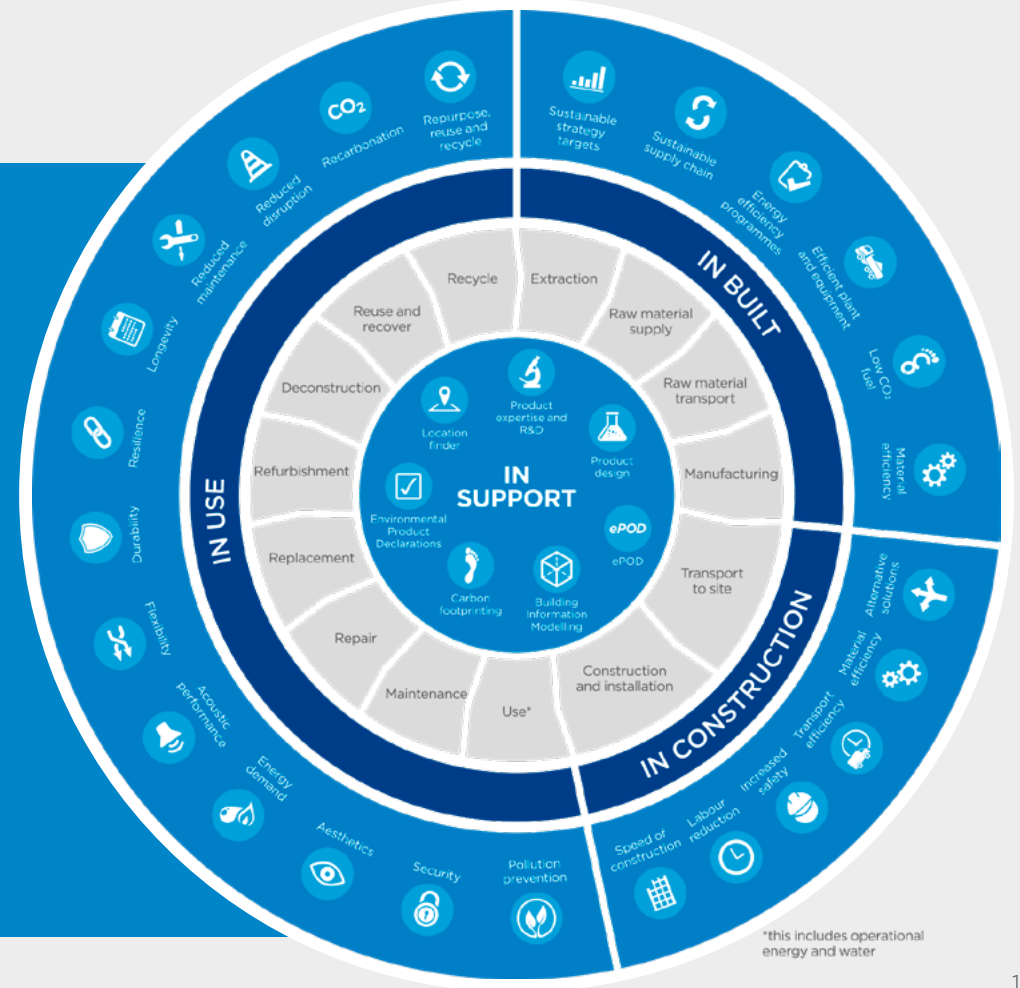
The way our products perform or support construction and can improve sustainability during an asset's build phase.

IN USE

How our products perform and can contribute to the performance of a building or element of infrastructure during operation, including end of life.

IN SUPPORT

All our services, certifications, labelling, tools, information and guidance which help customers achieve sustainable outcomes.



IN BUILT

The delivery of a low carbon built environment must start with the products that are used to construct it.



For Tarmac this means ensuring that the business operates in the most sustainable manner along with ensuring that the processes used to extract and manufacture products have the lowest possible impacts. As a responsible business Tarmac must ensure that its customers can be assured that the products which they are using have been produced responsibly and sustainably, all of this is carried out as business as usual.

SUSTAINABLE SUPPLY CHAIN

The responsible and ethical management of environmental, social and economic impacts is fundamental to any sustainable business and supply chain. This encompasses the materials we buy, our quarry operations, the way we manufacture products and transport them to customers. Tarmac has adopted the approach of ISO 20400:2017 Sustainable procurement. In support of this we require all our suppliers to be accredited to either Avetta (PICS) or Achilles Building Confidence to ensure that they are operating in a responsible manner.

ENERGY EFFICIENCY PROGRAMMES

Effective energy management is integral to minimising carbon emissions and driving efficiency. Tarmac became one of the first companies in its sector to be certified to ISO 50001 Energy Management. Implementing ISO 50001 enables Tarmac to understand and manage its energy use, inform decision making and deliver improvements.

RENEWABLE ELECTRICITY

As part of our commitment to low carbon solutions, all of Tarmac's electricity is procured from renewable sources.

RESPONSIBLE SOURCING

Our products have achieved an 'Excellent' rating through certification to BES 6001, the responsible sourcing standard, clearly demonstrating our responsible and ethical approach to managing the environmental, social and economic impacts of our business throughout our supply chain. This encompasses the materials we buy, our quarry operations, the way we manufacture products and transport them to customers.

LOW CARBON FUELS

The manufacture of all our products and materials requires the consumption of energy. Selecting alternatives to traditional fuels can deliver significant reductions. Where possible across our sites we have endeavored to change fuel sources, whether this is to lower carbon emitting sources such as natural gas or the use of waste as fuel. Using waste from other industries not only reduces carbon emissions but reduces waste to landfill and contributes to the circular economy. All of Tarmac's cement plants utilise waste derived fuels.

EFFICIENT PLANT AND EQUIPMENT

Investing in efficient plant and equipment can avoid detrimental effects on production, unnecessary processes, breakdowns

and stoppages all of which can increase emissions. Tarmac has an extensive programme of preventive maintenance, refurbishment and replacement in order to maintain plant and equipment at their most efficient and to incorporate new technology. These efforts have enabled a number of improvements including increases in recycled contents and the production of low temperature asphalts to reduce the impact of operations.

MATERIAL EFFICIENCY

The primary materials that form the foundation of the products we manufacture whilst not scarce are a finite resource. Tarmac supports a move away from the traditional 'take, make, dispose' way of working to an efficient management approach where maintaining a material's value is paramount and avoids the unnecessary extraction of resources. Examples are the use of Recycled Asphalt Planings (RAP) from old road surfaces in new asphalt, or the use of GGBS and PFA in cement and concrete, which would otherwise be sent to landfill remaining in use.

IN CONSTRUCTION



Tarmac recognises that significant opportunities exist within the construction phase for materials, products and solutions to play a role in driving down carbon emissions.

To enable this the characteristics of the materials and products that are being used to form the fabric of an asset need to be considered as part of the solution to aid construction. If this approach is followed significant changes and improvements can be made to improve the sustainability of the construction process.

SPEED OF CONSTRUCTION

Reducing the time taken to construct any infrastructure asset can have a positive impact on emissions. Plant and equipment emissions are reduced along with those from site offices and facilities. Tarmac's ULTILOW asphalts provide one route to achieve this. Manufactured at lower temperatures they are able to meet traffickable temperatures sooner, enabling roads to be opened faster, reducing construction time, shortening closures, congestion and emissions.

MATERIAL EFFICIENCY

The most effective and efficient use of materials is to utilise them where they have been produced, this includes materials produced on the construction site itself.

Tarmac has a number of solutions to incorporate site generated materials into new products such as the reuse of asphalt planings or crushed concrete in mobile plants to create new products. Tarmac can also offer lime and cement for soil stabilisation to improve existing conditions to avoid material removal, waste and production emissions.

LABOUR DEMAND REDUCTION

With labour in high demand and a cross-industry skills gap, projects can become delayed leading to additional emissions. Tarmac has solutions that can simplify the construction process saving time, reducing plant and the demand on skilled labour. One example, Topflow, removes the need for compaction due to its self-compacting

characteristics, negating the dependence on skilled operatives and associated plant to carry out this task.

REDUCED DISRUPTION

For many infrastructure projects disruption is unavoidable, especially when works are linked to existing infrastructure assets. In these circumstances significant sources of emissions are due to the scale and duration of disruption. Tarmac have shown that through collaborative working that they can enable significant reductions in project duration and disruption, such as reducing the laying of 1,215 tonnes of asphalt from four nights work to a single shift on the M60 with Balfour Beatty and Mott MacDonald.

WASTE REDUCTION

Construction has a historical record of generating large volumes of waste, whether this is from the construction site itself or as a result of unused or over ordered products, all contributing to increased and wasteful emissions. Tarmac offer an 'order what you need' service and can batch materials in precise volumes, this includes

our Asphalt2Go service and our minimix businesses for small readymix loads. Tarmac also follows the principles of the circular economy focusing on reuse and recycling, offering mobile recycling and production facilities to make use of materials where they are generated. We have a business record of recycling 12,000 tonnes of asphalt into new asphalt in one week avoiding it being sent to landfill.

TRANSPORT EFFICIENCY

Transporting goods is essential to enable the construction of the UK's infrastructure and in turn offers uncomplicated opportunities to reduce carbon emissions. Tarmac actively manages its transportation, selecting the most suitable location for supply to avoid unnecessary trafficking and then selecting the most suitable method, either road, rail or water. Tarmac moves over 9 millions tonnes of materials by rail making a significant contribution to reducing emissions from transport. When replacing vehicles Tarmac specifies the cleanest and most viable and has a minimum specification of Euro VI vehicles for HGV replacement.

IN USE



The operational phase of an asset is a substantial contributor of carbon emissions over the life of an asset and improvements here can have a significant positive impact.

The fabric of an asset is not traditionally considered as a source for reductions in operational impacts. However, intelligent design that recognises the inherent characteristics and properties of the fabric can deliver opportunities over an assets life and at end of life to deliver improvements.

DURABILITY

Long life and minimal maintenance are effective tools to reduce operational carbon emissions. Concrete's long life means that is more likely that a concrete structure will come to the end of its life because no further use can be found for it, rather than a case of the concrete having failed due to age. In these cases, demolition is not always the automatic course. Structures can often be stripped back to their concrete core, then rebuilt to new, contemporary specifications, such as Park Royal in Sheffield ^[8].

FLEXIBILITY

Undertaking intelligent design with durable, long lasting materials and products offers flexibility in design and the ability to repurpose existing solutions. In the design and construction of infrastructure assets the use of high performing materials such as concrete to form a chassis for an asset allows internal and external spaces to be adapted as demands and requirements change.

ENERGY DEMAND

Energy consumption of buildings that support infrastructure assets during operation are a contributor to carbon

emissions. There are many ways in which these carbon emissions can be reduced, one such way is through the utilisation of the building fabric. Passive solar design makes use of a buildings thermal mass to reduce its energy demand for heating and cooling.

REPURPOSE, REUSE AND RECYCLE

During the early stages of projects, end of life scenarios for an asset need to be considered to ensure that the best value can be gained from products and materials, and to avoid unwanted waste at end of life. Tarmac's products combined with the expertise within the business enables assets to be designed to be repurposed as they are, deconstructed to be reused as construction elements or to create new products. One example is the recycling of asphalt planings to form new road surfaces.

RECARBONATION

Studies show that 5-20% of the CO₂ emitted during the cement manufacturing process is taken up during the service life cycle of

concrete, and an additional 5-10% can be taken up during the secondary or recycled lifetime. This means that up to 25% of the originally emitted CO₂ can be re-absorbed ^[7]. This benefit is often overlooked but is a critical consideration in understanding whole life carbon performance

POLLUTION PREVENTION

Infrastructure can typically result in increasing impermeable surfaces requiring the provision of extensive drainage networks, pollution interceptors or increasing the demand on pollution prevention downstream of infrastructure assets. Tarmac offers Sustainable Drainage Systems (SuDS) that can be implemented to reduce impermeable surfaces and deal with pollution issues in situ. One example is ULTISuDS, which intercept, filter, trap and treat contaminants reducing the risk of downstream pollution, whilst maintaining existing run off rates..

IN SUPPORT

To achieve the best possible project outcomes Tarmac can offer a wide range of support, enabling the realisation of opportunities set out in this guide to reduce carbon emissions.



The services and tools provided by Tarmac are built upon expertise and experience, helping people to design and build more sustainably whether it is certification and labelling or the provision of guidance and training for customers.

PRODUCT DESIGN

Tarmac's position as the leading supplier of construction material solutions has resulted in a wealth of expertise and experience being retained within the business. When engaged early on projects Tarmac's experts are able to leverage their expertise to refine existing solutions or propose lower carbon alternatives. In doing so they can enhance performance and help to deliver reductions in carbon emissions.

CARBON FOOTPRINTING

Tarmac is the only company in the sector to be able to provide plant, material and location specific footprinting for every product produced. This enables a full

understanding of the manufacturing and delivery emissions associated with a product which can be used in conjunction with a whole life approach to encourage the identification and selection of lower carbon alternatives.

ENVIRONMENTAL PRODUCT DECLARATIONS (EPD)

Continuing the approach set by carbon footprinting, Environmental Product Declarations (EPD) extend measurement to a broader number of impacts over a product's entire life. This provides a greater understanding of how products can be used to deliver a low carbon built environment with Tarmac providing verified



EPD for a range of products and a verified tool which can generate EPD for any product from any location.

BUILDING INFORMATION MODELLING

Utilising the digitisation of the construction industry has enabled us to develop bespoke systems to aid the capture of data and ongoing management of infrastructure assets. Our Asset Information Management Solution (AIMS) can collect data in real time about the laying of asphalt providing a wealth of information. This information can be analysed to understand performance in placement, over time to optimise maintenance and long term performance,

but also allowing us to understand the quantity and quality of materials available for reuse.

ELECTRONIC POINT OF DELIVERY (ePOD)

ePOD is an innovative new ticketing system utilising mobile devices and digital ticketing. It provides us with a new way to share our proof of delivery documents whilst increasing levels of service and interaction throughout the dispatching and delivery process. By doing this we remove the need for paper tickets, and all the associated stationary, fuel and storage costs and reducing journeys, driver downtime and time wasted on site.

DELIVERING LOW CARBON INFRASTRUCTURE

The products, solutions and services that have been identified throughout this guide can be applied to almost any infrastructure asset or project to deliver reductions in carbon.

To deliver the greatest value and most significant improvements collaboration and early engagement is fundamental as decisions taken during these stages provide opportunities for improvements to be implemented. Through collaboration Tarmac can engage the expertise and experience which is embedded across its business driven by innovation and past projects. Leveraging this expertise and experience enables products, solutions and services to be adapted and tailored

to drive down carbon emissions across the whole life of a product or asset delivering a low carbon built environment.

Products and solutions should be selected to suit the application and not because it is the approach that has always been used, as this can lead to over specification of performance, unnecessary manufacturing emissions and missed opportunities.

Tarmac's solutions influence a wide range of project aspects from construction methods

used on site, changes in performance characteristics to reduce material demand or improvements in durability reducing maintenance, repair and replacement interventions. These opportunities extend across the entire life cycle with the ability to support designing for deconstruction, repurposing or recycling of products into new products and solutions.

To find out more about the solutions and services that have been identified contact your local Tarmac representative or contact the Tarmac Sustainability Team
SUSTAINABILITY@TARMAC.COM

TIPS FOR INTEGRATING LOW CARBON SOLUTIONS

Design considering whole life

Engage early with your supply chain

Choose products that have been responsibly sourced

Enable specifications to use recycled or secondary materials

Enable specifications to use admixtures and additions

Require the provision of carbon footprints to determine carbon emissions

Encourage EPD use to focus on whole life

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