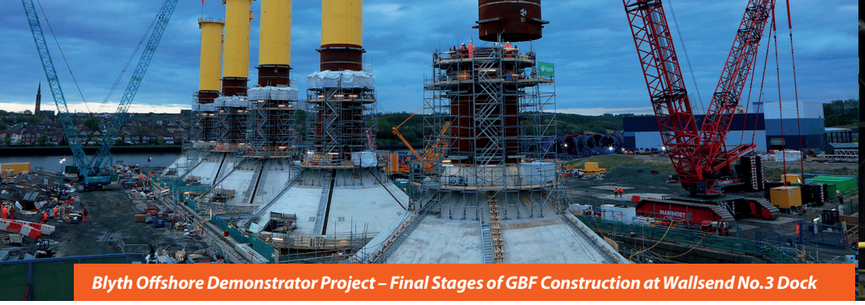
Floating offshore wind:

unlocking the opportunity with UK concrete, cement and aggregates

mpa UK Concrete



Blyth Offshore Demonstrator Project – Final Stages of GBF Construction at Wallsend No.3 Dock

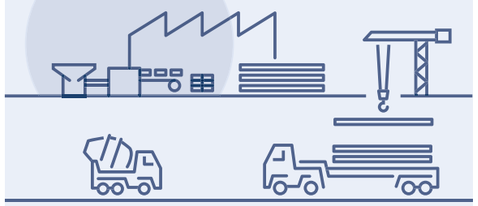
UK mineral products are essential for the clean energy transition

Concrete, cement and aggregates are part of a vitally important foundational industry that powers UK growth. Employing 89,000 people across all four nations and supporting over £18 billion of turnover each year, the mineral products sector is an engine for regional growth, social mobility and supplying the raw materials and manufactured products needed to provide the foundation for the renewable energy transition.

Mineral products industry employs over

89,000

people and supports a further
3.2 million jobs across the UK



Industry generates over

£18 billion

of turnover each year

Over

500

quarries providing an abundant and **low carbon supply across the UK**

10 UK cement plants

to meet **UK construction needs**

Foreword

The Chancellor of the Exchequer has said ***'where things are made, and who makes them, matters'.***

This is critical to the emerging floating offshore wind sector, which provides the UK with a once-in-a-generation industrial opportunity to build on thriving domestic supply chains that can retain manufacturing and its economic and social value on our shores.

There is great scope to develop a new generation of concrete-based floating substructures which can help the UK offshore wind industry to deliver portside manufacturing.

With floating substructures one of the highest value components of wind farms, there is a need to industrialise the production of floating offshore wind substructures to deliver cost certainty.

The UK is blessed with the geological resources to supply homegrown concrete, cement and aggregates. Underpinning this is a mineral products industry with the industrial capability, skills and technical innovation to support the manufacturing of concrete substructures at scale.

Our industry has a rich history of supporting major infrastructure projects and stands ready to deliver as a collaborative partner to develop designs which can cut costs, lower carbon and help sustain long-term manufacturing in the UK.

Prepared on behalf of UK concrete, cement and aggregates producers, this paper serves as a practical guide for developers, supply chain partners, policy makers and government. It sets out the benefits of these homegrown materials, the opportunity that concrete bases provide, our decarbonisation progress and the economic and social value that can be unlocked through partnership.

The UK is well placed to excel in floating offshore wind technology. It can seize this opportunity with homegrown materials to support British manufacturing, retain jobs and deliver economic and social value across the UK.

Chris Leese, Executive Chair
MPA Executive Management Committee

The floating offshore wind opportunity

As the UK looks to maximise floating offshore wind technology in deeper waters, its domestic mineral products industry is well placed to supply the concrete, cement and aggregates needed for a new generation of concrete-based floating substructures.

Wind developers and supply chains can benefit from a sophisticated and experienced domestic mineral products sector with a proven industrial ecosystem to support major project delivery and meet the exacting needs of offshore wind.

Working in partnership with the offshore wind sector, our mission is to help the UK unlock its homegrown advantage by delivering security of supply and lower carbon options, as well as cost surety, to derisk projects using concrete.

The industry is committed to collaborating as early as possible with the offshore wind sector to help it unlock the opportunity for floating substructure technology.

By doing this we can create sustainable sourcing strategies underpinned by technical excellence, collaborative innovation, reliable logistics and a focus on driving social value across the UK.

Our sector at a glance

Concrete:

Over 90 million tonnes of concrete is consumed in a typical year in the UK and the material remains essential to our way of life.

Concrete is a locally sourced material. Around 95 per cent of concrete consumed in the UK is produced domestically, using locally and responsibly sourced materials. With more than 700 ready-mix concrete plants, it benefits from a well-established national supply chain that supports jobs and strengthens communities from Stornoway to Penzance.

Cement:

Portland cement was invented in the UK 200 years ago and remains a vital ingredient in concrete. Around 40 per cent of the UK's cement is produced in the Peak District, with manufacturing plants also located in the Midlands, the north of England, Scotland, Wales and Northern Ireland. Cement production is often embedded in rural communities, providing high value employment and skills development for local people. Domestic production of cement secures supply, shields against global market volatility and ensures the UK controls the decarbonisation of its materials.

Aggregates:

Over 500 quarries across the UK produce crushed rock, sand and gravel used in the manufacture of concrete, reducing the need to transport materials long distances. Aggregates represent the largest material flow in the economy and comprise the biggest proportion of the volume of concrete. The sector supports highly productive local employment, often in rural areas where high paid, permanent opportunities are more limited.

Responsible sourcing:

UK concrete, cement and aggregates are responsibly sourced in line with the BES 6001 certification which demonstrates a commitment to managing environmental, economic, and social factors from raw material extraction in quarries through to manufacturing and processing.

Concrete produced in the UK is responsibly sourced, with more than 90 per cent certified as 'very good' or 'excellent' in accordance with the BES 6001 framework.

THE UK MINERAL PRODUCTS SECTOR HAS THE INDUSTRIAL ECOSYSTEM TO SUPPORT MANUFACTURED FLOATING OFFSHORE WIND BASES

World class major infrastructure delivery

From HS2 to renewable energy, the mineral products industry is experienced at first class infrastructure project delivery.

The Government's Floating Offshore Wind Taskforce has a target to develop UK manufacturing capability to produce at least 50 units of floating foundations by 2030.[1]

More than 25 GW of offshore floating wind farms are planned for UK waters, which is over twice the current installed capacity of wind farms off the coast of the UK. It is anticipated that at least half of the planned floating wind farms will be installed through the 2030s.

The UK mineral products sector is well placed to meet this demand, which could represent an approximate 4 per cent uplift in volume of concrete supplied. As with any significant UK infrastructure pipeline, it requires clear visibility of the timing and location of the material needs to ensure the supply chain and productive capacity to deliver. Early engagement can ensure that the necessary strategic planning is in place to shape sustainable and technical sourcing solutions for wind.

The UK has the skills and technology required to produce concrete bases, with a wealth of contractors that are experienced in delivering large concrete infrastructure projects. Portside manufacturing of concrete foundations will be key to unlocking this opportunity. The mineral products industry can play an active role, collaborating with partners with the necessary capacity, experience, proven designs and financial strength.

HS2 – delivering concrete at scale

Infrastructure projects such as HS2 have undertaken concrete pours of a similar scale to the likely requirements for concrete floating substructures. Over 2.5 million m³ of high specification, lower carbon concrete has been successfully delivered over the past five years.

Construction of Old Oak Common Station for HS2

1. UK Floating Offshore Wind (FLOW) Task Force (2025) *Floating Wind: Anchoring the next generation offshore*

Sustainable logistics

The mineral products industry is underpinned by a leading UK-wide multi-modal logistics offer to support low carbon delivery and project cost efficiencies.

By using road, rail and sea freight to move materials, the sector can develop a bespoke, sustainable logistics offer to support portside manufacturing.

Established rail (assuming suitable infrastructure exists) and sea (either aggregate dredgers or bulk carriers) transport modes provide economies of scale for the efficient and sustainable delivery of domestically produced construction materials.

Unlocking the concrete opportunity for floating offshore wind

The UK has a significant opportunity to industrialise the repeatable production of concrete-based floating substructures which provide strength and durability in the marine environment, whilst being fully recyclable at end of life.

Concrete in the marine environment

Concrete has an established and successful track record for the construction of coastal and offshore structures in the UK, including extensive flood defences and port development as well as fully submerged uses.

It exhibits excellent durability credentials with little maintenance requirements by comparison to other materials.

Concrete was the primary material used to successfully create the Mulberry Harbours, the floating artificial harbours used in the D-Day landings during World War II. Sections of these harbours still remain today.

Gravity base construction dates back as far back as 1950 when an oil platform in the Gulf of Mexico was developed using concrete. Since then, many smaller concrete structures have been built. The Ekofisk Tank is seen as a significant milestone. Completed in 1973, its inception has led to over 40 gravity base concrete structures being sited within the North Sea.

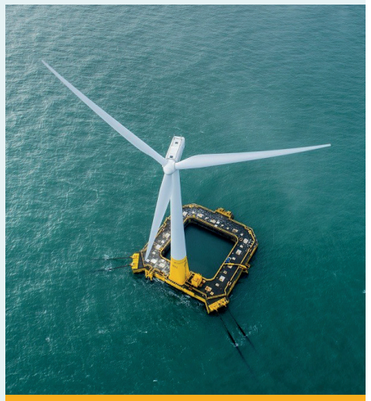
Saitec Offshore Technologies assembly: Port of Bilbao, Spain

BW Ideol, ECN, Bouygues TP, Devisubox: Floatgen Ecole Centrale de Nantes (SEM-REV)

Concrete's properties

Concrete continues to evolve to meet the infrastructure needs of the 21st century. Its properties make it an attractive option for use in floating substructures, with a wide range of benefits:

- Concrete exhibits good properties against corrosion and water abrasion, especially when compared to steel with mix designs and detailing able to take into account the specific challenges of the marine environment. This eliminates the need for surface coatings and reduces maintenance requirements over the lifecycle of the structure.
- Concrete is a highly rigid material and is well suited to the kinds of hydrostatic forces experienced in UK offshore environments.
- The weight of concrete reduces the need for ballast in the structure.
- Fatigue of reinforced concrete in the offshore environment is well understood, which is important for structures subject to cyclic loading.
- Optimisation of the substructure's shape and size to achieve increased power outputs is possible due to concrete's manufacturing flexibility.



Floatgen, Floating wind turbine equipped with the BW Ideol patented Damping Pool® foundation, operating in France for 5 years. BW Ideol / V. Joncheray

Saitec Offshore Technologies assembly: Port of Bilbao, Spain

Portside manufacturing at scale

Smart standardisation of manufacturing will be important to help provide quality and consistency, as well as reduce project cost. With a range of potential floating substructure designs, there is a need to allow key technologies to mature and manufacturing capacity to scale up in preparation for volume production in the UK.

Concrete's unique versatility and the industry's capacity provides the opportunity for portside manufacturing of bases at scale.

The construction methodology could employ a variety or combination of concrete manufacturing techniques depending on base design. These could include slip-forming or precast production, using reusable formwork and possibly even 3D printed concrete.

The mineral products sector is ready to collaborate for wider offshore wind infrastructure development such as port expansion to help develop solutions that will provide the most efficient project delivery.

Steel reinforcement

It is common practice to reinforce concrete with steel bars to improve its structural performance in high-stress environments.

The domestic steel rebar sector already supplies the UK with millions of tonnes of product each year and is ready to scale production further to deliver for floating offshore wind and create new jobs. The industry is a circular success story, recovering and reusing significant quantities of materials within its products. The manufacture of reinforcement cages for concrete can also be highly automated, allowing for efficient and repeatable production.

Lower capital expenditure

Concrete's lower capital expenditure (CAPEX) and suitability for UK construction could provide a competitive alternative to steel designs, according to a study by consultancy OpenWater Renewables Ltd.[2]

The UK Technology Leadership Board commissioned study identified the concepts best suited to the North Sea and concluded that concrete foundations could be the best option for developers of floating offshore wind farms in the North Sea.

The work considered a fictional North Sea wind farm and key factors relevant to floating wind turbine foundations which impact end users' selections for their projects.

Critical factors included installation, CAPEX and operating expenditure, financial strength, and project track record. Technical maturity was also a key factor in assessing the concepts.

For North Sea projects, ease of installation and repair were seen as key differentiators due to the short weather windows in which critical work has to be done.

2. OpenWater Renewables (2025) *Assessment of Floating Wind Turbine Foundations for North Sea Conditions*

Our industry's decarbonisation journey

The UK concrete and cement industry has already made significant progress to decarbonise its manufacturing. Early action has seen CO_2 emissions generated by the UK sector now 63 per cent lower than 1990 levels and the industry is decarbonising much faster than the UK economy as a whole (54 per cent over the same period).[3]

UK concrete and cement currently account for around 1.5 per cent of UK CO_2 emissions, five times lower than the global average where cement accounts for around 7 per cent of emissions.

The UK industry has a clear roadmap to net zero. This will be delivered through decarbonised electricity and transport networks, fuel switching, greater use of low carbon cements and concretes as well as carbon capture, usage and storage (CCUS) technology for cement manufacture.

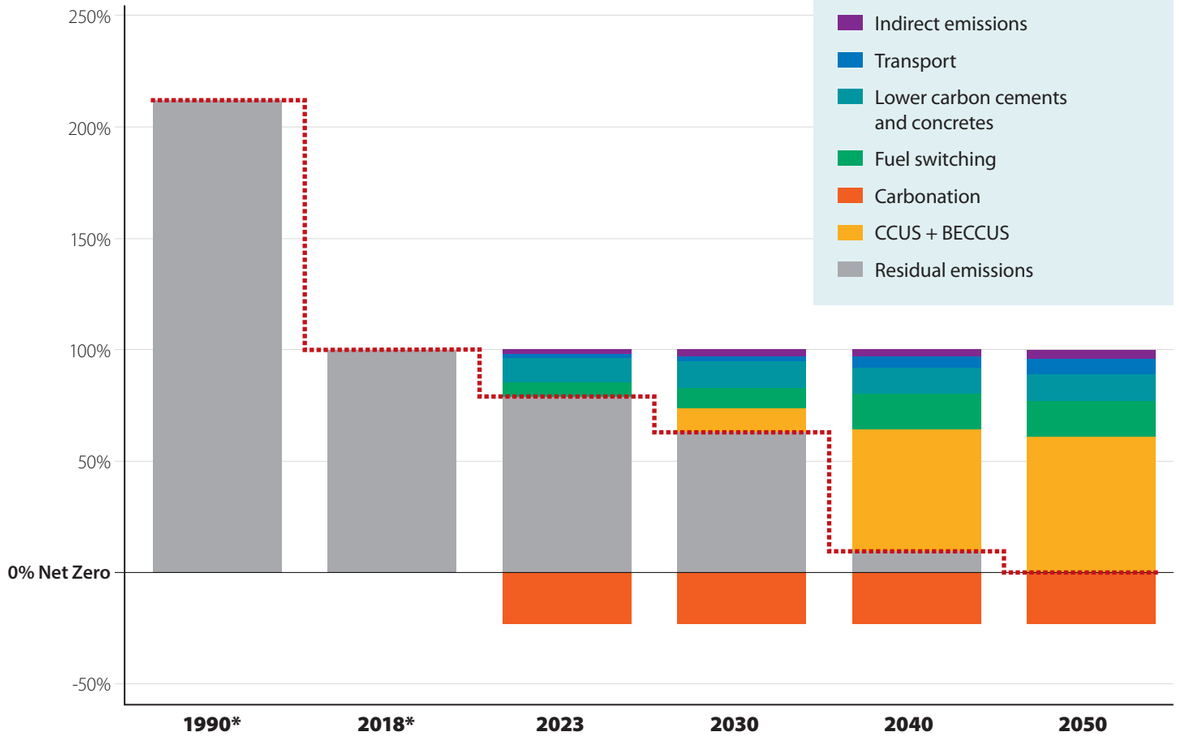
The importance of CCUS

The Climate Change Committee, the independent adviser to UK government, has stated that for industrial sectors such as cement with process emissions for which alternatives are unavailable, CCUS technology is key to delivering net zero.

Construction is progressing for the UK cement industry's first carbon capture facility at the Padeswood cement works in north Wales. The project will capture up to 800,000 tonnes of CO_2 a year starting in 2029 and be an integral part of the HyNet industrial cluster.

In addition, the Peak Cluster is an innovative collaboration to capture, transport and permanently store CO_2 emissions from five cement and lime plants across Derbyshire and Staffordshire.

Decarbonisation trajectory to 2050



** Carbonation occurred in 1990 and 2018 but had not been accurately measured and therefore is not shown in the diagram*

3. MPA UK Concrete (2025) *UK Concrete and Cement Industry Roadmap to Beyond Net Zero: Progress report 2025*

Concrete is the low carbon solution

Recent studies have stated that floating concrete structures offer a lower carbon option than equivalent steel structures, with reduced transport emissions being a major factor.

Concrete is the optimum choice for locally manufactured offshore wind bases, with over 90 per cent of the materials used to produce UK concrete sourced in the UK compared to only 32 per cent for steel.

A lifecycle analysis produced for the Government's Offshore Renewable Energy Catapult[4] research programme stated that a concrete semi-submersible substructure produced only 34 per cent of the emissions associated with an equivalent steel structure. It demonstrated that concrete remained the lower carbon option even when transportation was excluded, and the virgin steel was replaced with recycled steel.

This research aligns with the findings of the Norwegian study by consultant DNV[5], which included a comparison between steel and concrete bases for floating offshore wind projects. The study compared steel bases built in Asia and shipped to Europe against concrete bases built in Norway. The study concluded that the concrete bases had a lower CAPEX (by around 40 per cent) and that the concrete substructures were between 2.5 and 5 times less carbon intensive than steel, depending on the design and the end-of-life strategy.

Using new concrete standards to decarbonise concrete mixes

The concrete standard BS 8500 for the UK was updated in 2023 to allow for the use of more lower carbon and multi-component cements.

The standard provides the opportunity to blend finely ground limestone from UK quarries with other low carbon materials such as fly ash, a by-product from power generation and ground granulated blast furnace slag (GGBS), a by-product from the steel industry.

Using these supplementary materials reduces the amount of Portland cement (CEM I), helping to create a lower carbon concrete.

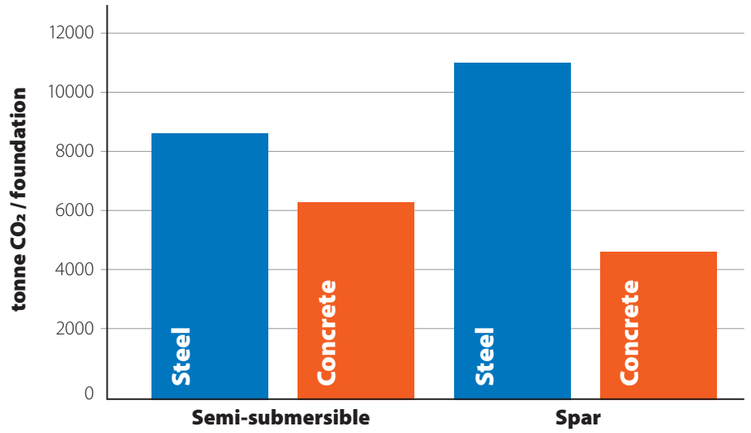
Circularity

Concrete structures are durable and have low maintenance requirements, offering the potential to be kept in service for very long periods of time.

Concrete is 100 per cent recyclable. When eventually decommissioned, floating concrete substructures could be broken down into their constituent materials, which could be used either in new concrete or elsewhere within the construction sector. This provides wind developers with a useful resource at the end of field life and is contributing to the circular economy.

As outlined in the latest UK Concrete Sustainability Data Report, concrete in the UK contributes very little waste to landfill with only 0.3kg of waste per tonne of concrete produced in 2023. According to Department for Environment, Food and Rural Affairs, 93 per cent of hard construction and demolition waste is recovered, mostly for use as recycled aggregates. The concrete industry also uses more than 250 times more waste and byproducts from other industries than the waste it sends to landfill.

Embodied carbon lifecycle analysis of steel and concrete floating offshore wind foundations



Based on Figures 4-10 and 4-11 in the DNV Comparative study of concrete and steel substructures for FOWT (2022)

4. DNV (2022) *Comparative study of concrete and steel substructures for FOWT*

5. Offshore Renewable Energy Catapult (2023) *PN000463 – Cornwall Flow Accelerator.*

Helping developers maximise UK materials to unlock the Clean Industry Bonus

Concrete producers, cement makers and aggregates providers can help the offshore wind sector maximise local, homegrown materials to deliver jobs and Clean Industry Bonus (CIB) opportunities for communities.

The abundance of local materials and an established ecosystem mean concrete is perfectly placed to help deliver the 60 per cent local content required by the Contract for Difference.

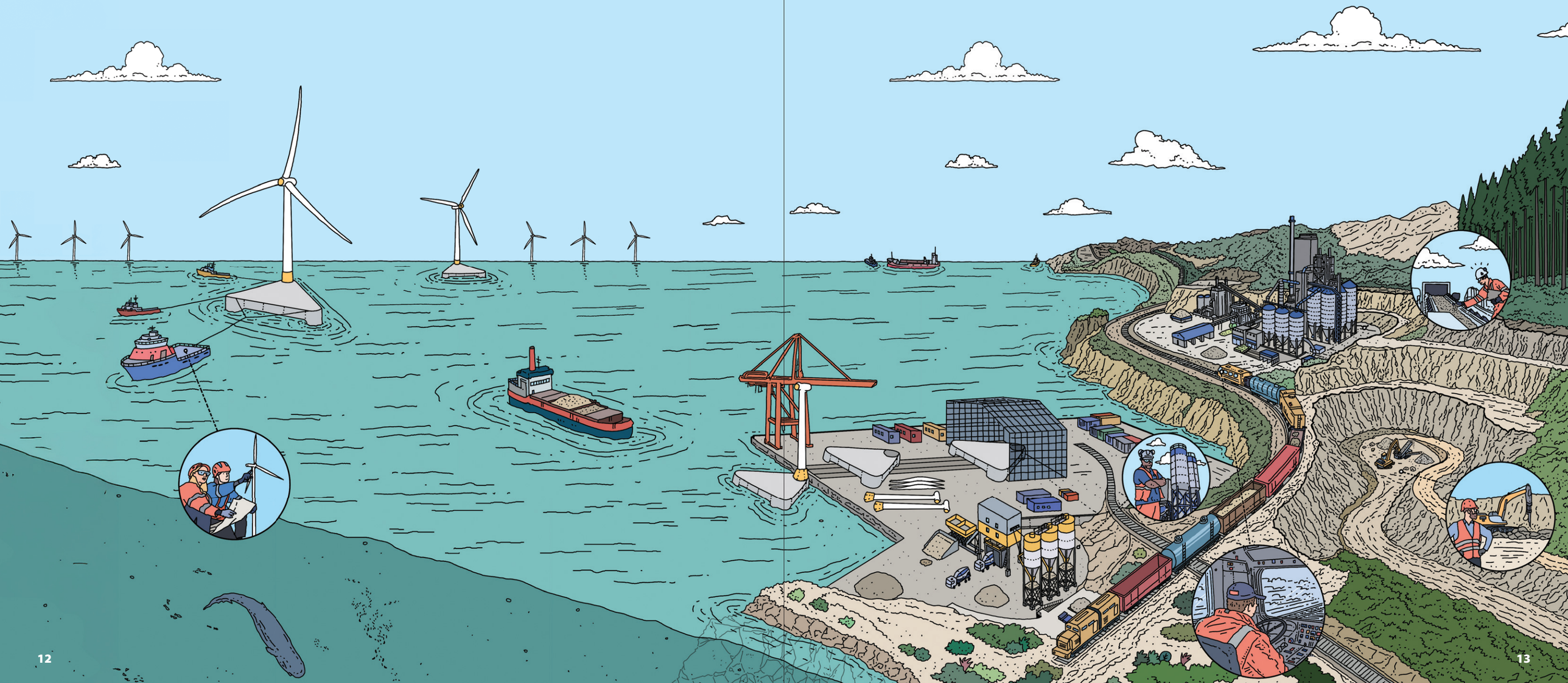
This can provide an important boost for UK manufacturing, construction and the mineral products sector.

It can ensure that the CIB is positioned at the heart of driving a new industrial chapter which retains economic value and job creation in the UK.

Using UK-produced concrete, cement and aggregates provides an opportunity to create manufacturing jobs and generate social value in coastal communities as well as in the quarries and cement plants across the UK.

Gross Value Added (GVA) Benefits

The Celtic Sea Blueprint report commissioned by The Crown Estate, carried out a Gross Value Added (GVA) analysis, comparing two steel reference projects and one concrete reference project. The analysis indicated that there is a 'greater GVA benefit and jobs from utilisation of concrete vs steel platforms'.



Industry and government collaboration

Government has made it clear that ***where things are made, matters.*** This must apply as much to the offshore wind supply chain as it does for other UK critical infrastructure.

UK-produced cement and concrete is essential for supporting the UK's growth ambitions. Without domestic manufacturing, floating offshore wind farm construction will be outsourced beyond UK shores.

This would offshore investment and economic opportunity and see the industry reliant on imports at a time of geopolitical volatility.

Relying on imported products increases the risk of supply chain disruption and price fluctuations, offshores the economic benefit of growth, increases the environmental impact due to additional transport and provides no guarantee that the products are responsibly sourced.

The domestic concrete sector is well placed to meet the demands of floating offshore wind with low carbon materials for portside manufacturing at scale.

To support domestic delivery, the sector will need clear visibility of the timing and location of the material needs and a procurement policy that puts a preference on UK-made materials to keep the benefit of growth in the UK; boosting the economy, creating and retaining well-paid regional jobs.

Key enablers

Using procurement to prioritise UK materials

Government, with its shareholding within Great British Energy, is well positioned to use its procurement powers to drive adoption of new lower carbon British produced cement and concrete products for floating offshore wind.

For the offshore wind industry, there is an opportunity to benefit from a UK concrete and cement industry, which has cut emissions by 63 per cent lower compared to 1990 levels.

Industry collaboration to ensure sustainable production

The floating substructure that supports the offshore wind turbine is one of the highest value components of the wind farm, second only to the turbine itself. Cross sector collaboration will be key to develop proven floating substructures that can be manufactured and constructed from UK facilities and which will open up opportunities for the domestic supply chain. The mineral products sector is ready to be a collaborative partner, supporting the offshore wind industry to ultimately develop designs which can cut costs, carbon and help sustain long-term manufacturing in the UK.

Supportive mineral planning

The UK is blessed with the geological resources to provide a robust and steady supply of aggregates for the floating offshore wind market.

To support this, the mineral planning system will need to adopt a more strategic approach to managing and monitoring permitted mineral reserves - to ensure the right minerals can be provided in the right place and at the right time.

Floatgen, Floating wind turbine equipped with the BW Ideol patented Damping Pool® foundation, operating in France for 5 years. BW Ideol / V. Joncheray

About UK Concrete

UK Concrete is part of the Mineral Products Association, the trade association for the aggregates, asphalt, cement, concrete, dimension stone, lime, mortar and industrial sand industries. We are actively working with our members and the offshore wind industry to help unlock the economic, environmental and social value opportunities created by the next generation of floating offshore wind in UK waters.

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essential materials
sustainable solutions

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