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Aggregates demand and supply in Great Britain:

Scenarios for 2035

Extracting Minerals . . . Manufacturing Products . . . Supplying Markets

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Executive summary

If you cannot grow it, you have to dig it.

Aggregates are essential to our economy and quality of life. They are the main constituent of the foundation and fabric of our built environment, onshore, offshore above ground, on the ground and below our feet.

They are the backbone of our world. They are critical for our homes, roads, railways, schools, hospitals, and other types of infrastructure. An end-product in their own right, aggregates are also a raw material used in the manufacture of other vital construction products, such as ready-mixed concrete and concrete products, asphalt, lime and mortar. They are key enablers to improved energy infrastructure and climate change mitigation and adaptation. Aggregates are also used in a variety of non-construction-related processes, including the production of fertiliser, toothpaste and glass.

Around 250 million tonnes of aggregates are used each year in Great Britain, and a further 20 million tonnes in Northern Ireland. Just under a third of total aggregates demand, 28% in 2021, is supplied from recycled and secondary sources, the remainder requiring the extraction of primary aggregates. Around 90% of all aggregates are used by the construction industry. Aggregates are the largest material flow in the economy and construction's largest supply.

Considering our future needs, there are four inescapable realities.

1. **Future supply cannot be assumed. It needs to be planned, monitored and managed.**
2. **A more strategic approach will be required to ensure a steady and adequate supply is enabled, whether nationally, regionally or locally.**
3. **Primary aggregates will continue to supply over two-thirds of overall demand.**
4. **Land-won primary aggregate resources, whilst abundant, will need to be unlocked to ensure demand can be met, as imports, recycled and secondaries cannot fill the gap.**

This report produced by the Mineral Products Association (MPA) presents two projections of future demand to 2035, factoring in different levels of aggregates intensity of construction. It then proposes four sets of supply scenarios to meet this demand, depicting differing strategies to address the issue of currently depleting land-won rock and sand & gravel permitted reserves.

These scenarios highlight the pressure that may come to bear on some sources of aggregate if others are restricted and need substitution, to the point where the economy will face problems securing steady and adequate supplies of essential minerals.

This report builds on available analytical and qualitative information to provide greater visibility for the industry and the mineral planning system to plan for the future demand and supply needs. In all scenarios considered, this report shows that:

- Increasing tonnage of aggregates will be needed to supply our construction needs. Demand projections for Great Britain suggest that, by 2035, some 323 million tonnes of aggregates will need to be supplied each year.
- Assumed efficiency improvements and reductions in the aggregates intensity of construction would reduce this requirement, with demand projected to plateau at 277 million tonnes per annum from 2027.
- Cumulatively, this means that between 3.8 and 4.1 billion tonnes of aggregates will be required between 2022 and 2035. This compares to a total of 3.2 billion tonnes of aggregates supplied in the previous 14-year period, between 2008 and 2021.
- Recycled and secondary sources of aggregates will continue to provide a valuable source of supply but cannot possibly fulfil all the demands created by construction activity; significant tonnages of primary extraction will still constitute the majority of supply and be necessary to meet overall demand. Primary aggregates are projected to supply between 68% and 72% of total demand by 2035.
- While there appear to be sufficient indigenous resources of primary aggregates available, there are issues around the supply mix that will need to be addressed. The ongoing decline in permitted reserves of land-won sand & gravel in particular indicates a potential need for growing supply from other sources, including crushed rock and marine sand & gravel.
- Future supply of aggregates also faces additional challenges related to transport infrastructure, the safeguarding of essential minerals infrastructure and access to skills.
- The demise of 75% of current planning permissions in 2042 casts an additional shadow across the challenges of ensuring steady and adequate supply.

Introduction

There is currently no strategic approach to assessing future demand and supply needs for aggregates to inform the mineral planning system and Managed Aggregates Supply System. As a response to this information gap, the Mineral Products Association has set out long term aggregates demand and supply projections for Great Britain to 2035. This follows the methodology of the previous report published in 2017, which projected demand until 2030.

The aim is to provide industry and key stakeholders with indications of the potential tonnages of aggregates that may be required to satisfy future demand, reflecting the UK's needs for construction including Government's policy ambition for housebuilding and infrastructure, in addition to other private sector investment.

Demand projections are based on historical trends and forecasts for the UK economy, construction activity and aggregates markets, and take account of the potential for further efficiency gains in the use of aggregates in construction.

Supply scenarios intend to lay out what would need to happen for demand to be satisfied, detailing the various challenges around the main drivers of supply. Whilst these scenarios have been produced at national (GB) level, they should also provide useful context for local planning, including in England in the preparation of Local Aggregates Assessments (LAAs) and the production of local minerals plans and mineral planning policies, in Wales in conjunction with the Regional Aggregate Working Parties (RAWPS), and in Scotland in setting up Strategic and Local Development Plans. They should be useful in assessing whether the various geographic regions are making a full contribution towards meeting national and local aggregates needs[1].

[1] Estimating future demand for aggregates at sub-national (regional or local) level is fraught with difficulties. Historical data for sub-national construction activity produced by the Office for National Statistics lost their 'national statistics' designation in 2014, whilst issues with the modelling of these estimates are being investigated and improvements developed. Looking forward, the Government's Infrastructure and Construction Pipeline is subject to significant uncertainty around the delivery of projects, including in scope, timings and overall costs. In infrastructure in particular, past records point to a patchy and lengthy delivery. Furthermore, translating the investment pipeline into construction aggregates demand is challenged by a lack of material audits associated with projects, with little to no consideration and visibility given to the volumes, geography and timings of material demand across project timelines. Taken together, this points to clear limitations in assessing the level of aggregates demand at a sub-national level.

1. Overview of the aggregates market

The main components of the aggregates markets are primary aggregates, meaning quarried crushed rock and both land-won and marine dredged sand & gravel, as well as aggregates obtained from the recycling of Construction, Demolition and Excavation Wastes (CDEW), or derived from other industrial, production or extractive processes (secondary aggregates). This can include waste materials derived from the extraction of china clay, ball clay and slate, as well as furnace ash and slag from iron and steel production (Figure 1).

Within primary aggregates, crushed rock includes sandstone, igneous rock, limestone and dolomite in respect of their use as aggregates for construction, whilst sand & gravel for construction use includes both quarried (land-won) and marine-dredged materials.

Supply data for primary aggregates is available from the British Geological Survey (1), which consolidates information about aggregate operators' sales as a measure for total supply in Great Britain. This data was originally collated as part of the Annual Minerals Raised Inquiry surveys (2) until 2014, when funding for the survey was withdrawn. Since 2015, total supply has been estimated by the Mineral Products Association using a combination of data from the 4-yearly Aggregate Minerals Survey for England & Wales (3), data from The Crown Estate (4) for marine sand & gravel, and the results from its own industry survey of producer members' sales (5).

Figure 1 - Components of aggregates supply

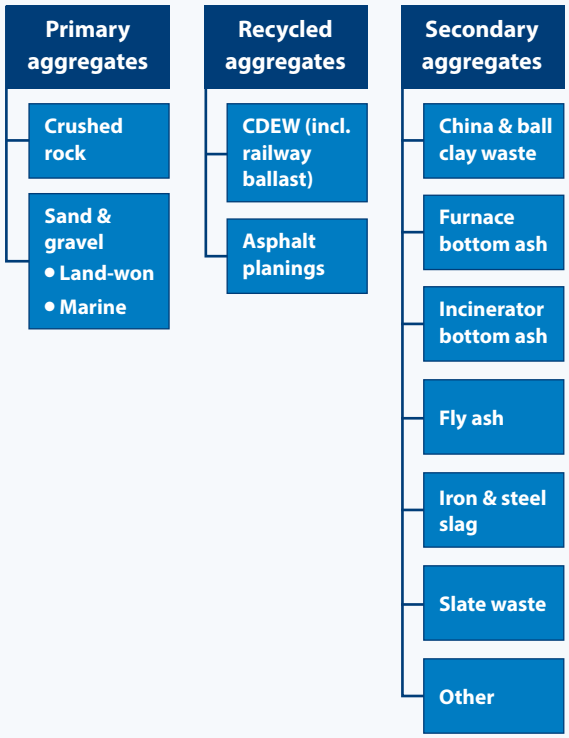
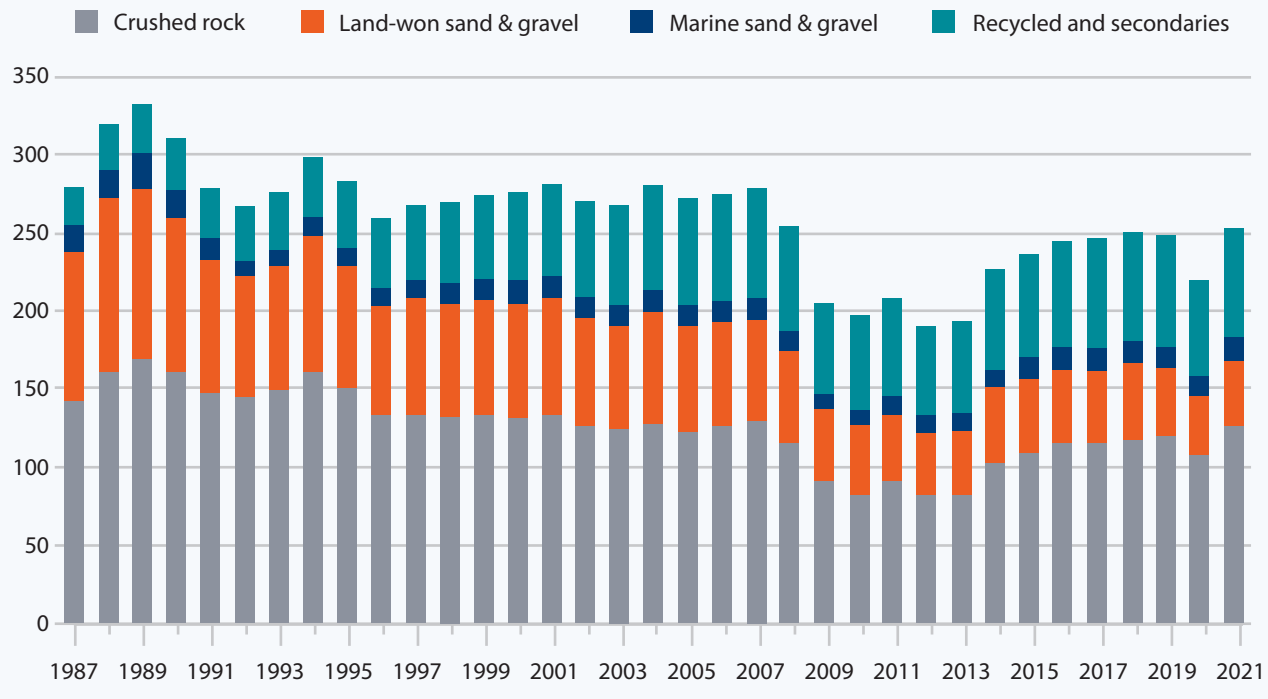
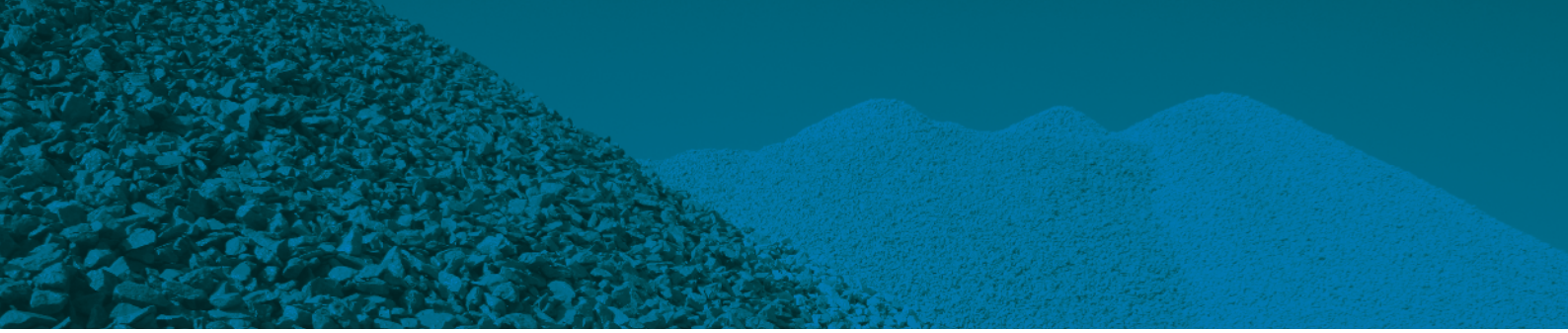


Figure 2 - Aggregates supply by source in Great Britain, 1987-2021 (million tonnes)



Source: British Geological Survey, The Crown Estate, Mineral Products Association.



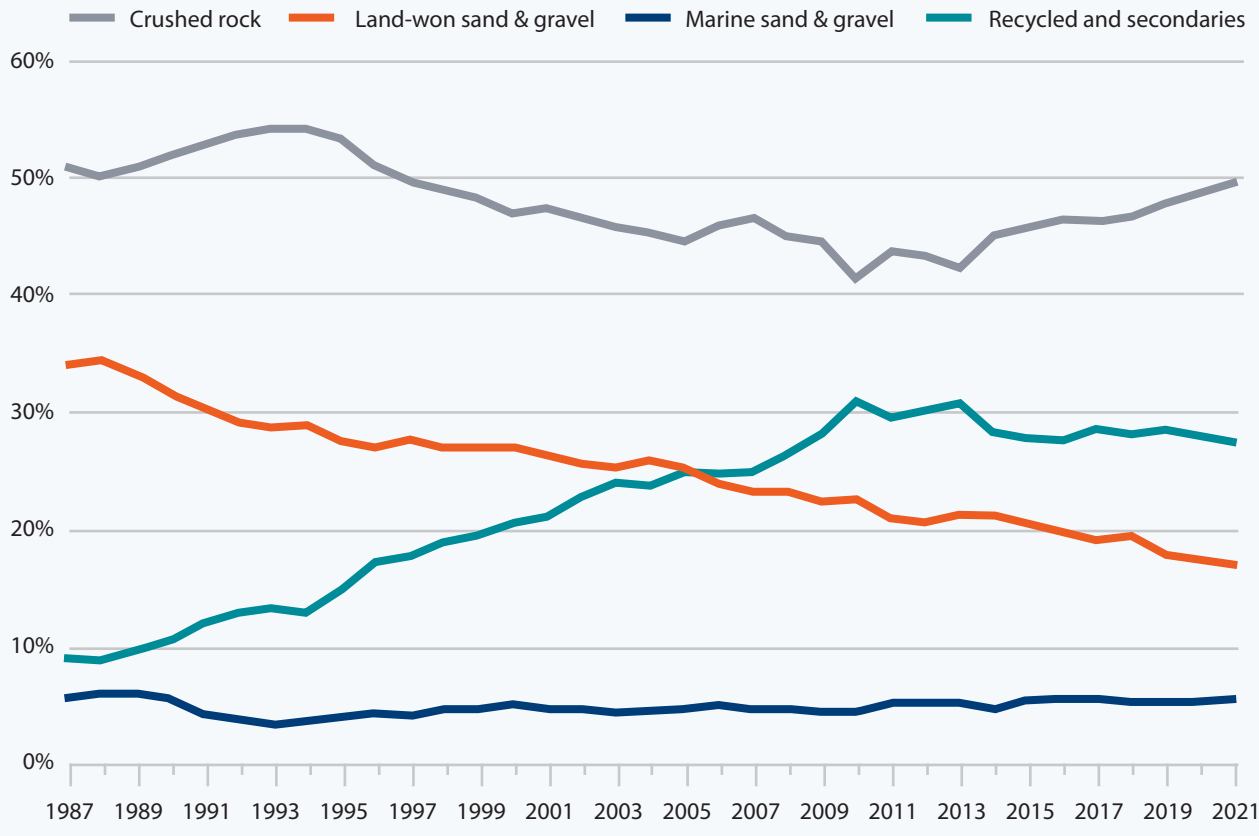
In 2021, total primary aggregates supply in Great Britain reached 183.3 million tonnes, including 125.9 million tonnes of crushed rock and 57.5 million tonnes of sand & gravel (Figure 2). Within sand & gravel, 75% came from land-won sources, whilst the remainder originated from marine-dredged licences.

The share of sand & gravel in aggregates supply has declined significantly since the late 1980s due to a reduction in land-won extracted tonnages (Figure 3). This was initially offset by significant increases in the share of recycled and secondary aggregates until 2010, whilst recent years saw a marked increase in primary crushed rock tonnages, likely to be driven in part by the ongoing substitution of sand & gravel for crushed rock and crushed rock fines in the manufacture of concrete.

Regionally, aggregates supply data shows limited variations across the English regions, Wales and Scotland (Figure 4). For crushed rock, supply shares are typically spread within a maximum of 3 percentage points around their historical mean (standard deviation ≤3%). Scotland stands out somewhat, as its share rose from 11% in 1988 to a peak of 26% in 2010, before falling back again to 20% on average since 2014. Sand & gravel supply also remained remarkably stable (standard deviation ≤1%), with the exception of a shift in the data between the East of England and the South East in 2000, which is due to a change in the regional boundaries affecting Essex, Hertfordshire and Bedfordshire.

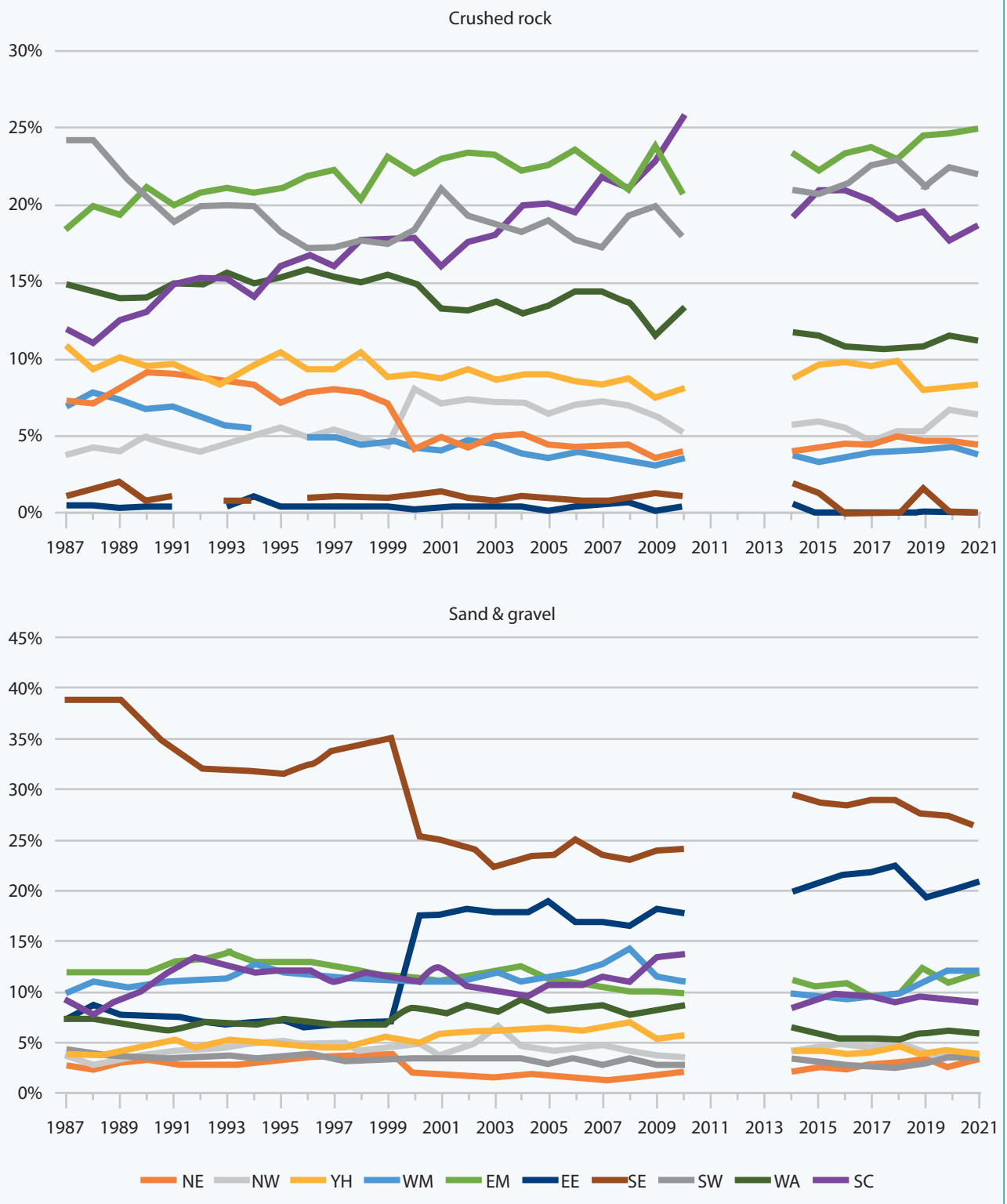
In contrast to primary aggregates, there are no official statistics available for the supply of recycled and secondary sources of aggregates. In response, the Mineral Products Association has developed a methodology to track the contribution of recycled and secondary aggregates to overall aggregates supply in Great Britain with the aim of addressing this data gap (6). It shows that recycled and secondary aggregates contribute significantly to the total aggregates supply: in 2020, total recycled and secondary sources of aggregates accounted for 28% of overall aggregates supply in Great Britain, a leading position internationally in the use of recycled and secondary aggregates. Assuming the supply of these materials followed the trend in overall construction activity since then, it would result in a total supply of 69.7 million tonnes of recycled and secondary aggregates to the aggregates market in 2021 (Figure 2 and Figure 3).

Figure 3 - Shares in total aggregates supply in Great Britain, 1987-2021



Source: British Geological Survey, The Crown Estate, Mineral Products Association.

Figure 4 - Primary aggregates supply by region in Great Britain, 1987-2021[2]



Source: British Geological Survey, The Crown Estate, Mineral Products Association.

[2] Regional data not available for 2011-13.

2. Aggregates intensity of construction

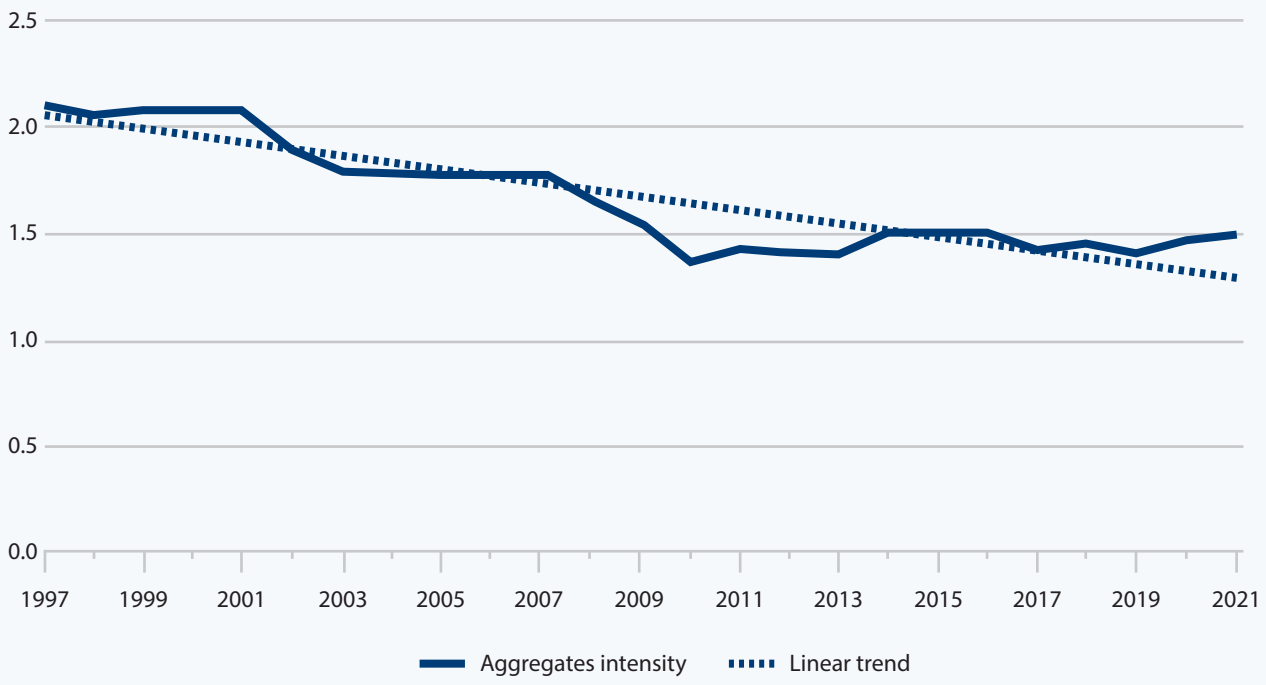
Aggregates intensity is defined as the tonnage of aggregates used per thousand pounds spent in construction in Great Britain. It is derived using aggregates sales from all primary, recycled and secondary aggregates, relative to total construction activity, including both new work and repair and maintenance, as measured by the ONS (7).

Figure 5 shows that the aggregates intensity of use in construction has declined in the past 25 years, from 2.1 tonnes of aggregates used per thousand pounds spent in construction in 1997, to just under 1.5 tonnes in 2021, a 1.4% decline per annum on average over the period. The trend also depicts a couple of step-changes in 2002-03 and again in 2008-10, which are likely to reflect efficiency gains in the manufacture of mineral products, such as concrete or asphalt.

The data suggests that the aggregates intensity may have bottomed out in 2010. A combination of factors may indeed limit further reduction in intensity, including the type of construction work taking place and the share of aggregates demand used 'unbound', for instance as fill materials, rather than feeding into the manufacture of products. End-use data available for England and Wales show that in 2019 (3), 60% of all crushed rock sales and 30% of all sand & gravel were used unbound, either as uncoated roadstone, rail ballast, fill materials or building sand. Such demand has more limited opportunities for substitution and offers less opportunity for improved efficiencies, therefore limiting the potential for greater reduction in aggregates intensity. Demand for unbound aggregates is likely to be particularly significant at times when construction work is dominated by large infrastructure projects, early in their construction timeline. Since 2020, the rapid recovery in primary aggregates demand after the initial Covid-19 lockdown was driven by a boost in demand for fill materials for projects such as HS2 and in roads construction. Demand for fill materials is likely to remain high over the next few years, given that the outlook for construction activity is dominated by a number of new major infrastructure projects, particularly in the transport and energy sectors (8).

Variations in aggregates intensity can have a significant impact on the future level of aggregates demand, as technological progress, increased material efficiency, and different compositions of construction work can lead to different tonnages of aggregates being required to produce a similar level of construction output. Specific assumptions on the future trend in aggregates intensity are therefore required in order to build scenarios for total aggregates demand to 2035.

Figure 5 - Aggregates intensity: tonnes of aggregates per thousand pounds spent in construction in Great Britain, 1997-2021



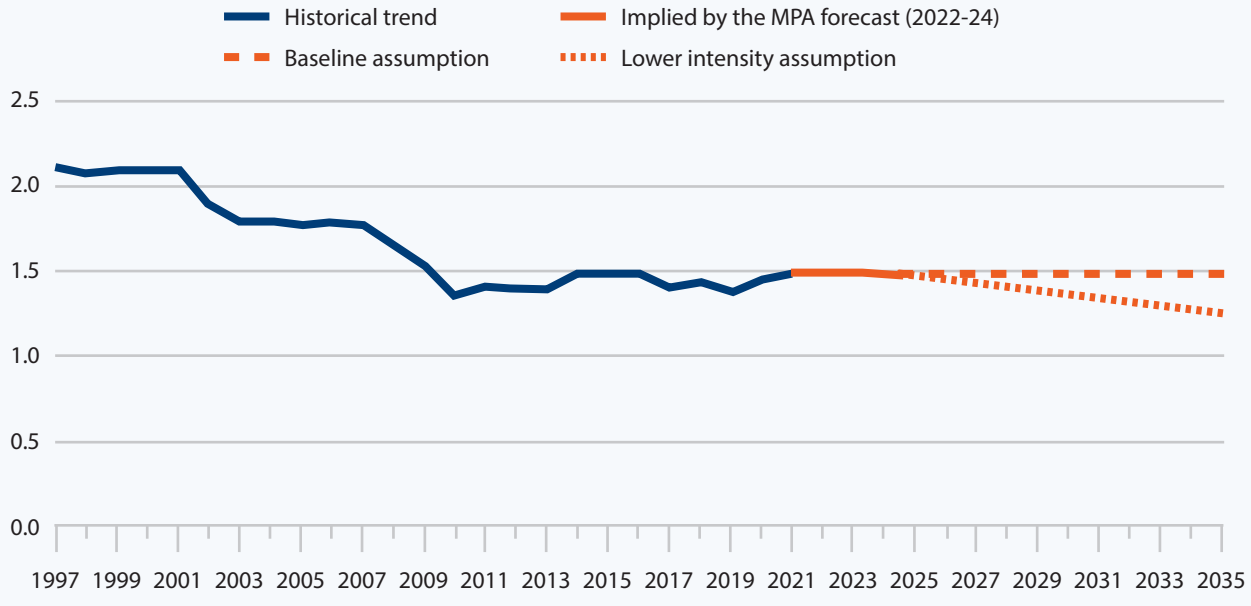
Source: British Geological Survey, The Crown Estate, Mineral Products Association, Office for National Statistics.

In this report, aggregates intensity over 2022-24 is derived from existing industry forecasts for construction activity and aggregates demand[3], as detailed in section 4. Further out, over 2025-35, two assumptions are considered and applied as follow (Figure 6):

- Under a 'baseline' assumption, future aggregates intensity continues on the path it has followed since 2014. This depicts a construction market where reductions in aggregates intensity have broadly bottomed out. The data shows a marginal decline of 0.05% on average per annum between 2014 and 2021. This would translate into aggregates intensity remaining broadly flat, just under 1.5 tonnes per thousand pounds spent in construction each year over 2025-35, although in reality some volatility from year to year is likely and should be expected.
- A counterfactual assumption of further reductions in aggregates intensity is also considered, referred to as the 'lower intensity' assumption. This reduction may be achieved through a combination of continuing improvement in resource efficiency, reducing waste, and greater substitution with other materials (steel, glass, timber). This would offset at least partially any increases in aggregates demand fuelled by the need to improve both housing supply and the infrastructure provision over the next 10-15 years. In this situation, total aggregates demand is projected on the assumption that the construction industry would deliver a 1.4% decline in aggregates intensity each year between 2025 and 2035, in line with the compound annual growth rate recorded between 1997 and 2021. It would reach just under 1.3 tonnes per thousand pounds spent in construction by 2035.

These two assumptions should not be interpreted as a forecast, however. They are simple illustrations to provide a basis on which to estimate future aggregates demand in light of the outlook for construction activity to 2035 in Great Britain (see section 4). In practice, further long-term reductions in intensity will be limited for reasons explained previously. It would also imply that the intensity of use could eventually reach zero - meaning no demand for any sort of aggregates, regardless of the level of construction output. This is clearly unrealistic at present, given that there is no likelihood of total substitution of aggregates demand (both primary and recycled) in the foreseeable future. Aggregates are ubiquitous to construction, sourced indigenously from the UK, and much of this is relatively local to markets (9). In a world that is striving to transition to Net Zero, indigenously produced aggregates also have a relatively low carbon footprint compared to other manufactured and imported products, with a greater proportion of the emissions generated coming from transport, rather than from the inherent extraction and processing. Finally, it is also worth noting that newer, low carbon concretes and low temperature asphalt currently still require similar aggregates tonnages to traditional products. As a result, whilst there may be scope for a greater use of recycled and secondary sources of aggregates as opposed to primary sources, the overall aggregates intensity looks unlikely to see any new significant step-change over the next 10-15 years.

Figure 6 - Aggregates intensity assumptions to 2035



Source: Mineral Products Association.

[3] The Mineral Products Association produces regular 3-year forecasts for aggregates demand (and other mineral products) based on the latest construction forecast from the Construction Products Association.

3. Aggregates demand projections to 2035 in Great Britain

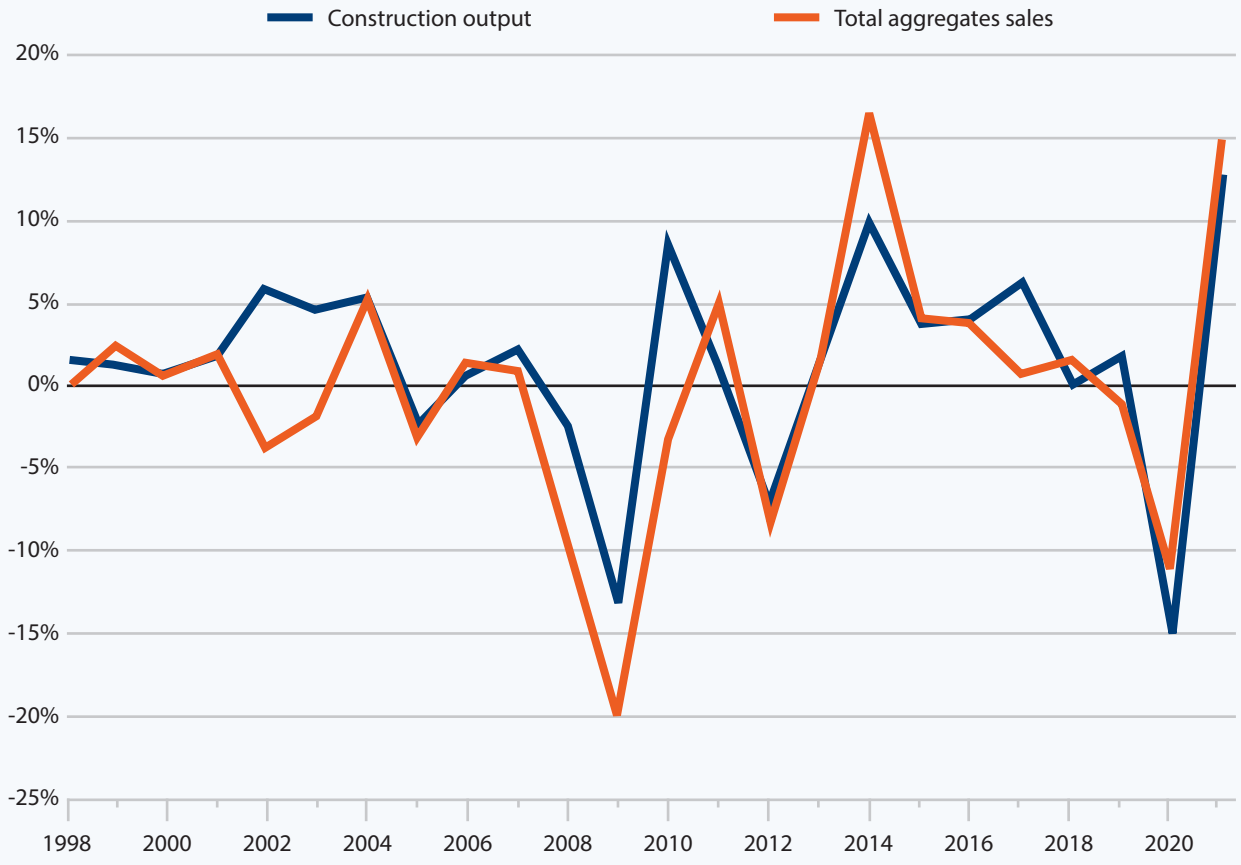
Following a 9.3% contraction in UK Gross Domestic Product (GDP) as a result of Covid-19 and the introduction of stringent public health restrictions, the vaccine rollout throughout 2021 enabled a sharp rebound in activity.

UK GDP recovered its pre-pandemic (Feb-20) level at the end of 2021 and posted a record-breaking 7.4% annual growth in 2021 compared with 2020 (10). However, a combination of supply chain bottlenecks, labour and raw material shortages and soaring energy prices have challenged many industries and slowed momentum. These challenges are expected to continue during 2022, exacerbated by the war in Ukraine, holding back growth and pushing inflation. The Bank of England expects GDP growth of 3.8% in 2022, before stagnating (-0.25%) in 2023 (11).

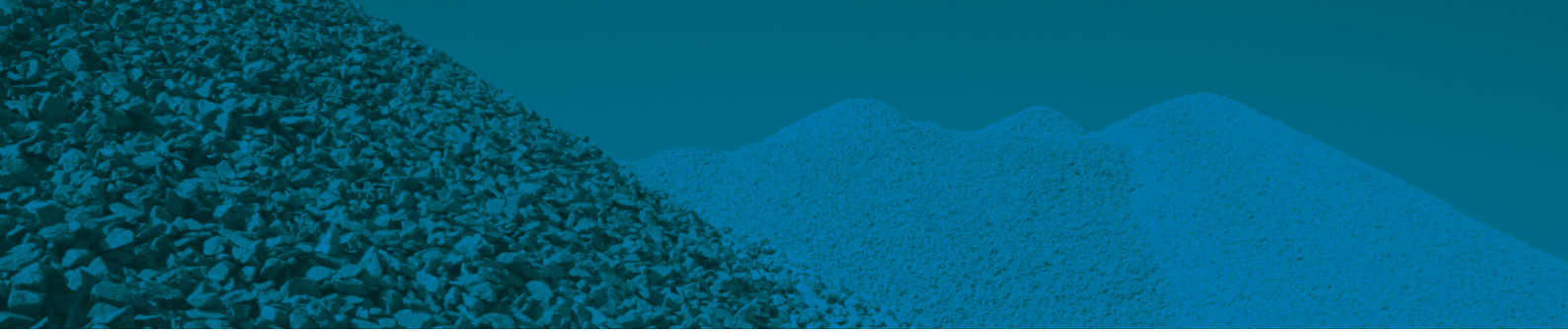
The construction supply chain has been at the forefront of bottlenecks and rising costs. Rising prices for raw materials, energy and labour started to impact projects on the ground in the second half of 2021, but total construction output nonetheless leapt back above pre-Covid-19 levels at the end of the year. Overall, total construction output rose by 12.9% in 2021 compared to 2020, driven by work in infrastructure, private housing repair & maintenance, and non-housing repair & maintenance (7).

As a result of this rapid rebound in activity, construction demand for aggregates and other mineral products also recorded double-digit growth during 2021. The tonnages of primary aggregates sales rose by 15.7% on an annual basis in 2021, 14.1% for ready-mixed concrete, 12.5% for asphalt and 24.4% for mortar (5). Within aggregates, crushed rock demand was supported, in particular by the acceleration in infrastructure work, including roads and major infrastructure projects such as High Speed 2, a high-speed railway line that is under construction between London and Wigan, via Birmingham and Manchester. This boosted the demand for fill materials and asphalt manufacture. By contrast, the recovery in ready-mixed concrete demand is being held back by a weaker recovery in new commercial tower projects and is dragging on the recovery in demand for sand & gravel, two-third of which is used in the manufacture of concrete.

Figure 7 - Change in construction output and aggregates sales in Great Britain, 1998-2021



Source: British Geological Survey, The Crown Estate, Mineral Products Association, Office for National Statistics.



Momentum in construction activity and aggregates demand continued in the first half of 2022. The Construction Products Association (8) forecasts further growth in construction output over the next 3 years, up 2.8% in 2022, 2.2% in 2023 and 2.9% in 2024 (Table 1). Infrastructure work is set be a key driver of growth in 2022 and remain high over 2023/24, underpinned by work progressing under the 5-year spending plans within the regulated sectors (in roads, rail, energy and water), and momentum building up on major projects, including Hinkley Point C, the Thames Tideway tunnel and High Speed 2. The resilience of the construction supply chain will nonetheless be severely tested by global supply-chain bottlenecks and elevated raw materials, energy and labour costs, with the uncertainty worsened by the war in Ukraine.

From 2025 until 2035, construction output is projected to grow by 1.6% on average each year, as forecast by Oxford Economics (12). For context, the compound annual growth rate for construction output during between 2014 and 2021 was also 1.6%, which effectively means that construction activity is assumed to continue on its post-Financial Crisis trend until the end of the projection period. This projection may be considered as somewhat conservative; it is possible that construction activity will increase faster than assumed given Government's plans for infrastructure investment to reach £650bn over the 10-years to 2030/31. This includes £400bn-worth of detailed planned projects, half of which is due to be invested by the end of the financial year 2024/25 (13). It is nonetheless worth noting that there is significant uncertainty over the scale and timing of delivery of this pipeline and Government's ambition, particularly given the poor record in this area in recent years. This adds to further uncertainty on the quantity and timing of the construction materials and associated products that will be needed to support their delivery. Faster growth in construction activity than assumed in these projections would ultimately provide a further boost to aggregates demand over the entire period.

Based on existing construction forecasts covering 2022-24, the Mineral Products Association expects sales volumes of aggregates and other mineral products to continue to grow over the same period: total aggregates sales tonnages are expected to grow 2.9% in 2022, 2.5% in 2023, and 2.2% in 2024 (Table 1). Whilst this outlook reflects the positive market conditions at the start of 2022, with near-term construction demand particularly robust, resilience thereafter is at risk from elevated raw materials, energy and labour costs. The war in Ukraine has so far caused major price volatility on international markets for both energy and non-energy commodities, and is likely to add greater pressure on already stretched supply chains throughout 2022. Russia and Ukraine are major exporters of metals, agricultural goods and fertilisers. In addition to energy prices, the prices of copper, steel, and aluminium have also increased. Ukraine is a major exporter of neon; supply shortages of neon could exacerbate existing bottlenecks for microchips and semiconductors from Asia. Finally, the positive outlook for aggregates demand is also conditional on the timely delivery of the infrastructure pipeline, for which delivery remains a significant source of uncertainty, particularly given Government's poor record in this area in recent years.

Figure 8 - Estimated public and private investment from 2021/22 to 2030/31 by sector

Regulated utilities

£96,945m

Social infrastructure (Public)

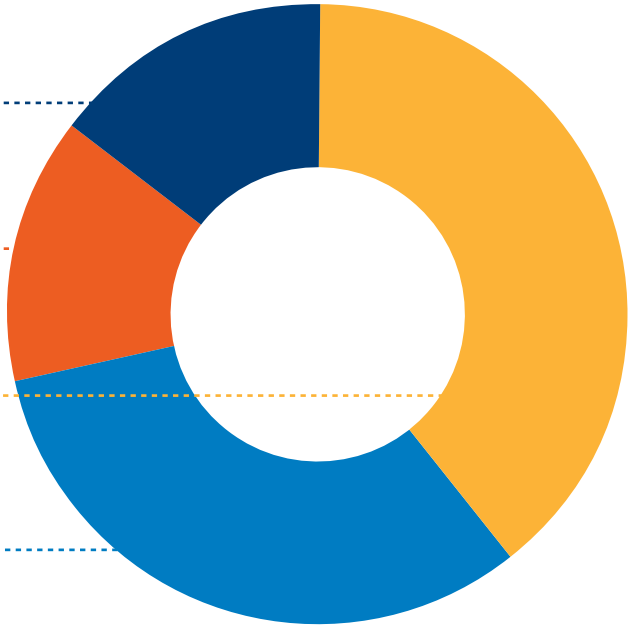
£89,241m

Economic infrastructure (Public)

£253,987m

Private investment across all sectors

£208,360m



Source: Infrastructure Project Authority.

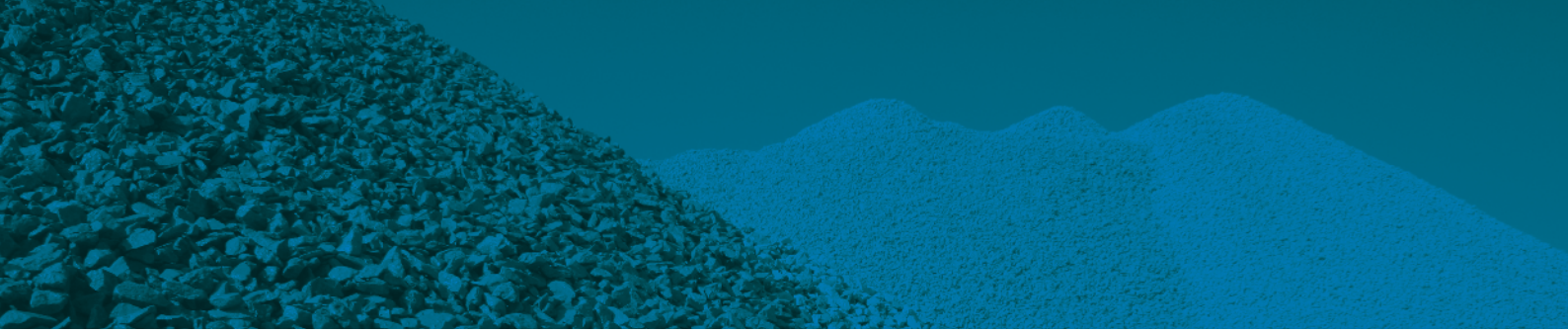


Table 1 – Construction and aggregates demand forecasts, 2022-24 (%)					
	2020	2021	2022(e)	2023(f)	2024(f)
Construction output	-14.9	12.9	2.8	2.2	2.9
Total aggregates	-11.2	14.9	2.9	2.5	2.2
Crushed rock	-9.6	16.7	3.2	2.7	1.9
Sand & Gravel	-12.4	13.3	2.6	2.5	2.2
Recycled & secondaries*	-13.0	12.9	2.8	2.2	2.9
* Assumed to follow the trend in construction activity from 2021.					
Source: Office for National Statistics, Construction Products Association, Mineral Products Association.					

Post-2024, total aggregates demand is derived from the longer-term construction outlook to 2035 and the two 'baseline' and 'lower intensity' aggregates intensity assumptions, as described in section 3. Under the baseline assumption, annual aggregates demand is projected to increase from 253 million tonnes in 2021 to 323 million tonnes by 2035, a level not seen since the late 1980s (Figure 9). This is based on construction output rising to £218bn in 2035, up from £170bn in 2021. The aggregates intensity is assumed to remain broadly flat over the period at just under 1.5 tonnes of aggregates per thousand pounds spend in construction.

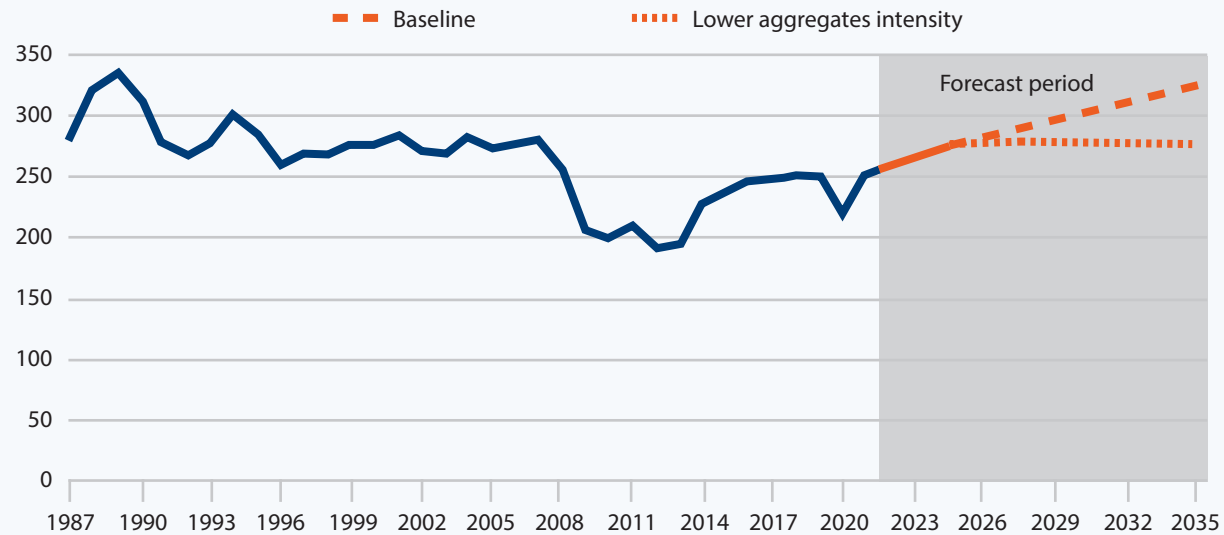
Assuming further reductions in aggregates intensity (to 1.3 tonnes per thousand pounds spent in construction) and the same outlook for construction activity, annual total aggregates demand is still projected to increase to 277 million tonnes by 2035.

Cumulatively, these projections suggest a total demand for aggregates in the range of 3.8 to 4.1 billion tonnes between 2022 and 2035.

For context, this compares to a total of 3.2 billion tonnes of aggregates supplied in the previous 14-year period (2008-21), a period of significant economic instability which included the Great Recession and Covid-19. Construction output contracted by 15.4% between 2007 and 2009 and only fully recovered its pre-recession (2007) peak in 2015. In 2020, the sector was hit again, this time by the impact of the pandemic, which caused another 14.9% contraction in a single year. Further back, in the 14-year period between 1994 and 2007, total aggregates demand reached 3.9 billion tonnes.

Previous (2017) demand projections indicated total demand between 3.2 and 3.8 billion tonnes of aggregates over 2016-30. Despite the inevitable degree of uncertainty underpinning such projections, not least reflecting the fact that volatility in the wider economic and construction activity is highly likely as seen in recent years, the outturn for the first five years of the projection period (2016-21) has proven to be in line with expectations (see section 4).

Figure 9 – Total aggregates demand in Great Britain: 2022-35 projections under the baseline and lower aggregates intensity assumptions (million tonnes)



Source: Mineral Products Association.

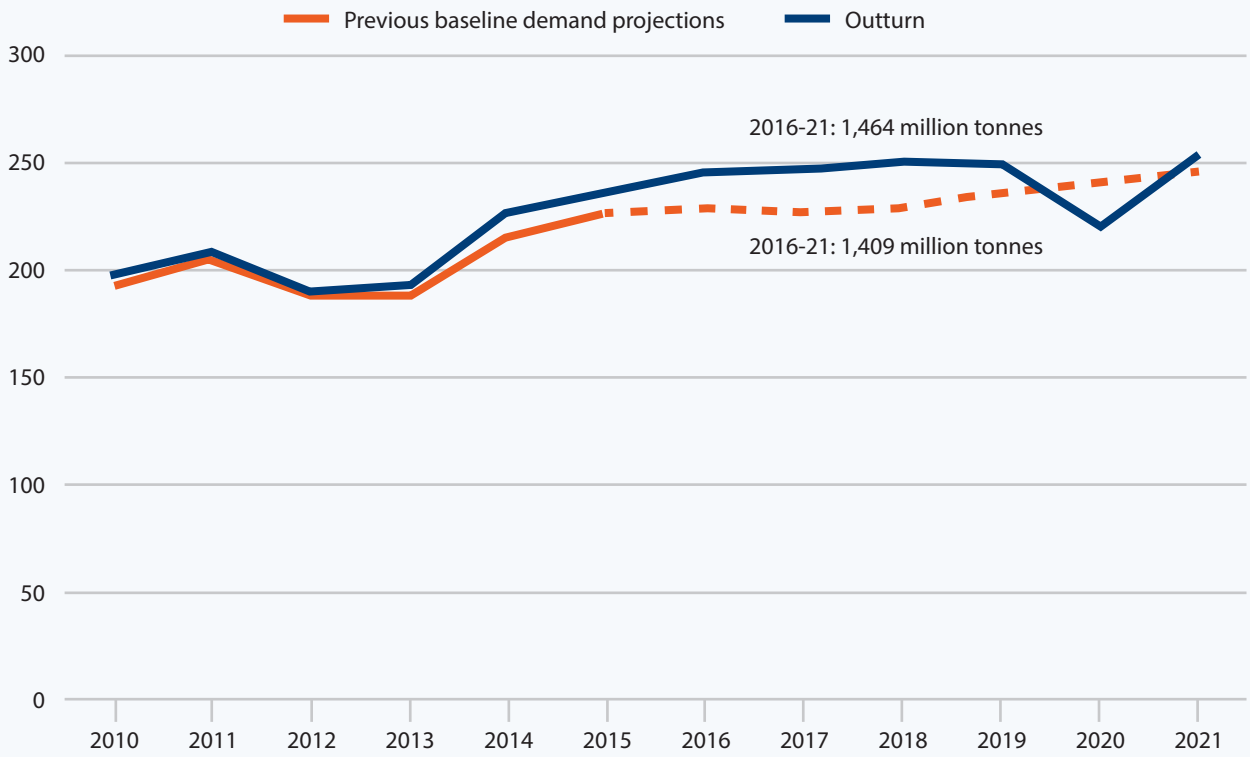
4. Comparison with previous (2016-30) demand projections

A first publication of these scenarios was produced in 2017 and covered the 15-year period between 2016 and 2030 (14). Using a similar methodology, these scenarios were based on two assumptions for the aggregates intensity of construction.

The outturn for total aggregates demand was 1.46 billion tonnes cumulatively between 2016 and 2021, just 54 million tonnes (c.4%) higher than the 2017 baseline demand projection of 1.41 billion tonnes for the same 5-year period (Figure 10).

The higher tonnage outturn reflects in part the small positive revisions to the historical data for aggregates sales up to 2015, but also the greater resilience in construction activity and aggregates demand post-EU Referendum, a period beset by unusual economic and political uncertainty stemming from the Brexit negotiations. Some of the gains were then reversed as a result of the Covid-19 pandemic, which caused an unprecedented global economic shock in 2020-21.

Figure 10 - Total aggregates demand in Great Britain: Previous (2017) projections and outturn for the period 2016-21 (million tonnes)



Source: Mineral Products Association.

5. Considerations for aggregates supply

a. Resource availability and permitted reserves

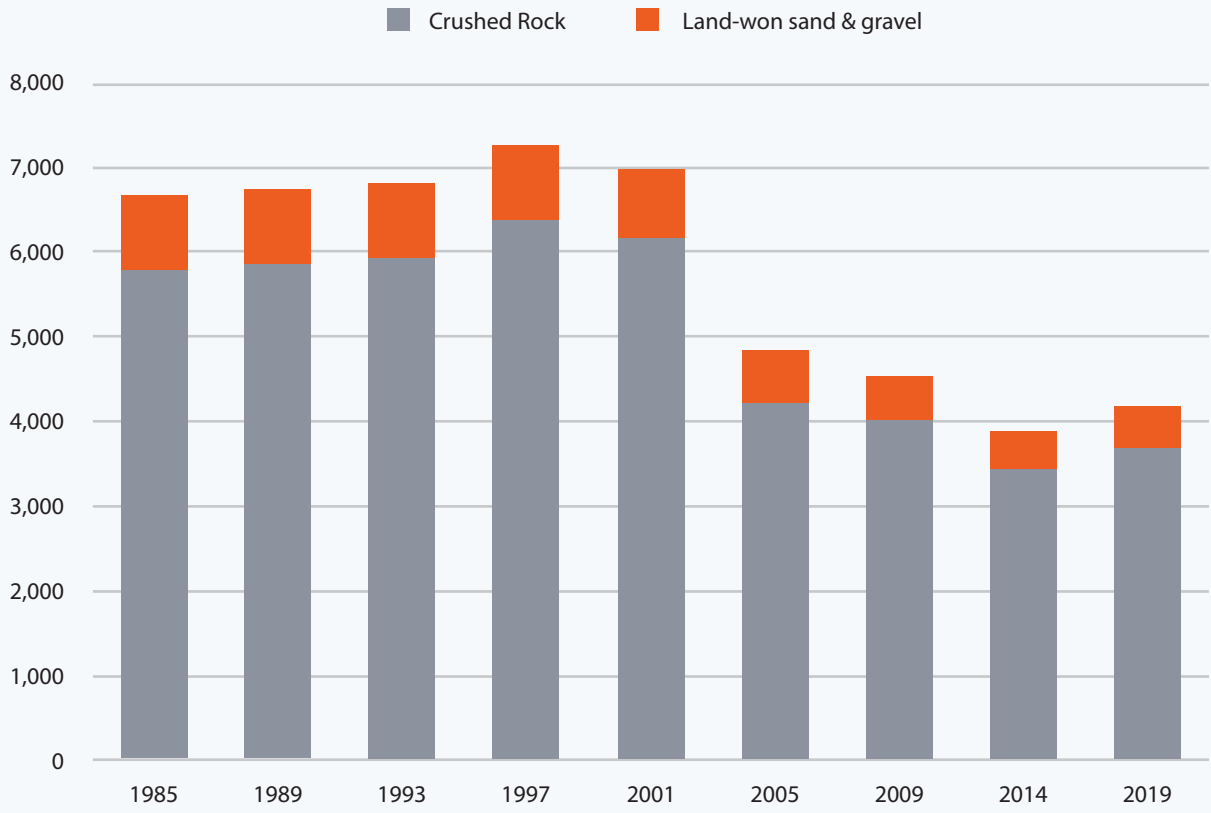
Aggregates are widely available in Great Britain, and imported tonnages remain relatively low. A key factor influencing the supply of aggregates, and therefore other mineral products manufactured using aggregates, is the operation of the mineral planning and associated regulatory systems.

Figure 11 indicates changes in land-won permitted reserves of aggregates in England and Wales since the mid-1980s (3). The step change reduction in 2005 was influenced by a more robust and consistent reserve assessment methodology than previously used. In 2019, there were 4.2 billion tonnes of land-won permitted aggregates reserves, and a further 307 million tonnes of permitted reserves of primary marine aggregates in 2021 according to The Crown Estate (15).

A complementary indicator, the replenishment rate, provides a useful insight into the long-term availability of supply. In any one year, if sales of primary aggregates are equal to the tonnage of new permitted reserves, the replenishment rate would be 100%. Figure 12 and Figure 13 indicate that long-term replenishment rates for both land-won sand & gravel and crushed rock are well below 100%, with sales continuously exceeding the tonnage of new permitted reserves granted each year (16). Between 2011 and 2020, for every 100 tonnes of land-won sand & gravel produced, only 63 tonnes have been replaced through new planning permissions. For crushed rock, the replenishment rate is a little higher at 76% over the same period, although it mostly reflects new permissions granted at a small number of sites in 2011 and 2012, which means that the 10-year replenishment rate will reduce significantly in the next two years.

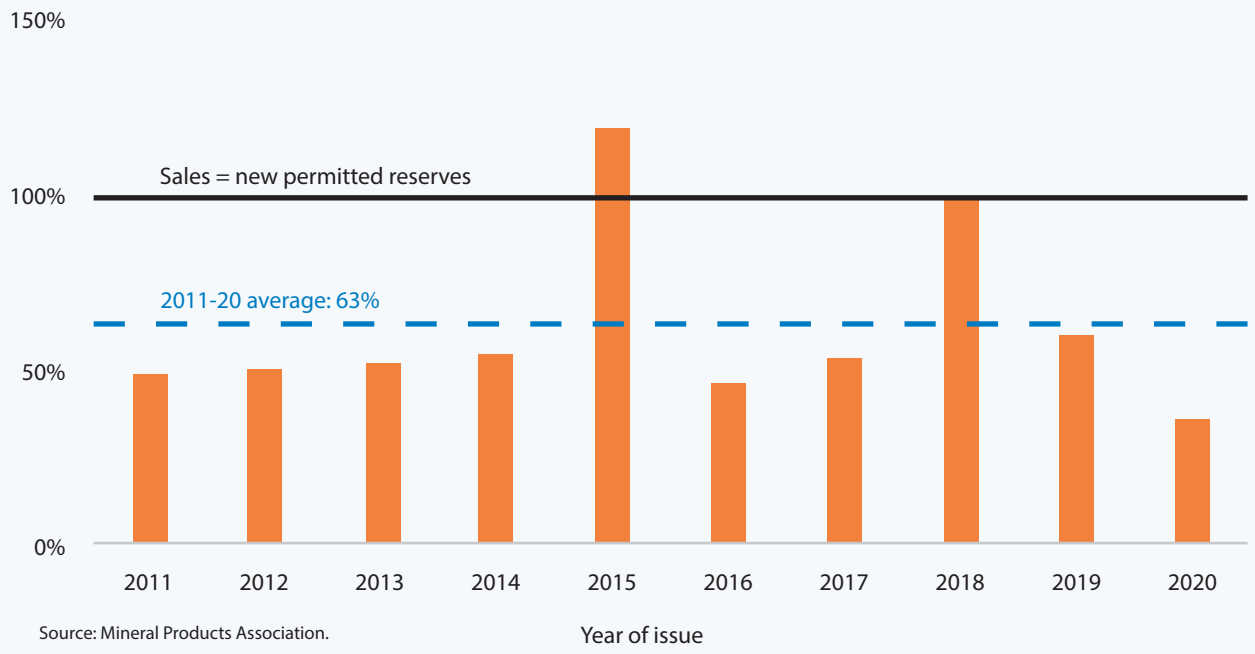
The implication of long-term replenishment rates well below 100% raises the prospect of supply shortages further down the line. Some regions responsible for national supply are facing challenges in maintaining their reserve base, particularly given the additional levels of demand required to support the delivery of various nationally significant infrastructure projects alongside baseload demand for construction materials. Reserves in the traditional major supply areas, such as the East & West Midlands, North West, South West and South East, are increasingly being depleted as the quantity of new reserves permitted remains below sales.

Figure 11 – Primary aggregates permitted reserves in England and Wales (million tonnes)



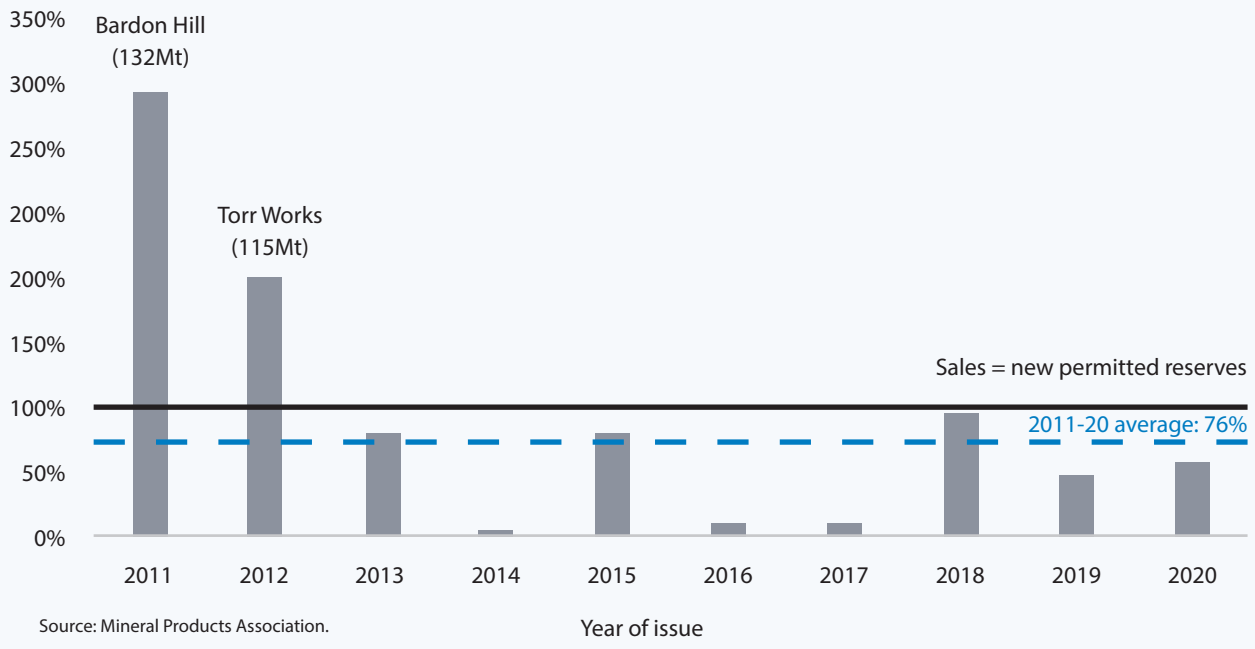
Source: British Geological Survey.

Figure 12 - Land-won sand & gravel replenishment rates in Great Britain (2011-20)

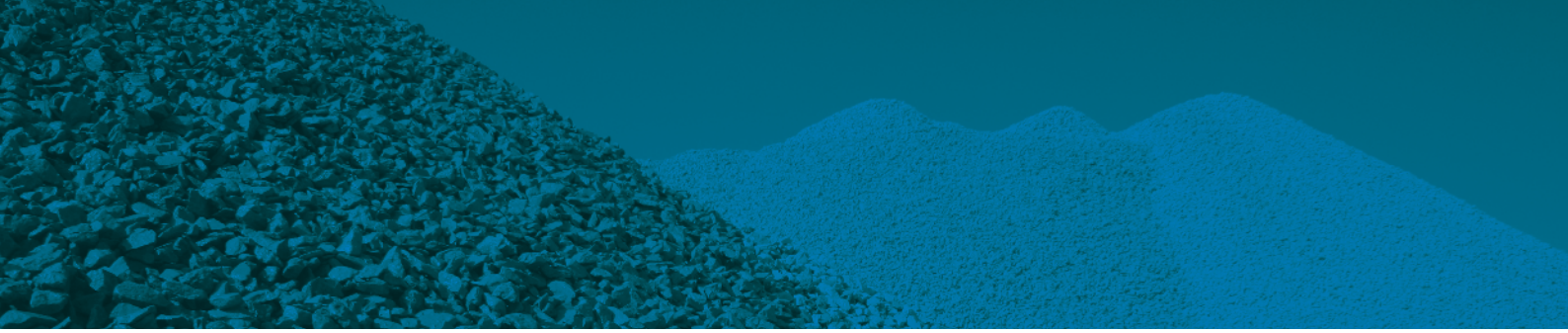


Source: Mineral Products Association.

Figure 13 - Crushed rock replenishment rates in Great Britain (2011-20)



Source: Mineral Products Association.



b. Recycling and secondary aggregates

In all supply scenarios considered in this analysis, it is assumed that the supply of recycled and secondary aggregates grows in line with construction trends, not faster. The rationale is twofold:

- The availability of recycled aggregates is determined by the potential for demolition activity, which enables construction, demolition and excavation wastes (CDEW) to be reprocessed and/or re-used as an aggregate for construction purposes whenever possible. In addition, there is evidence that all CDEW which can already be recycled as aggregates is being already used, with limited opportunity for a significantly higher share of CDEW in aggregates markets. Research by the Department for Communities and Local Government into CDEW markets suggested that it was already the case in 2005, when it found little evidence of hard construction and demolition waste which could be recycled into aggregate being landfilled as waste (17). More recently, whilst the Construction Sector Deal references approximately 120 million tonnes of CDEW generated by the construction industry in 2014, the Mineral Products Association showed that minerals and waste management industries already convert the vast majority of this waste into a resource in the 'chain of utility': after discounting spoil from navigational dredging, much of which is disposed of offshore, 76% of all construction waste is either recycled as aggregates or used in recovery operations, such as, the restoration of quarries and other mineral sites, enabling the recycling of land (18). National statistics on waste from the Department for Environment Food & Rural Affairs also show that for the past decade, over 90% of the hard construction and demolition waste (i.e. excluding excavation waste such as soils) has already been recovered (19). It is of course possible that a continuing policy focus on improved resource efficiency as part of the circular economy and on more efficient and technically advanced recycling practices could squeeze some more recycled content from demolition and secondary material sources. However, the view is that the potential for recycling has already reached a high level, and that if further improvements are possible, these are expected to remain small and incremental.

- Significant sources of secondary materials exist, including large historical stockpiles of china and ball clay waste, slate and fly ash, but these are often located away from markets and centres of demand. Their use and contribution to the total aggregates supply-mix could increase but only with improvements to transport infrastructure or as a consequence of changes to the geographic distribution of construction material demand. Meanwhile, other sources of secondary aggregates, such as fly ash and furnace bottom ash, recorded a continual decline in Great Britain in recent years reflecting the closure of coal power stations and limited imports.

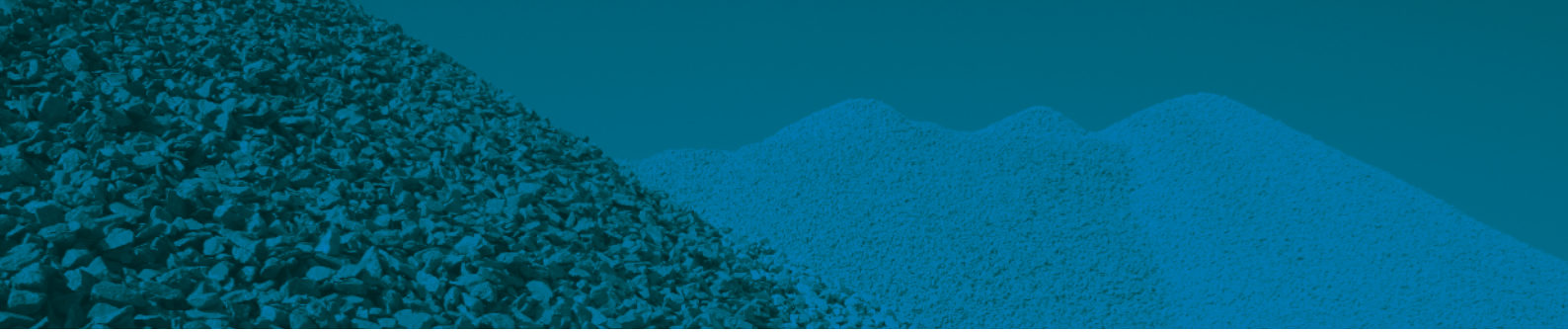
As a result, considering aggregates demand to 2035 under the 'baseline' intensity assumption, it is estimated that the share of recycled and secondary materials in total supply is likely to remain stable. The tonnage of recycled and secondary materials will increase in line with demolition activity but this is not expected to be a game-changer: significant tonnages of primary supplies will be necessary to meet demand. In our supply scenarios, assuming no significant change in the aggregates intensity of construction, the contribution of recycled and secondary aggregates remains at its 2021 level, at 28% of total aggregates supply by 2035.

In contrast, in the event of further reductions in aggregates intensity, the squeeze on overall aggregates demand implied by the reduction is assumed to be borne solely by primary resources, so that the resulting share of recycled and secondary material increases in comparison. Under this 'lower intensity' demand scenario, the same tonnage of recycled and secondary aggregates is projected to reach 32% of a lower total aggregates supply by 2035.

Regardless of the path for aggregates intensity, whether unchanged over the next 15 years or with reductions in line with historical trends, it is apparent that whilst recycled and secondary aggregates are providing a valuable source of supply, significant tonnages of primary aggregates would still be necessary to meet overall demand.

While circular economy strategies are looking for ways to move recycled and secondary aggregates up the construction material value chain in place of primary aggregates, this will not necessarily reduce the overall demand for construction aggregates. The demands that have traditionally met by these sources, such as fill, will still remain. Therefore, if recycled and secondary aggregates are not available to meet these ongoing needs, the demand will instead have to be fulfilled from alternative sources – in all likelihood primary aggregates.

One could also argue for the possibility of a decline in the availability and use of recycled aggregates in the future: a focus on renovating buildings to drive energy efficiency for instance, similar to the EU Renovation Wave as part of the Green Deal, could constrain the tonnages of aggregates available from demolition activity. Whilst this point could be debated, what it highlights is that there are many uncertainties associated with the future of recycled and secondary aggregates sources, suggesting some caution is required in making assessments of potential future supply and placing undue reliance on this.



c. Access to markets

Aggregates can only be extracted where they are found, and as bulk materials, they are highly dependent on efficient transport networks to be moved to where the demand is.

Transport and logistical pinch points already exist due to the limited availability of drivers and delivery vehicles, the capacity for rail freight and supporting infrastructure to supply aggregates (including secondary aggregates), and wider concerns about future availability of strategic wharf capacity for the supply of marine dredged aggregates and the import of crushed rock from both domestic and overseas sources.

In recent years, and particularly in 2021 as construction demand rebounded sharply post-pandemic, there has been some evidence that transport constraints have delayed deliveries to customers in localities where demand is strong, but in general the transport supply chain has continued to meet customers' needs. Whether this continues will depend on factors such as:

- the future availability of vehicle drivers;
- the availability of suitable new vehicles;
- the use of larger, articulated tipper trucks;
- the development of more efficient supply logistics in cooperation with customers;
- potential delivery restrictions in urban areas, such as during rush-hour;
- the ability of industry and freight operators to increase the average loading of train deliveries;
- the availability of critical rail paths;
- the availability of rail depot capacity in key markets;
- the availability of wharf capacity in key locations and connections to the rail network;
- the availability of marine dredging production capacity;
- the future distribution of demand, as concentrated geographical hot spots of construction activity place particular pressure on local transport capacity, especially relevant for major infrastructure projects.

d. Overseas imports

Construction aggregates are widely available in the UK; some 275.1 million tonnes of primary, recycled and secondary aggregates were produced in 2021[4]. Import tonnages from overseas are low. Whilst there is a gap in data availability in this area, total imports of aggregates are estimated to account for less than 5 million tonnes each year. This includes crushed rock from Scandinavia and marine sand from the near-continent.

Whilst there may be scope for import tonnages to increase to support future demand, for instance by making use of some underutilised port facilities, such changes will only happen if commercially viable and environmentally sustainable. Even assuming a doubling of imported aggregates to 10 million tonnes per annum by 2035 – if possible – it would still represent less than 5% of the total UK primary aggregates supply. As such, whilst imports tonnages are likely to grow over the next 15 years, their contribution is not considered to be significant compared to the overall market demand anticipated.

e. Skills

There is growing concern around the future availability of skilled workers to support the industry, exacerbated by the Covid-19 pandemic.

In construction, the Construction Products Association indicates that employment peaked in early 2019. Since then, the sector has lost 270,000 workers due to the loss of EU workers and domestic workers retiring early (8). Skills availability is flagged as a key challenge and constraint on construction output growth in the medium-term.

In the mineral products industry, the sharp rebound in the UK economic and construction activity in 2021 resulted in well-reported shortages of drivers and rising wage costs. Whilst the pressure on drivers somewhat stabilised in the first half of 2022, attracting workers with the technical skills required continue to be reported as a major challenge by aggregates and mineral products producers, including for instance for frontline machine operative roles.

Minerals planning authorities and some planning consultancies are also reporting difficulties in recruiting and retaining qualified and experienced planning staff needed to enable the planning system function properly. This may be due to a combination of factors including senior officers retiring and being difficult to replace, lack of mineral planning training and a lack of awareness of opportunities in the sector, stretched resources, low morale, relatively poor pay and attractiveness of other planning roles and disciplines.

It is very difficult to assess if skills shortages are likely to inhibit the industry's ability to operate and supply, or whether the supply chain will be able to adapt. However, government will have to take the issue of access to skills into account if it wants to avoid putting further pressures on industries already facing skills shortages at the current level of activity, let alone in an environment on continued growth in construction needs and the resulting aggregates demand.

[4] A total of 253.1 million tonnes of aggregates were produced in Great Britain in 2021, and a further 22 million tonnes estimated for Northern Ireland.

6. Aggregates supply in Great Britain: Scenarios for 2035

A set of supply scenarios have been produced as an illustration of what may need to happen in order for the aggregates industry and planning system to be able to satisfy future demand. They are intended to provide a basis for discussion as to whether these are achievable, given the various supply constraints laid out in the previous sections.

Whilst the scenarios have been produced at national (GB) level, describing how the pattern of aggregates demand and supplies are likely to change over the next 15 years, it provides context for local planning.

English national planning policy and guidance require that, in preparing LAAs, mineral planning authorities consider forecasts of future demand, based on the average of 10 years past sales and other relevant local information. There is no strategic or consistent approach to forecasting future demand and supply needs, be it at national, regional or local scale. This is increasingly resulting in inconsistencies and tensions between individual mineral planning authorities and the Aggregate Working Parties in England who oversee the function of the Managed Aggregate Supply System, and creates unnecessary uncertainty for the industry in committing to investment and long-term developments.

Planning policy in Wales requires demand for aggregates to be monitored annually at an all-Wales and regional levels by Welsh Government in conjunction with the Regional Aggregate Working Parties (RAWPS) and reviewed in the Regional Technical Statements (RTS) that cover both north and south Wales regions. The RTS provides an estimate of the future demand for construction aggregates in Wales based on a series of assumptions, and provides specific recommendations to individual local planning authorities regarding the quantities of aggregate which need to be supplied from each area to ensure that adequate provision is maintained throughout the relevant Plan Period.

National planning policy in Scotland requires local development plans to support the maintenance of permitted reserves for construction aggregates of at least 10 years at all times, though again, there is no national mechanism to provide an overall assessment of future construction aggregate needs.

Attempting to undertake detailed local plan scale modelling is hindered by scale, lack of skills and resources, data availability and consistency of the assumptions applied, and methodology that is used. Instead, the Mineral Products Association considers that local mineral plans should be informed by better consideration of the wider macroeconomic trends and outlook including the planned housing and infrastructure construction, in order to fully understand what future demand is likely to be and how different it may be from the 10 year average of historic sales. This would also include the potential indirect effects arising from additional pressures on production capacity increasing the demand requirements for adjacent mineral planning areas. This should then inform local minerals planning policy, in particular through flexibility and provision for growth in demand and aggregates supply, including where appropriate, provision at a rate above the 10-year historic average figure.

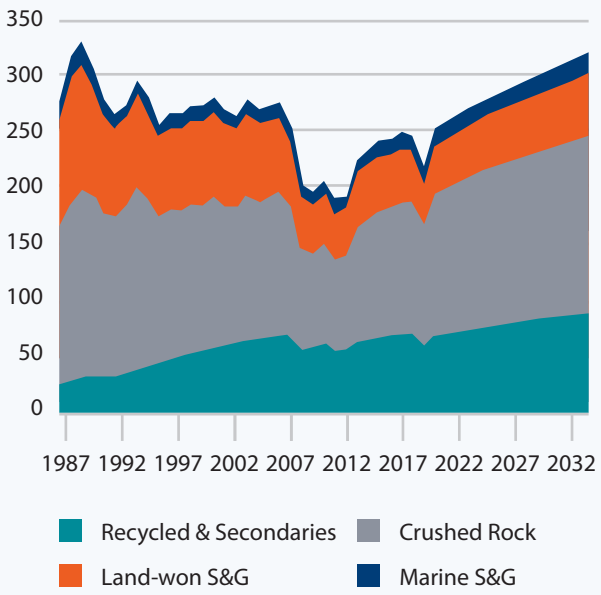
The four supply scenarios that follow combine the demand projections described in section 4 under the two alternative pathways for the aggregates intensity of construction, and the various constraints and challenges that are likely to impact on the industry over the next 15 years. The assumptions used for each scenario are detailed below, along with the resulting tonnages of aggregates likely to be required by 2035.

Supply scenario 1. Business as usual

The short-term supply-mix reflects the Mineral Products Association market forecast for 2022-24. Beyond 2024, recycled and secondary aggregates supply is assumed to follow the trend in construction activity. The remainder of the demand is supplied by primary aggregates, maintaining the current supply-mix between crushed rock (69%) and sand & gravel (31%) until 2035.

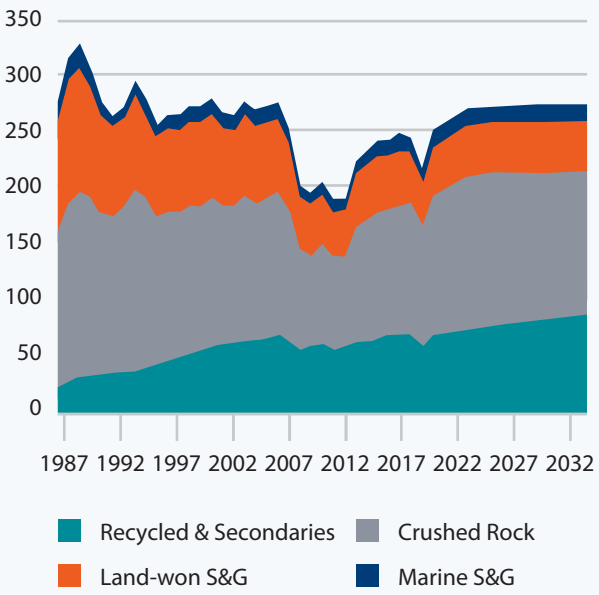
Within total sand & gravel, the respective shares for land-won (75%) and marine aggregates (25%) are also maintained until 2035.

Baseline

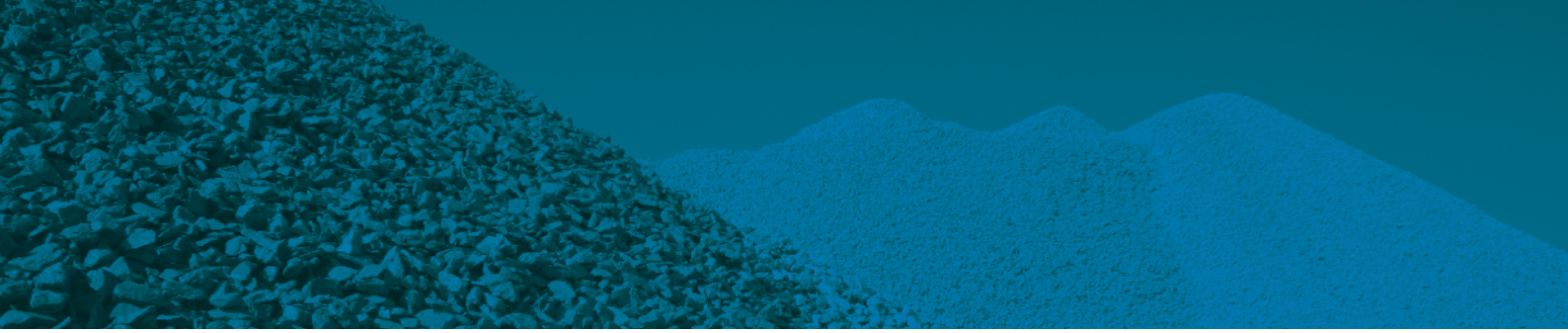


(Mt)	2021	2035
CR	126	160
Land-won S&G	43	55
Marine S&G	14	18
R&S	70	90
Total	**253**	**323**

Lower intensity



(Mt)	2021	2035
CR	126	129
Land-won S&G	43	44
Marine S&G	14	15
R&S	70	90
Total	**253**	**277**



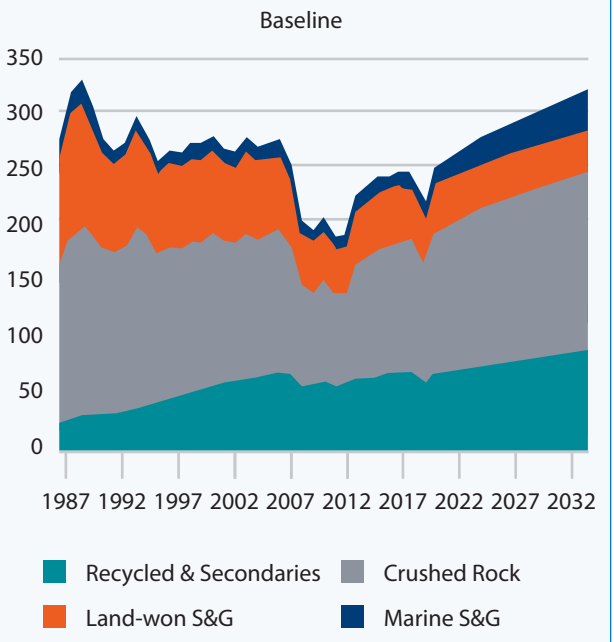
Supply scenario 2. Mind the gap: Offshoring sand & gravel supply

The continuous under-replenishment of land-won sand & gravel permitted reserves is resulting in growing pressures on local material availability and costs. As the availability of land-based sand & gravel becomes increasingly constrained over time (due to depletion of resources, planning and environmental designations, under-provision in plans, and local opposition) this scenario explores the implication of a gradual substitution of land-based sources with marine sand & gravel, assuming that there are sufficient marine permitted reserves, as well as dredger and wharf capacity, to replace the land-based shortfall.

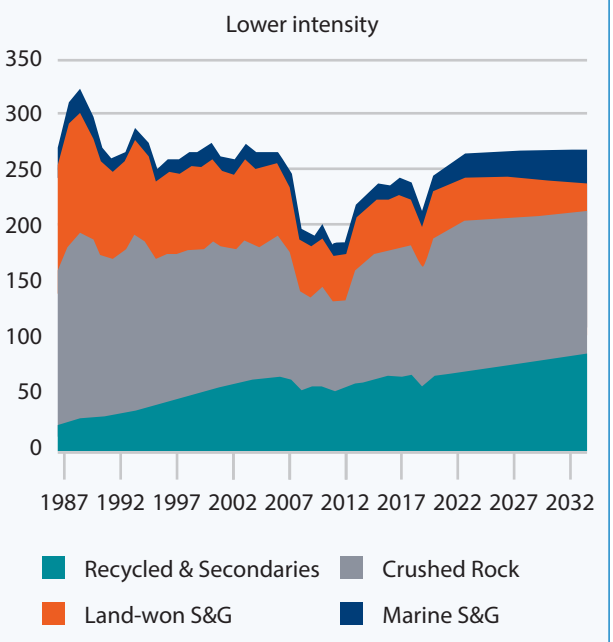
The supply mix between primary aggregates and recycled and secondary sources reflects the same assumption as in the previous scenario. Recycled and secondary aggregates supply is assumed to follow the trend in construction activity, whilst the remainder of the demand is supplied by primary aggregates, maintaining the current supply-mix between crushed rock (69%) and sand & gravel (31%) until 2035.

Within sand & gravel supply however, there is a shift in the supply mix, with the share of marine aggregates assumed to increase to 50% by 2035, mirrored by a corresponding fall in land-won sand & gravel supply.

It is worth noting that in this scenario, the supply of marine sand & gravel would need to at least double to fully compensate for the reductions in land-won sand & gravel supply, from 14 million tonnes in 2021 to 29-36 million tonnes per annum by 2035.



(Mt)	2021	2035
CR	126	160
Land-won S&G	43	36
Marine S&G	14	36
R&S	70	90
Total	**253**	**323**



(Mt)	2021	2035
CR	126	129
Land-won S&G	43	29
Marine S&G	14	29
R&S	70	90
Total	**253**	**277**

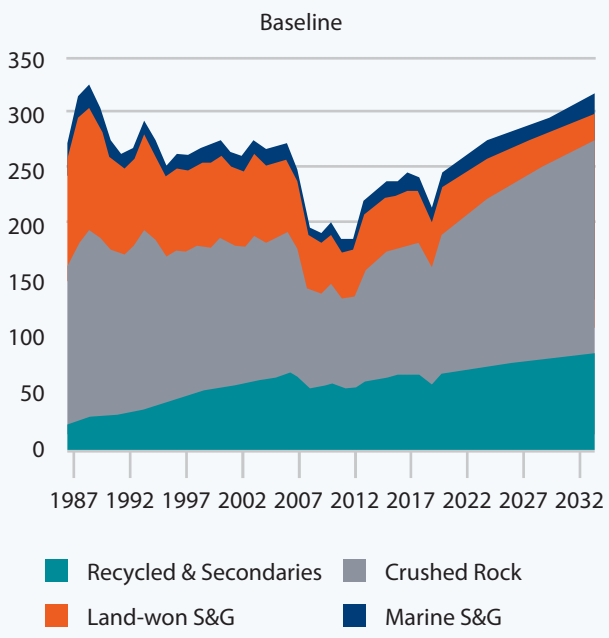
Supply scenario 3. Substitution with crushed rock

In recent years, mineral products producers have reported a gradual substitution between land-won sand & gravel and crushed rock alongside crushed rock fines, particularly in the manufacture of concrete. This trend is expected to continue, depending on local material availability, transport options, costs and technical feasibility.

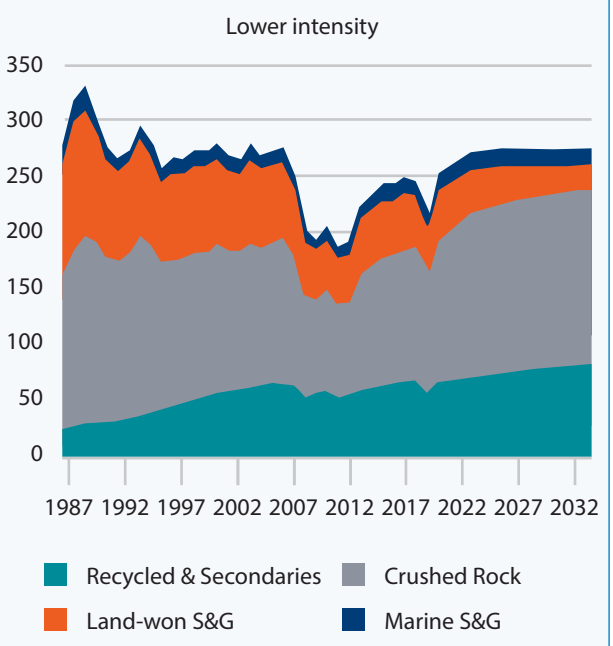
In this scenario, recycled and secondary aggregates supply is still assumed to follow the trend in construction activity, with the remainder of the demand supplied by primary aggregates.

However, the supply-mix within primary aggregates markets shifts. Land-won sand & gravel tonnages are assumed to decline by 5% per annum, offset by an increase in crushed rock supplies to satisfy total demand. Meanwhile, marine sand & gravel tonnages continue to grow as per scenario 1, not faster, to reflect a situation whereby marine supply growth may be limited by wharf and dredger capacity.

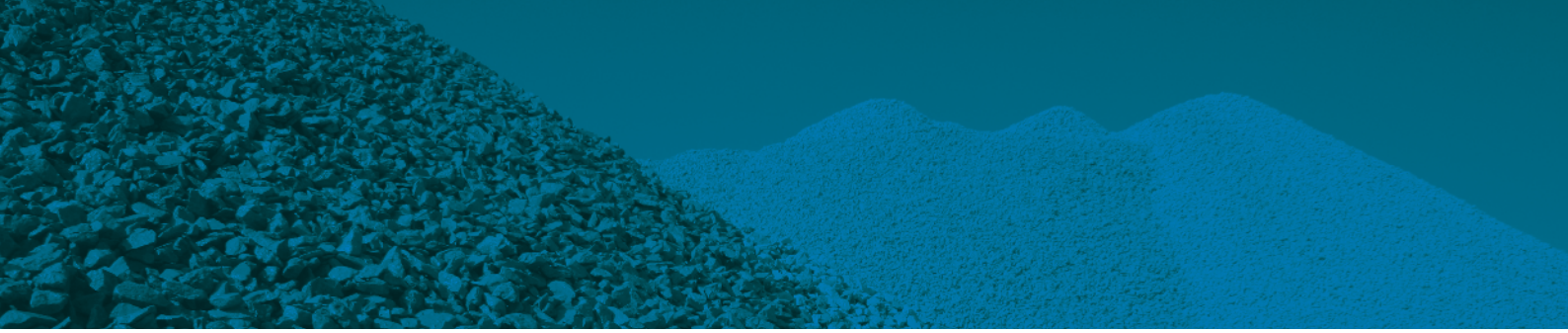
In this scenario, the annual supply of crushed rock would need to increase substantially, from 126 million tonnes in 2021 to 152-194 million tonnes per annum by 2035. For such a scenario to be realised, and unless new large quarries are granted permission, much would depend on the extractive capacity of existing large quarries with adequate and sufficient rail links to deliver to markets.



(Mt)	2021	2035
CR	126	194
Land-won S&G	43	21
Marine S&G	14	18
R&S	70	90
Total	**253**	**323**



(Mt)	2021	2035
CR	126	152
Land-won S&G	43	21
Marine S&G	14	15
R&S	70	90
Total	**253**	**277**



Supply scenario 4. Throwing the kitchen sink

Arguably the most likely scenario assuming increases in supply are achievable, the mineral planning authorities' and the industry's response to declining availability of land-won sand & gravel is likely to be a combination of solutions, including increasing both the supply of marine sand & gravel and the substitution with crushed rock fines.

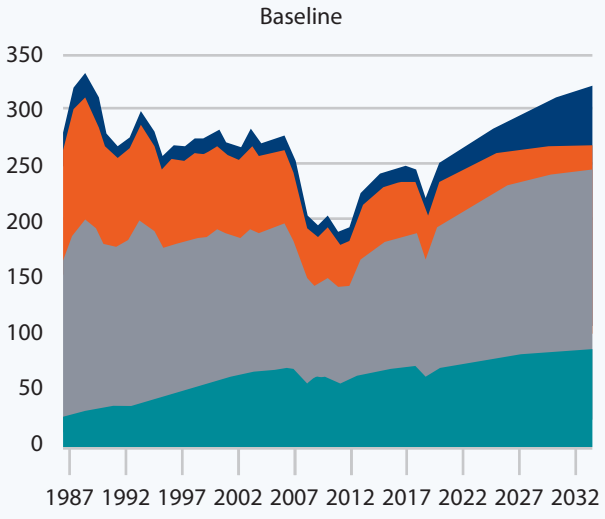
For the supply-mix to evolve in this direction, other elements will be required, including the availability of all associated infrastructure (rail/river/sea) to enable the material to access the markets where it is required.

In this scenario, land-won sand & gravel supply is assumed to decline by 5% each year of the projection period, reaching 21 million tonnes per annum by 2035, less than half the tonnage supplied in 2021. To meet demand, the shortfall is assumed to be made up by a combination of increases in marine sand & gravel (10% per annum) and in crushed rock for the residual demand.

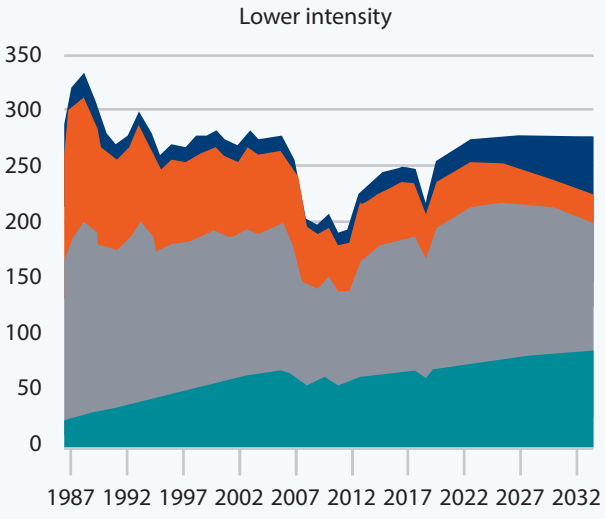
Under this set of assumptions, marine sand & gravel supply rises to 34 million tonnes per annum in 2030, and to 54 million tonnes by 2035. For context, this compares to potential demand of 29 million tonnes per annum by 2030 estimated by The Crown Estate[5], and a total permitted offtake of 39 million tonnes per annum (15). A total of 54 million tonnes per annum by 2035 also means that the supply of marine sand & gravel would need to almost quadruple over the next 14 years and raises serious concerns as to whether this is achievable.

Despite the sheer scale of the increase in marine supplies, it would still not be sufficient to fully meet baseline demand, a situation whereby the aggregates intensity of construction is expected to remain broadly flat over the projection period. To make up for the difference, crushed rock supplies would also need to increase, by 1.6% per annum.

By contrast, a fall in the aggregates intensity of construction combined with a 10% per annum increase in marine sand & gravel tonnages would result in reduced tonnages required of crushed rock (-0.8% per annum).



(Mt)	2021	2035
CR	126	158
Land-won S&G	43	21
Marine S&G	14	54
R&S	70	90
Total	**253**	**323**



(Mt)	2021	2035
CR	126	113
Land-won S&G	43	21
Marine S&G	14	54
R&S	70	90
Total	**253**	**277**

[5] Not all the demand is used for UK construction purposes. It also includes significant tonnages for beach replenishment and exports.

7. 2042

The Town & Country Planning (Minerals) Act 1981 made provision to impose an end-date on all planning permissions for mineral working which did not have a specified end-date across Great Britain and were granted permission before 22nd February 1982. This was set at February 2042, 60 years after the power came into effect.

The result is that a significant number of mineral planning permissions are currently set to expire on the same day in 2042. While some operations will have exhausted their reserves by then, particularly for sand & gravel sites, many sites supporting major crushed rock and industrial mineral operations are likely to still contain commercially viable reserves, and as such may still be producing essential minerals.

For crushed rock, the planning permission for 152 sites ends in advance of 2042, with a further 115 sites expiring in 2042 (20). Collectively, these permissions represent 68% of the 3.7 billion tonnes of crushed rock reserves permitted across England and Wales at the end of 2019. Significantly, the 115 sites that expire in 2042 are responsible for 48% of these reserves (1.8 billion tonnes).

For land-based sand & gravel operations, planning permission for 260 sites ends in advance of 2042, with a further 33 sites expiring in 2042. Collectively, these permissions represent 85% of the 459 million tonnes of land-based sand & gravel reserves permitted across England and Wales at the end of 2019.

The demand projections described in this report highlight the importance of maintaining a steady and adequate supply of mineral resources, with sufficient and growing productive capacity over the long term. The 2042 deadline is less than 20 years away, and at the tail end of a period of significant growth expected for construction activity and demand for aggregates.

The industry is already facing long-term declines in the permitted reserve base, as construction aggregates continue to be sold and consumed at a faster rate than they are being replaced as has been the case for well over ten years. It can typically take 10 to 15 years to identify and prove resources, secure land and rights, prepare and submit planning applications, and for these to be determined and permissions issued. Therefore, in order to ensure a steady and adequate supply of essential minerals can be maintained, the implications of the 2042 deadline start to become significant in around 5 years' time.

Given the essential nature of mineral supply to the delivery of national ambitions for infrastructure and housing, whilst increasing our resilience to climate change and delivering the roadmap to net zero, it is vital that the issue of transitioning to 2042 and beyond whilst replenishing supply is addressed now.

Conclusion

There is currently no consistent and strategic approach to assessing future demand and supply needs for aggregates, be it at national, regional or local scale to inform planning for aggregates and the Managed Aggregates Supply System. Yet, there is a consensus that substantial tonnages will be required if national governments are to deliver on their policy objectives in housing and infrastructure.

The aggregate demand projections laid out in this analysis suggest that requirements could increase from 253 million tonnes in 2021, to 323 million tonnes by 2035, a level not seen since the late 1980s. Efficiency gains in the use of aggregates could lead to a reduction in the aggregates intensity of construction and reduce the pace of growth in demand to 277 million tonnes by 2035 – higher than in 2021. Cumulatively, this analysis suggests a total demand for aggregates in the range of 3.8 to 4.1 billion tonnes between 2022 and 2035.

Turning to the supply, it is clear that whilst recycled and secondary aggregates are providing a valuable source of supply, even larger tonnages of primary extraction will be necessary to meet overall demand. However, there are uncertainties around the supply mix of primary aggregates. Four 'supply scenarios' are considered in this analysis, based on the constraints and challenges that are likely to impact on extraction over the next 15 years. They are intended to provide a basis for discussion as to whether these are achievable.

With historic long-term replenishment rates for primary aggregates well below 100%, future long-term supply pressures are building up. This is particularly the case for land-won sand & gravel supply, the contribution of which to total aggregates supply is likely to continue to decline over the next few years, replaced by a combination of marine sand & gravel and crushed rock substitution. Replenishment rates for sand & gravel will need to increase if this decline is to slow. This will rely upon the industry bringing forward more planning applications and the mineral planning system responding accordingly.

These scenarios have been produced at GB level, based on national historical data and forecasts. They should also provide useful context for local planning, including in England in the preparation of LAAs and the production of local minerals plans.

These scenarios help to flesh out four inescapable realities when considering future aggregates needs:

1. **Future supply cannot be assumed. It needs to be planned, monitored and managed.**
2. **A more strategic approach will be required to ensure a steady and adequate supply is enabled, whether nationally, regionally or locally.**
3. **Primary aggregates will continue to supply at least two-thirds of overall demand.**
4. **Land-won primary aggregate resources, whilst abundant, will need to be unlocked to ensure demand can be met, as imports, recycled and secondaries cannot fill the gap.**

There is also a need for greater transparency of the construction material needs associated with nationally significant infrastructure projects and other major developments. The requirement for such projects to produce construction material resource and supply audits will help to ensure there is visibility around the resources required, where they are intended to be sourced from and the period of time over which they will be required. This will allow both the local mineral planning system and the mineral industry to respond in a timely manner to ensure the right materials are available in the right place and at the right time – thus ensuring the most cost-effective and sustainable supply options to be provided. This approach will also allow competing demands of major projects to be considered more holistically against the backdrop of the baseload of construction material demand that will remain in the background.

Annex 1. Total aggregates demand to 2035 in Great Britain

(Million tonnes)	'Baseline' demand	'Lower intensity' demand
	Assuming aggregates intensity ≈1.5 tonnes of aggregates per thousand pounds spend in construction	Assuming reductions in aggregates intensity to ≈1.3 tonnes per thousand pounds spent in construction
2021 (outturn)	253.1	253.1
2022	260.5	260.5
2023	267.1	267.1
2024	273.0	273.0
2025	278.9	275.0
2026	284.1	276.4
2027	288.7	277.0
2028	292.9	277.2
2029	297.0	277.2
2030	301.2	277.3
2031	305.2	277.2
2032	309.4	277.1
2033	313.8	277.2
2034	318.2	277.3
2035	322.7	277.4
2022-35	**4,112.8**	**3,846.9**

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

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