



mind the gap

2017-2030

**UK residual waste
infrastructure capacity
requirements**



mind the gap 2017-2030

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foreword

The new millennium has witnessed a revolution as our sector has progressively moved away from landfilling, previously the dominant form of waste management, and in the process diverted millions of tonnes of residual waste into recycling and thermal treatment alternatives.

The scale and speed of the transformation is almost without precedent amongst comparable countries in Europe. While this is undoubtedly a good-news story, it also makes forward investment planning more challenging, particularly in forecasting the types of facilities we need to build over the medium to long term, at what scale and at which locations. In this task, we are hampered by poor statistics on commercial and industrial waste arisings, which comprise the majority of our discards and for which there is no national plan addressing residual waste infrastructure needs.

In 2014, SUEZ published **Mind the Gap**, our assessment of residual waste infrastructure requirements from 2015 to 2025 based on our understanding of the impact of policy, market trends and the future preferences of our public and private sector customers. We identified a significant capacity gap opening up for thermal treatment if infrastructure build failed to keep pace with the volumes of residual waste diverted from landfill.

Why the need to revisit the UK's infrastructure requirements three years after our first assessment? Because market conditions have changed rapidly and significantly since 2014. The rate of landfill closures has increased and Brexit has introduced a new layer of complexity to market forecasts. We also recognised that a top-level national assessment of infrastructure requirements had its limitations, because our facilities are invariably sized to cater for local or regional waste management catchments and specific market needs.

In **Mind the Gap 2017-2030**, we update our forecast of UK residual waste infrastructure requirements (from 2017 to 2030) in light of the new market drivers, considering our capacity estimates by region. We hope that this granularity will provide a more nuanced picture of the UK's waste management infrastructure needs. Faced with a capacity gap in the here-and-now, the urgency for decisive policy and planning action has never been greater. We present our latest infrastructure assessment with this in mind.



David Palmer-Jones
Chief Executive Officer
SUEZ recycling and recovery UK

introduction

In 2014, SUEZ recycling and recovery UK (SUEZ) first published Mind the Gap, which provided an assessment of the UK's infrastructure requirements for the management of residual municipal and similar commercial / industrial (C&I) waste over the time period 2015 to 2025.

The assessment was prompted by significant structural changes to the waste management sector since the turn of the millennium, as key policy drivers such as landfill diversion targets, statutory recycling targets and landfill tax kicked in. From single digit municipal waste recycling performance in the late 1990s, the UK improved to 39% in 2011-12 and 44.5% in 2013-14. While total waste arisings were forecast to rise over the period 2015-2025 in line with population and economic growth, residual waste was forecast to fall from 32.8 million tonnes in 2015 to 31.1 million tonnes in 2025 as waste prevention, recycling and other value recovery processes continued to take effect.

In 2014, we forecast a capacity gap for energy recovery from waste of 17.8 million tonnes in 2015, falling to 5.7 million tonnes by 2025 at the then build-out rate for proposed new facilities, which was to some extent mitigated by the growing export market in refuse derived fuel and solid recovered fuel to Northern Europe.

We did not envisage a landfill capacity shortage at national level, although we recognised the likelihood that local shortages would force residual waste to travel longer distances to seek out spare landfill capacity. For anaerobic digestion of separately collected food waste, we forecast a balance between installed capacity and feedstock availability, with local over-capacity 'a real possibility' if food waste prevention measures were to take effect and/or take-up of separate food waste collections stalled.

Key terms

Municipal waste is waste collected by local authorities, mainly waste from households. Separately, we added waste of an equivalent composition from construction and demolition activities.

'Similar' commercial / industrial waste is waste from commercial / industrial premises that is of similar composition to municipal waste.

Residual waste is material that is left over after recycling and other recovery activities have been performed on the waste as collected.

Our forecasts in 2014 were broadly in line with other industry assessments, but more pessimistic than the government's view that sufficient capacity for residual waste treatment would be delivered by the market. Our overall conclusion, supported by other industry-led forecasts, was that "... it is not at all clear that all municipal waste has a non-landfill treatment solution. It is also clear that for residual similar commercial / industrial wastes a substantial residual waste treatment capacity gap exists, which is likely to continue through to 2025."

We see three key reasons to update our previous forecasts:

- ▶ UK landfill closures have accelerated at a much faster rate than anticipated, leading to void space shortages in some parts of the UK appearing sooner than was indicated by the market signals in 2014. This has had a knock-on effect on non-landfill treatment capacity requirements moving forward.
- ▶ Brexit is likely to alter the market dynamics for exported refuse derived fuel and solid recovered fuel, again requiring a re-appraisal of domestic thermal treatment capacity. The Brexit vote also presaged a weaker Pound, bringing adverse foreign exchange considerations into play in relation to export contracts.

- ▶ In line with the typical geographical boundaries of waste catchments, investment decisions in our sector are taken at a local or, at their widest, a regional level rather than on the basis of a national assessment of infrastructure needs. While the latter is important to inform and set broad national policy objectives, the business case for investment in waste management infrastructure requires a more granular, nuanced, assessment.

In this report, we present an updated assessment of the UK's residual waste infrastructure capacity requirements for the period 2017-2030. We base our assessment on a regional analysis of residual waste arisings taking into account factors such as population growth, rising recycling rates, regional landfill capacity trends, changing treatment mix, the 'Brexit effect' and the impact that price may have on waste mobility – from European treatment destinations back to the UK, and between domestic treatment options.

We divided the country into 14 trading zones. These zones represent trading areas with boundaries demarcated predominantly by transport and logistical considerations, within which the majority of the wastes generated tend to move and be treated. We illustrate our approach (explained in the next section) by presenting in detail our assessment of infrastructure requirements for three of these trading zones:

- 1 The M8 corridor**
- 2 The M62 corridor**
- 3 The South East**

Infrastructure requirements for these and the remaining trading zones are summarised, and aggregated to UK level, in a round-up section towards the end of this report.

This map shows our approximate demarcation of these trading zones across England, Scotland and Wales.

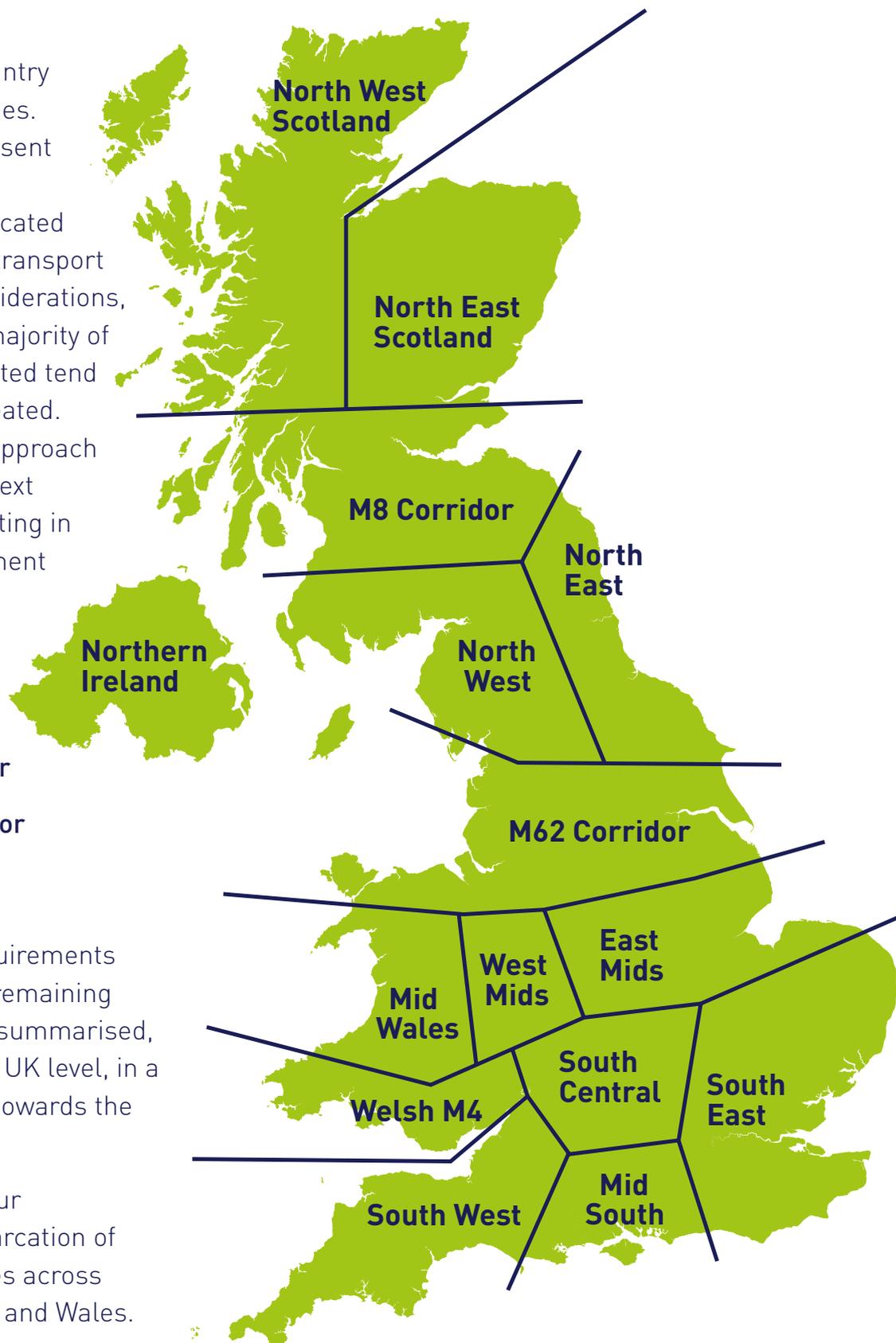


Figure one · Trading zones map

forecasting residual waste treatment capacity

Methodology

The assessment methodology for each trading zone followed a standard format.

Firstly, the trend in waste arisings was estimated on the basis of population growth and economic performance, the latter matched to the profile of economic activity for that zone.

We drew on our sectoral database of waste types and composition to estimate trends for commercial / industrial waste arisings. The efficacy of waste prevention measures such as 'love food hate waste' was factored in.

Secondly, residual waste arisings were estimated by subtracting, from waste arisings, the tonnages recovered through recycling and other recovery processes such as cement works, biomass conversion plants and mechanical biological treatment. For municipal waste, we assumed national recycling rates of 50% (the present target for 2020) and 65% (the likely new target should the revised EU Waste Framework Directive apply to the UK under a 'soft' Brexit). For Wales, Scotland and Northern Ireland, specific recycling rates within their respective waste management plans were applied. These recycling rates were applied over the period 2017-2030, with 2017 as the baseline.

Key assumptions

- ▶ Population growth is in accordance with each authorities' latest projections.
- ▶ Municipal and commercial / industrial waste reduction per head continues.
- ▶ Recycling increases but at rates influenced by policy implementation in the respective devolved administrations and commercial reality.
- ▶ Landfill gate fees remain more expensive than the energy-from-waste alternative solutions.
- ▶ Energy incentives remain at present levels and energy incentive budget allocations for thermal technologies do not inhibit deployment.
- ▶ England, Scotland, Wales and Northern Ireland policies on municipal and commercial / industrial waste remain as proposed.

For commercial / industrial waste, we assumed a recycling rate of 56% in 2017, rising linearly to 65% in 2030. For municipal-like wastes from construction and demolition activities, we assumed this waste to be the residue of a pre-sorting process. The total residual waste figure used in the present report and in our 2014 report tends to be higher than the figures used by a number of other reports. This arises through a combination of factors including allowance for:

- ▶ Waste going to landfill as 'inactive' which is incorrectly classified (in February 2017, PwC suggested from a HMRC analysis that up to 25% of inactive fines may be incorrectly declared, which could amount to over 2 million tonnes per year for the last reported 12 month period¹).
- ▶ A reduction in 'fines' generated from the production of refuse derived fuel and solid recovered fuel, which would occur in the event of the modelled reduction in export volumes for these fuels.
- ▶ A proportion of waste passing through exempt waste management sites that would be classified as requiring residual waste treatment.

- ▶ Wastes arising through recycling operations that cannot be recycled and which therefore return to the residual waste stream.
- ▶ A proportion of equivalent construction and demolition waste requiring non-landfill residual waste treatment (approximately 1.6%).
- ▶ Illegal waste that, if prevented, would be required to be treated as residual waste.

Thirdly, the forecasted shift in tonnages of residual waste assigned to the treatment options (landfill, energy recovery in domestic thermal facilities, and exported refuse derived fuel and solid recovered fuel) between 2017 and 2030 was compared against forecast capacity based on our operational experience, customer feedback, technology constraints and market conditions. This was supported by our comprehensive list of operating, in-construction, planned and proposed facilities. The baseline was the projected installed capacity in 2017. The treatment split is compared with the assumed allocation in our original Mind the Gap report.

¹ <http://pwc.blogs.com/legal/2017/02/another-fine-mess-the-landfill-tax-gap.html>

	Mind the Gap (2014 report)		Mind the Gap 2017-2030	
	2015	2025	2017	2030
Recycling (municipal and commercial / industrial)	50.1%	55%	51.2%	57.8%
Thermal treatment	22.2%	35%	28.9%	38.9%
Anaerobic digestion	1.3%	1.9%	Included in recycling	
Landfill	26.4%	8%	19.9%	3.3%

In a departure from our 2014 assessment, we have not allocated a separate treatment category for anaerobic digestion, since biowaste (which is typically separately collected) presented to this process counts towards recycling targets and is therefore not strictly residual waste. In any event, several bespoke assessments of anaerobic digestion capacity requirements are available and further consideration here is therefore unnecessary.

The remaining balance of waste arisings, after recycling or combustion in a thermal treatment process, is then landfilled. The modelling assumes that landfill gate fees remain higher than alternative energy recovery options (see key assumptions item at the start of this section), hence energy from waste options are favoured over landfilling – resulting in low overall landfilling in the 2030 treatment mix. At the current rate of landfill-closures, the modelled 2030 treatment mix equates to 60-100 landfills nationally by 2030. Registered landfill numbers have fallen from the mid-thousands in the 1990s to approximately 500 in the early 2000s and an estimated 120-130 in 2016.

Exported refuse derived fuel and solid recovered fuel

The assessment of UK capacity needs for refuse derived fuel and solid recovered fuel presents a particular challenge. Faced with a shortage of UK energy recovery capacity, as landfill diversion progressed, export of material to surplus energy recovery capacity, principally in Germany, The Netherlands and Sweden, commenced in earnest in 2011 with the export of 272,000 tonnes of fuel. Exports had risen to 2.37 million tonnes in 2014 and to over three million tonnes in 2016.

Exporters recognise that the extent to which European facilities continue to receive exports of refuse derived fuel from the UK at the present level is open to question. As European economies continue to recover, so will the need to reserve any spare capacity for their own domestic needs. Furthermore, as landfill restrictions and higher recycling targets, anticipated in the European Commission's Circular Economy Package, ultimately become a legal requirement for EU Member States, any thermal treatment capacity headroom in mainland Europe will be eroded over time as these policy measures take effect and landfill diversion accelerates. The European Commission's communication on the role of energy-from-waste processes in the circular economy gives priority to optimising their contribution to the Energy Union by exploiting opportunities for cross-border partnerships. All told, as spare capacity balances out and

capacity headroom diminishes, European gate fees will rise.

Furthermore, a direct consequence of the Brexit vote was a fall in the value of Sterling relative to the Euro and other major international currencies, with mixed impact for waste managers. The weaker Pound made UK recyclates more attractive to overseas buyers, while overseas supply contracts for waste derived fuels have tended to be renewed in local currency (for example, Swedish Krona) or in Euros, raising the cost for UK exporters. Whether this 'Brexit effect' will persist in the longer term remains to be seen.

The terms of a Brexit deal will also determine whether exports from the UK will be faced with cross-border administrative costs and import tariffs, further increasing UK export costs to the EU. All told, the considered view is that, combined with the expected squeeze on excess European capacity, the price differential between exporting to Europe and building new UK capacity to compensate will narrow in the medium term.

The prognosis for exports of refuse derived fuel is therefore highly uncertain. A prudent course of action would be for the UK to anticipate a squeeze on European thermal treatment capacity and rising European gate fees over the coming years by planning for this waste stream to be re-shored over the medium term.

Forecasting UK infrastructure requirements for refuse derived fuel and solid recovered fuel has to take account of future trends in European thermal treatment capacity, as well as the sensitivity to 'price switch' points at which waste derived fuel is more likely to be retained for thermal treatment within the UK rather than exported to Europe. For this latter reason, we have, in the first instance, opted to assess the movement of refuse derived fuel and solid recovered fuel to export or domestic outlets.

The concept is illustrated in this figure, for the South East trading zone:

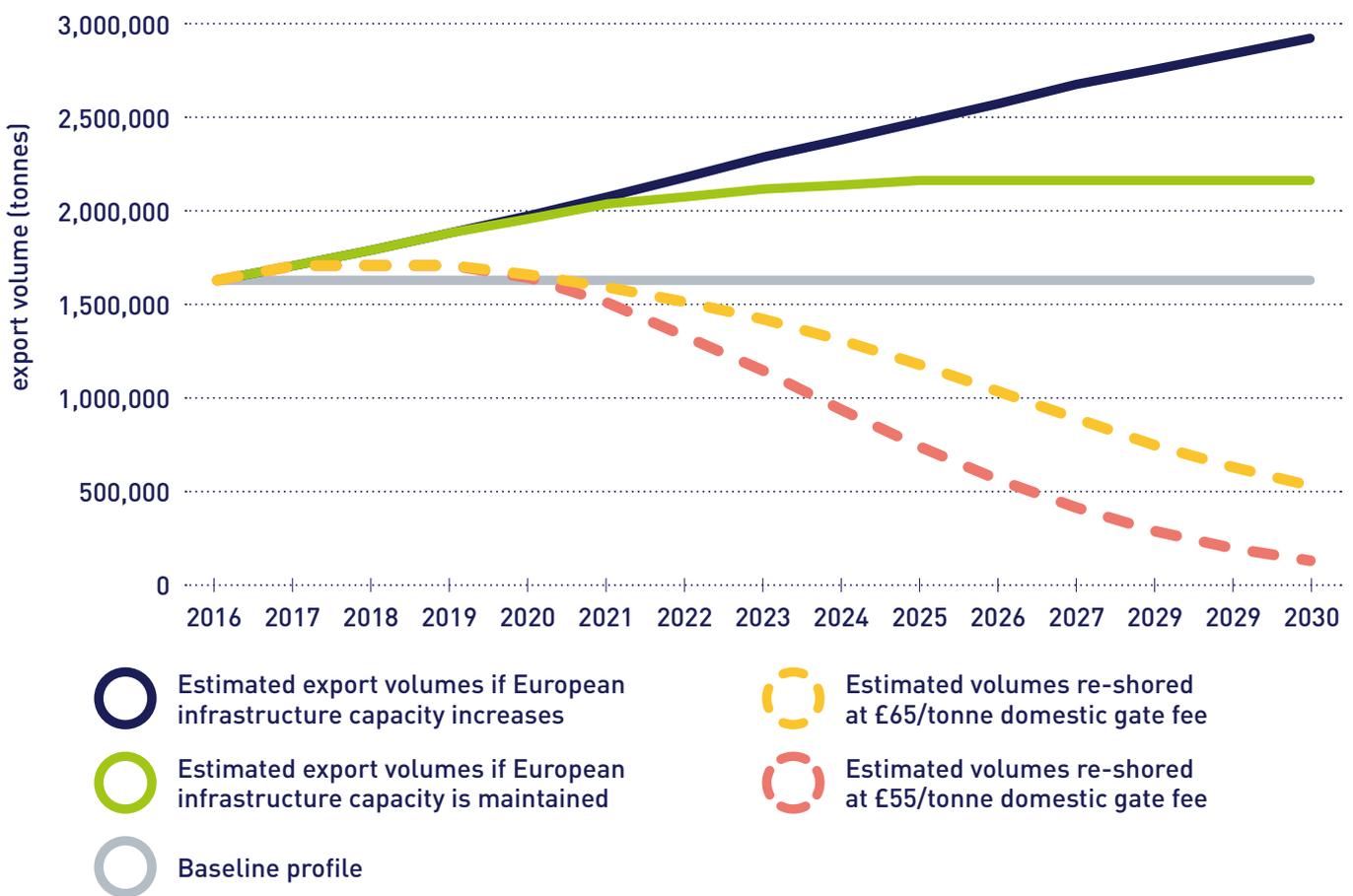


Figure two · Export tonnage effect

This figure shows the modelled effect of export tonnages over time, based on a range of economic scenarios. These scenarios will have an impact on domestic infrastructure capacity requirements, which will vary by region. The colours in this chart are reflected later in the regional capacity modelling for the South East.

The 'baseline profile' depicts the continued export of fuel to European destinations at the current rate, sustained until 2030. The solid green curve above the baseline profile represents our estimate of the increased export of fuel (in tonnes) to European destinations assuming current European infrastructure capacity is maintained, while the solid blue curve represents the additional tonnage exported assuming reported new infrastructure capacity investments and more recycling in Europe are built out and brought on stream by 2030.

The effect of price switch points is illustrated by the broken curves, with fuel switching back to UK energy-from-waste facilities at notional domestic gate fees of £55 and £65 per tonne ex-transport. These scenarios are representative of low and median gate fees (in the range £55 to £75 per tonne) charged in the UK in 2016/17, as reported in Tolvik Consulting's UK Energy from Waste Statistics – 2016 and WRAP's annual gate fee report, and are therefore valid as potential current price switch points.

At these switch prices, export to European outlets becomes uncompetitive, making re-shoring commercially viable. Whether or not these gate fees will apply in practice depends on the interplay between landfill and energy-from-waste capacity in a particular trading zone. We discuss this further in our summary section.

The final step is to set our estimates of fuel feedstock movements, both exported to Europe and re-shored back into the UK, against UK energy-from-waste capacity estimates to 2030. This enables us to arrive at a range of forecasted energy-from-waste capacity surpluses or deficits that vary by trading zone and over the period under study. For example, as the residual waste treatment market reacts on a local, national and international basis to the normal rules of supply and demand, depending on the scenario, a region could be in surplus until (say) 2023 but in deficit thereafter.

We have illustrated these forecasts in three particular trading zones – the M8 Corridor, the M62 Corridor and the South East – in the following sections of this report.

How the residual waste treatment capacity gap is represented

For each of the three trading zones presented in this report, we have modelled the combined effect of our projected profiles over the period 2017-2030 for residual waste arisings, including exported refuse derived fuel and solid recovered fuel.

Residual waste treatment processes cover:

- ▶ **Installed energy-from-waste capacity**
- ▶ **Mechanical biological treatment**
- ▶ **Alternative fuels conversions (for example, combustion of wood waste)**
- ▶ **Combustion in industrial kilns**
- ▶ **Landfill void space**

The outcome of the modelling is depicted in a series of bar charts, which provide a year-on-year estimate of the residual waste treatment capacity gap – either positive (capacity deficit) or negative (spare capacity) relative to the tonnages of residual waste requiring treatment.

Each colour in the bar charts relates to the corresponding coloured curve, with its associated modelling assumptions for export / re-shoring activity, as shown in figure two.

Each trading zone is represented by two bar charts showing capacity implications under two recycling assumptions relating mainly to household waste, to illustrate how recycling policy might also influence the capacity gap.

Data limitations

As noted in our 2014 assessment of residual waste infrastructure requirements, UK waste management operators and policymakers must contend with poor data, both in terms of coverage and granularity. While for municipal waste, well-established electronic reporting systems such as WasteDataFlow have ensured timely and reasonably reliable information on waste arisings, this is not the case for commercial / industrial and construction / demolition waste.

Until improvements to the present system are introduced, SUEZ has to rely primarily on its extensive municipal and commercial customer base, supplemented by in-depth sectoral surveys and on-board weighing for our commercial and industrial customers. SUEZ has an active programme of digitisation, data management and data analysis, enabling us to improve the accuracy with which we can profile the specifics of our customers' sectors. While our contribution to data generation is still a snapshot of the total commercial / industrial market, the rolling nature of data capture from our customer-facing frontline services makes it a more robust basis for making forecasts of current waste arisings than reliance on the most recent government waste arisings survey dating from 2010.

Indeed for commercial / industrial waste arisings, we have elected to rely on Defra's data, published in the Digest of Waste and Resource Statistics – 2017 Edition (March 2017) which shows 27.7 million tonnes arising in 2014, as opposed to later, much-reduced, estimates.

Whereas earlier attempts to put in place a more robust data collection system have faltered, Waste Data in the UK, a report for the RWM Ambassadors, recommended to government a route map for improvement which is being actioned in part by government, with the participation of SUEZ and other waste management operators.

analysis of the M8 corridor

Waste arisings

The M8 corridor trading zone comprises approximately 78% of Scotland's population, contributing a corresponding amount of municipal and commercial and industrial waste. The majority of these areas are expected to increase their populations, in some areas in excess of 20%. In the commercial and industrial sector, growth has been shown in the following sectors since the mid-1970s: distribution, hotels and catering, business services and finance, and government and other services.

These areas are particularly heavily represented in the M8 trading zone. Manufacturing has shown a sharp decrease, although it still represents a significant sector of activity.

With the Scottish government taking an active and directional role in waste management, we expect to see a continued reduction in the production of municipal and equivalent construction and demolition waste over time. Due to an expected increase in commercial and industrial activity, net waste production in the commercial / industrial sector is expected to increase slightly.

Landfill

Scotland is currently heavily committed to landfill treatment for its residual waste, but the number of new alternative facilities in build, or expected to be delivered, will divert much of the residual waste into energy-from-waste facilities. Further increases in recycling will remove some materials from the current residual waste stream and direct it into recycling activities (for example, food waste to anaerobic digestion). The M8 corridor is no exception.

Landfill void space will continue to decline rapidly as sites are filled, reach the end of their permitted operational period or are closed early for economic reasons, such as those included by impending landfill bans. We expect the zone to lose around 68% of its operating active waste landfill sites by 2030, leaving around eight sites operational in the trading zone by 2030. This should be sufficient to manage municipal waste and its equivalents that cannot be recycled or used for energy recovery beyond 2030. A surplus of landfill capacity is expected through this transition.

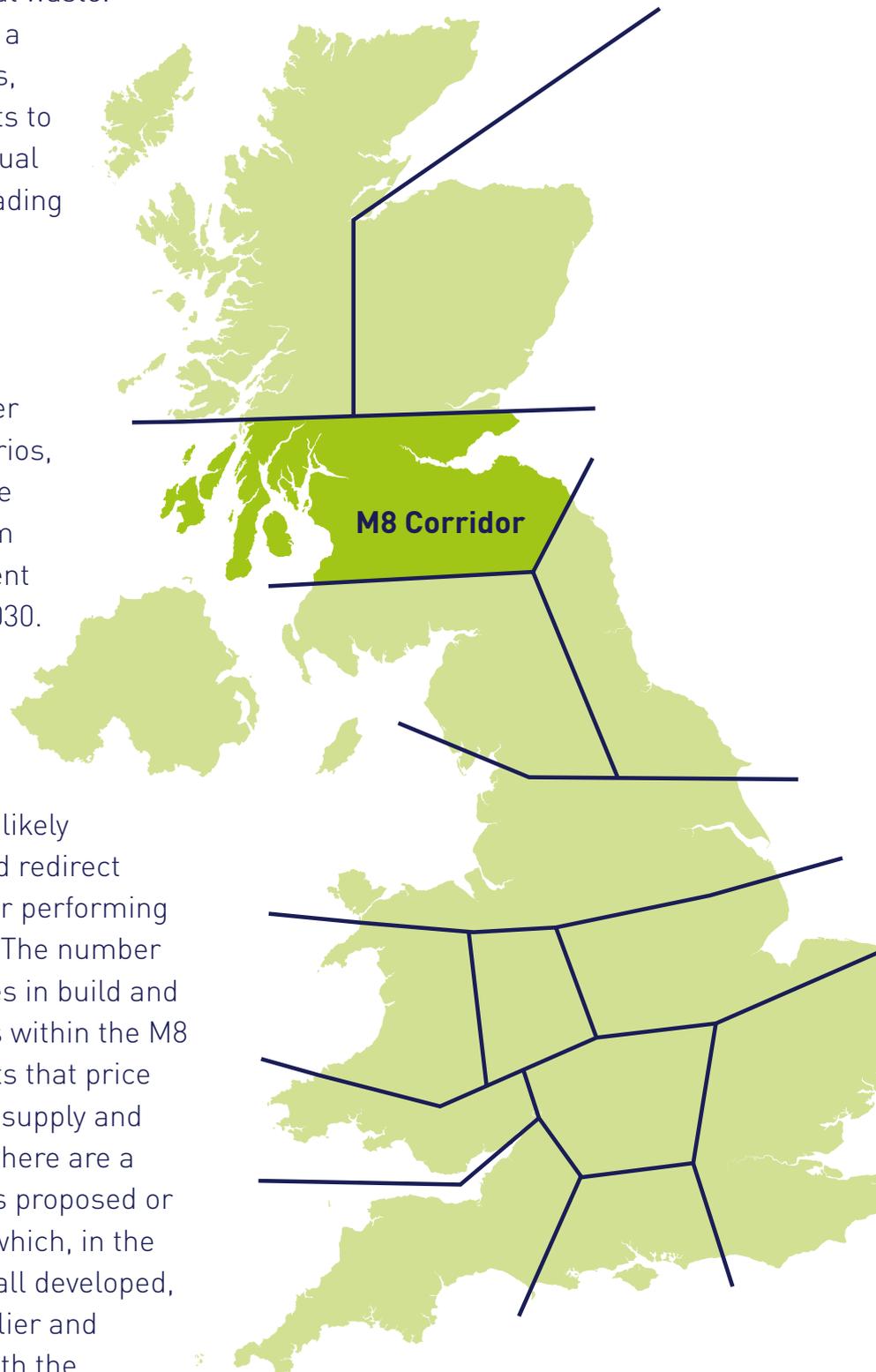
Energy-from-waste

Exports of refuse derived fuel and solid recovered fuel from this trading zone have not played a particularly significant role in the management of residual waste.

Although we have considered a number of potential scenarios, we do not expect these exports to play a significant role in residual waste management in this trading zone through to 2030.

Prospects

Based on our higher and lower recycling performance scenarios, we expect the M8 trading zone to reach its design equilibrium for domestic thermal treatment capacity between 2027 and 2030. If the modelled higher recycling performance is achieved then there is a small risk of overcapacity beyond 2028, which would be likely to curtail exports of waste and redirect waste from some of the lesser performing energy-from-waste facilities. The number of energy-from-waste facilities in build and the availability of landfill sites within the M8 corridor trading zone suggests that price stability through a balance of supply and demand will be maintained. There are a significant number of projects proposed or in early development stages which, in the unlikely event that they were all developed, could create overcapacity earlier and create potential imbalance with the recycling targets and facilities.



Landfill sites and void space

- Void space remaining (m³)
- Number of operating sites

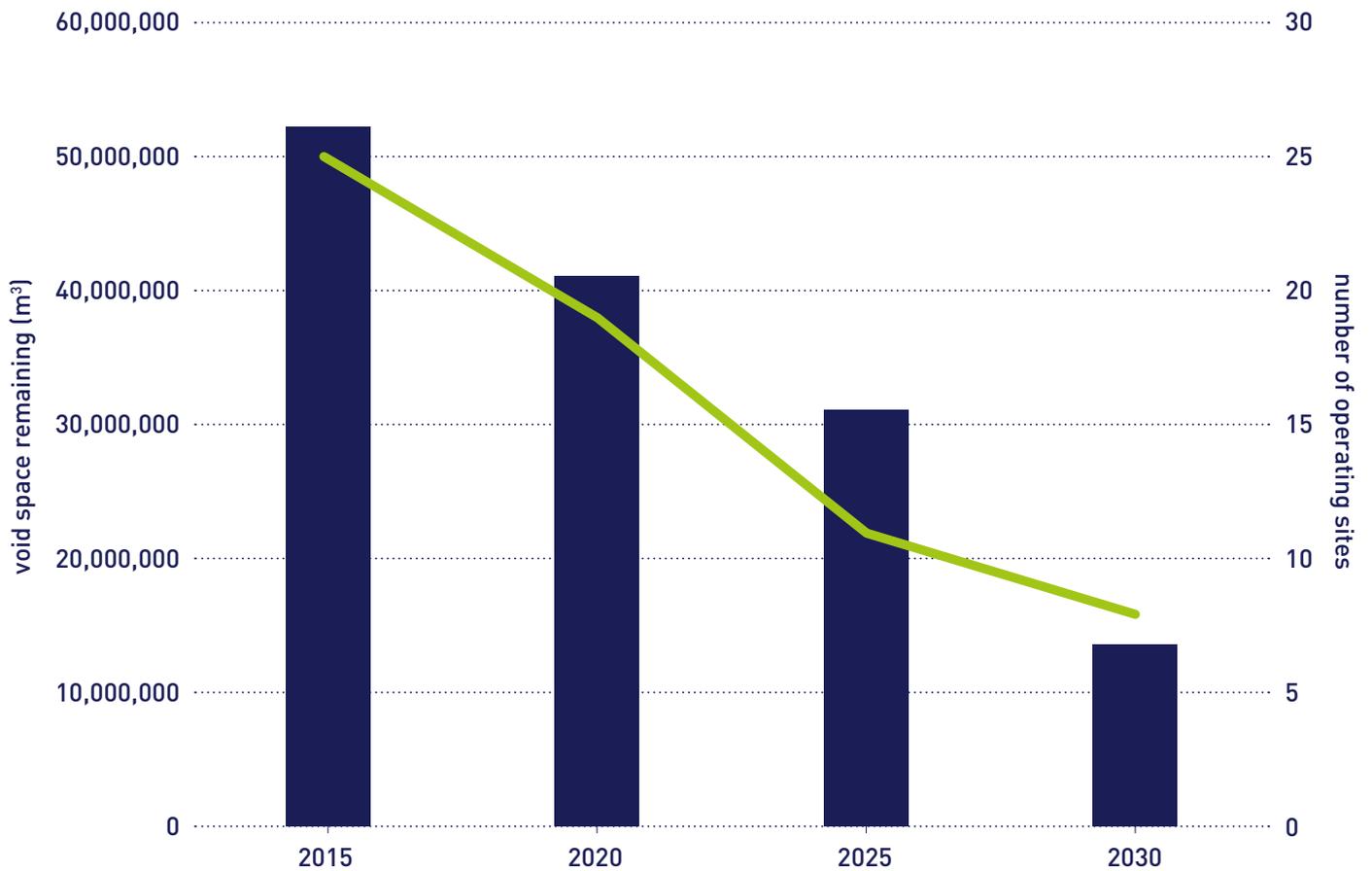
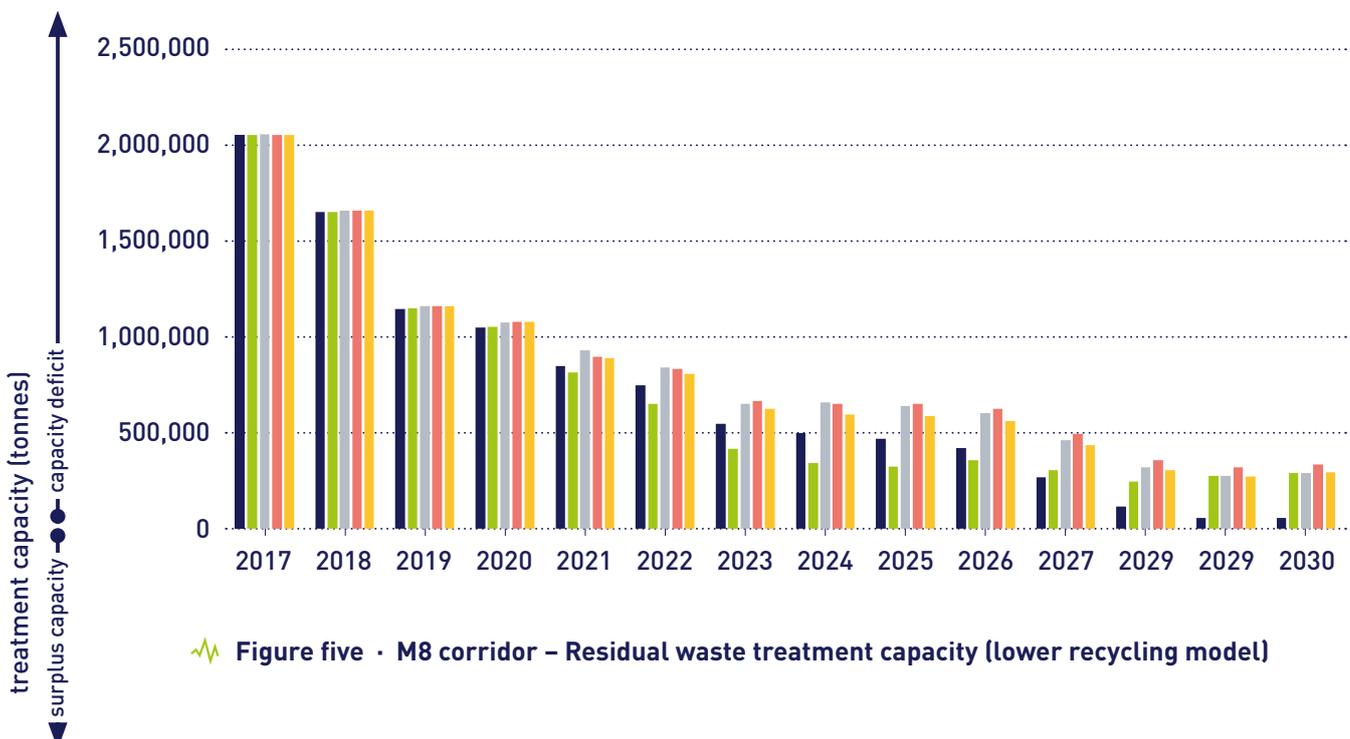
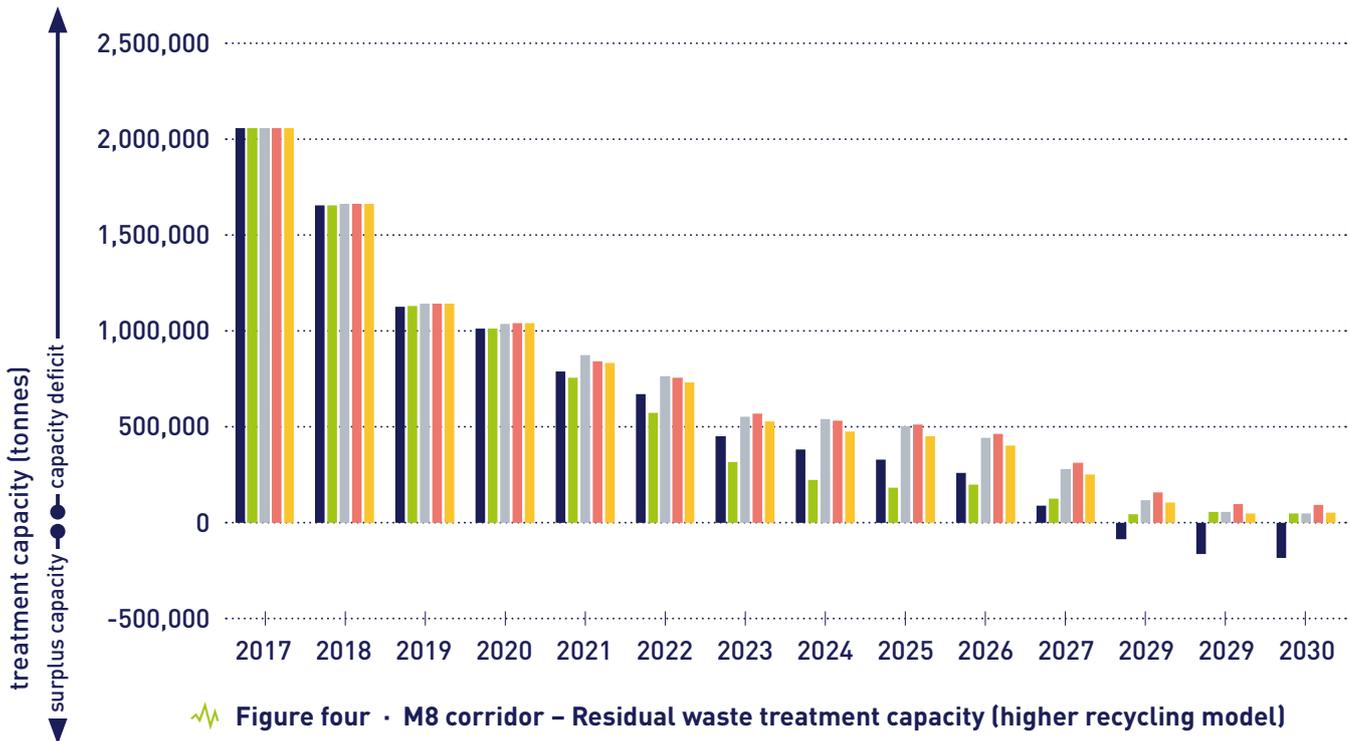


Figure three - M8 corridor trading zone – Landfill sites and void space model

Refuse derived and solid recovered fuel

- Estimated export volumes if European infrastructure capacity increases
- Estimated export volumes if European infrastructure capacity is maintained
- Baseline profile
- Estimated volumes re-shored at £65/tonne domestic gate fee
- Estimated volumes re-shored at £55/tonne domestic gate fee



analysis of the M62 corridor

Waste arisings

The M62 corridor encompasses a population in excess of 13 million and a number of major industrial and manufacturing zones, stretching from the Irish Sea to the North Sea. The population is forecast to grow around 7% by 2030 with the associated increase in households, employment and commercial and industrial activity. The trading zone spans very rural population areas to urban centres like Manchester and Leeds. Industrial activity ranges from heavy primary industries to high-tech manufacturing and research (containing over 20 universities) through to industrial farming in the east. Dominated by manufacturing, the zone accounts for over 10% of the UK Gross Value Added (GVA) in 2013. Growth in GVA across this zone has exceeded 20% through the period 2004-2013.

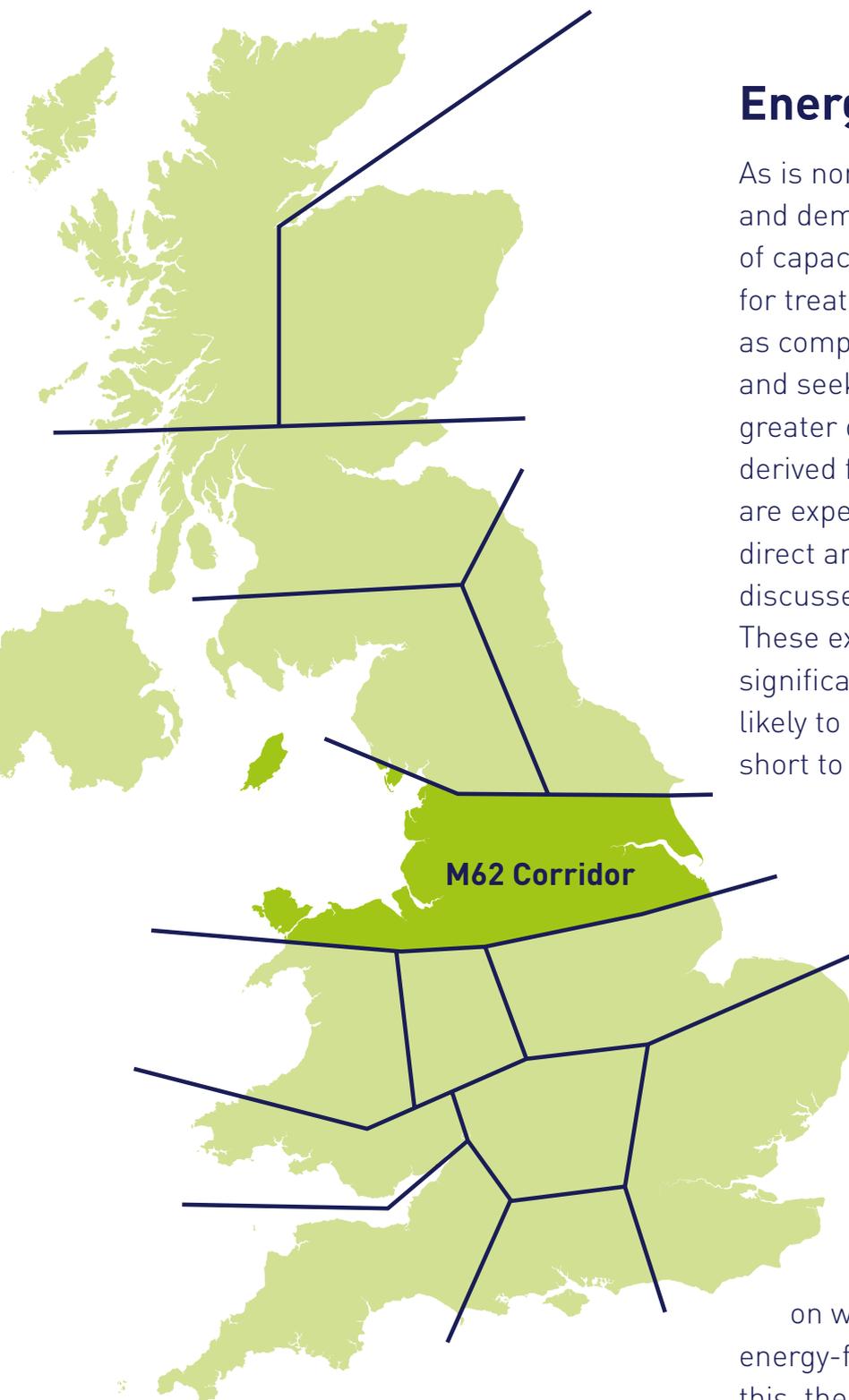
This trading zone is the focus of much of the Northern Powerhouse plans to drive new growth and productivity, particularly in the areas of the knowledge-economy and transport infrastructure.

The trading zone has a number of energy-from-waste solutions delivered and a number also in build. Performance of some of the mechanical biological treatment projects has been relatively poor, with more materials arising from processes flowing into

thermal treatment solutions than would originally have been expected. Other projects look likely to complete within the modelling period and will continue to allow the diversion of waste from landfill.

Landfill

The trading zone contains a high number of landfill sites and substantial waste void capacity. Despite the significant residual waste arising, it is expected that nearly 20 active waste landfill sites will remain in operation in 2030 with a void capacity remaining in excess of 20 million cubic meters. Modelling the actual, in-build and probable / possible projects, it would appear that the zone will move into energy-from-waste over-capacity between 2024 and 2027 depending on the success of recycling. Delivery of new residual waste recovery facilities is likely to respond to a closing of the capacity gap and should either reflect the balance of supply and demand or seek to draw in waste from other areas where non-landfill residual waste treatment is lagging behind capacity need. It is further expected that a number of landfill sites will prove uneconomic before they are full and their void space will either be written off or mothballed to await improved market conditions.



Energy-from-waste

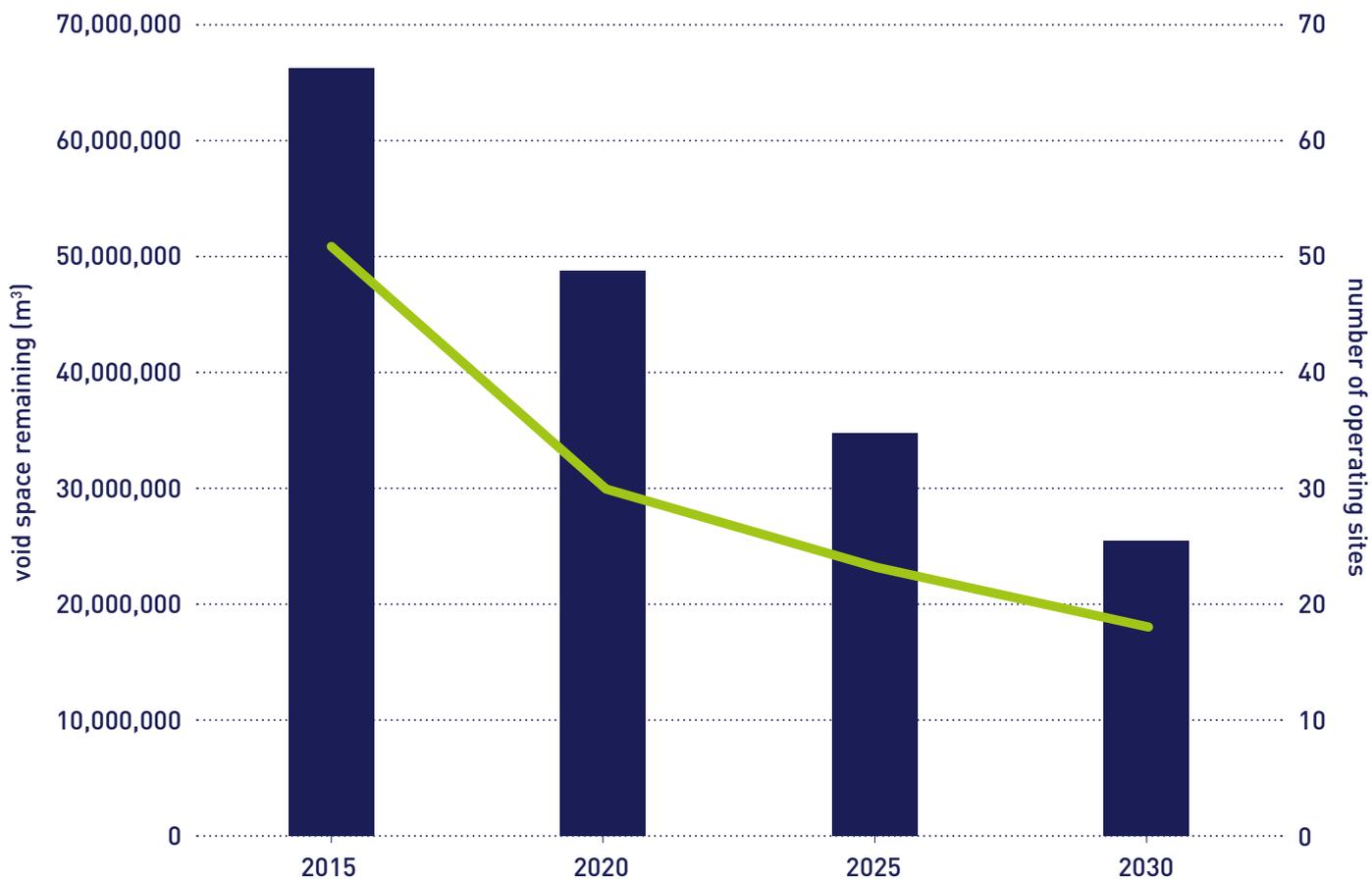
As is normal with market supply and demand, when the supply of capacity exceeds the demand for treatment, prices are likely to fall as competition for feedstock rises and seeks to attract waste from greater distances. Exports of refuse derived fuel and solid recovered fuel are expected to decline through the direct and indirect impacts of Brexit, discussed earlier in this report. These exports from this trading zone are significant and therefore re-shoring is likely to result in capacity issues in the short to medium term.

Prospects

The lack of national or regional policy creates a political and policy risk that could significantly move the direction of travel on landfill, on recycling, on waste production and on energy-from-waste. Added to this, the ambition of the Northern Powerhouse, and a growing population, one can see that this trading zone needs strong strategic direction and would benefit from policy and regulatory certainty.

Landfill sites and void space

- Void space remaining (m³)
- Number of operating sites



⚡ Figure six - M62 corridor trading zone – Landfill sites and void space model

Refuse derived and solid recovered fuel

- Estimated export volumes if European infrastructure capacity increases
- Estimated export volumes if European infrastructure capacity is maintained
- Baseline profile
- Estimated volumes re-shored at £65/tonne domestic gate fee
- Estimated volumes re-shored at £55/tonne domestic gate fee

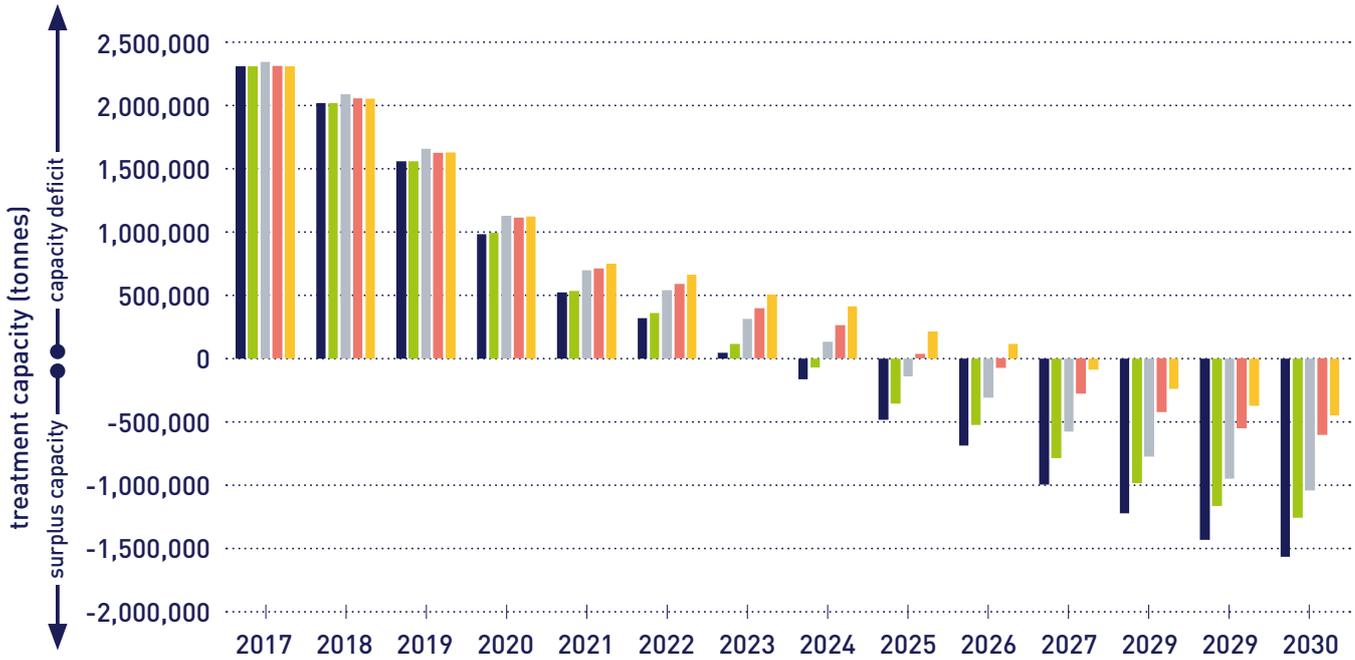


Figure seven - M62 corridor - Residual waste treatment capacity (higher recycling model)

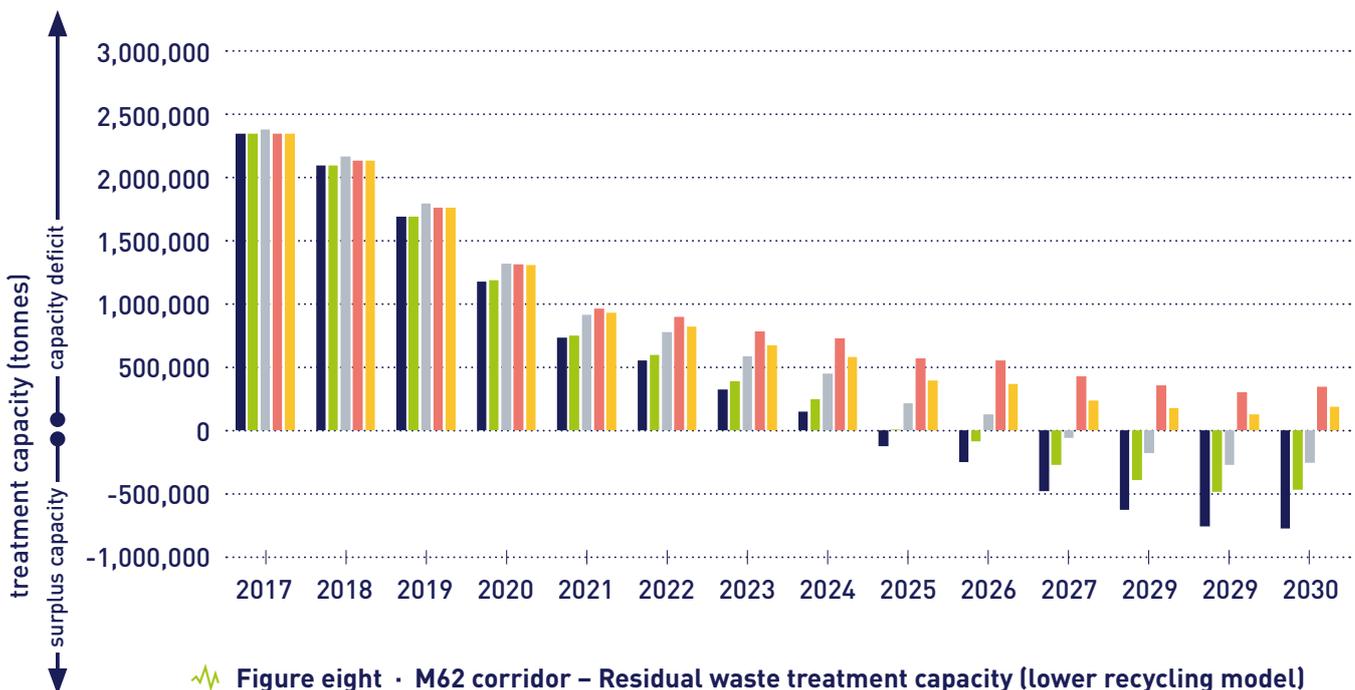


Figure eight - M62 corridor - Residual waste treatment capacity (lower recycling model)

analysis of the South East

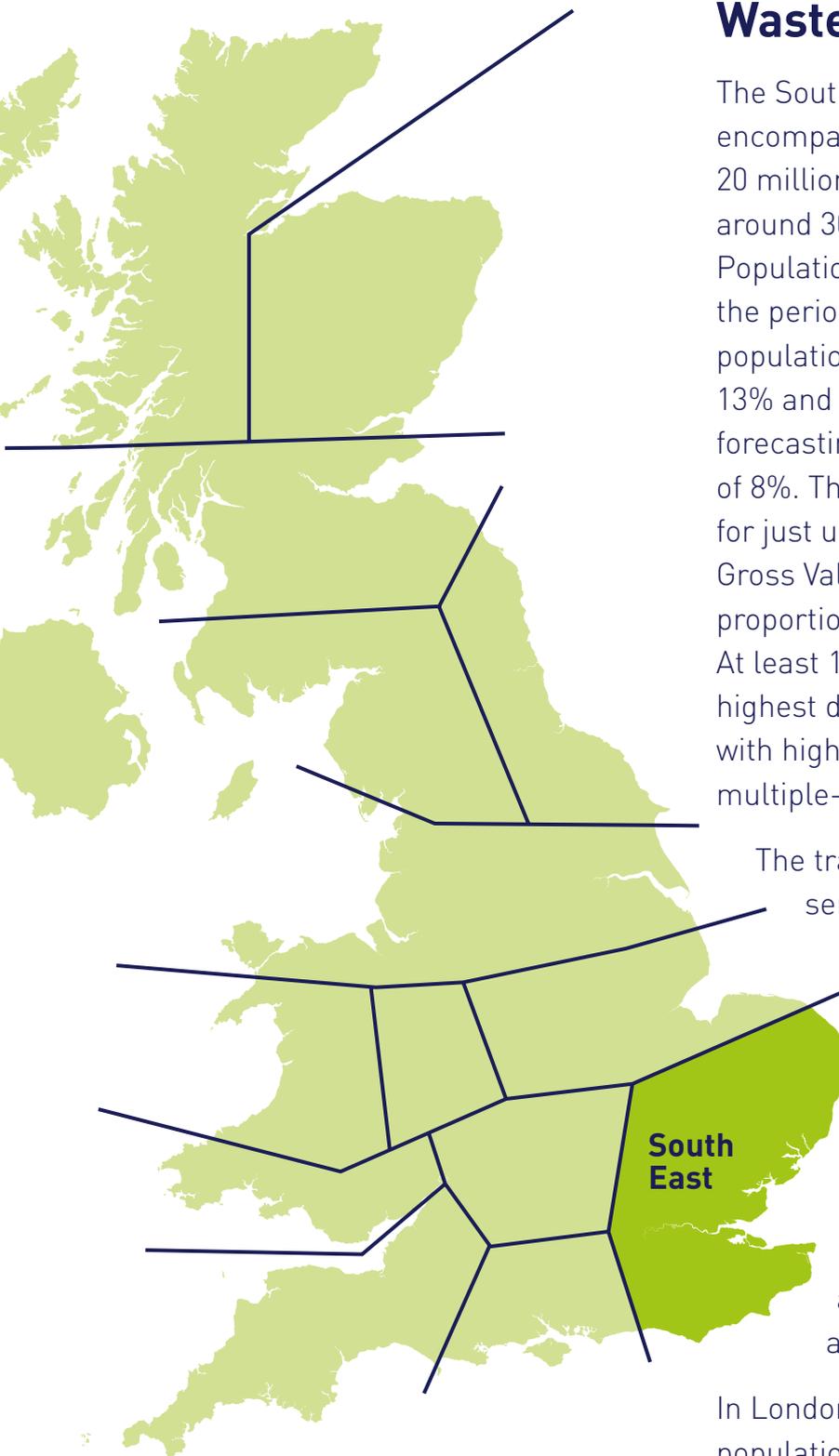
Waste arisings

The South East trading zone encompasses approximately 20 million people, accounting for around 30% of the total UK population. Population growth is significant over the period of this study, with London's population growing at a rate of over 13% and the wider region generally forecasting population growth in excess of 8%. The trading zone accounts for just under 40% of the UK total Gross Value Added (GVA) and a similar proportion of registered businesses. At least 16 Boroughs in London have the highest density of population in the UK, with high proportions of high-density and multiple-occupancy dwellings.

The trading zone is serviced by a series of radial roads from London and the M25, often mirrored by rail transport routes.

The trading zone also incorporates significant port facilities for inbound and outbound goods. The Port of London handles 48 million tonnes of cargo per year and the airports manage around 60% of all air passengers in the UK.

In London, currently less than 3% of the population work in the manufacturing sector with most GVA and employment being in the service, management and finance / insurance sectors.



Landfill

The South East trading zone currently has over 45 operating landfill sites receiving active residual waste, but is expected to see a rapid decline in numbers and available capacity through to 2030. This will arise generally through natural closure when the sites are full or when they reach the end of their planning permission. It is unlikely that landfill operators will seek to close sites prematurely for economic reasons unless export of refuse derived fuel and solid recovered fuel significantly grows (which is not expected) or if the economic fundamentals change, for instance through unrestricted export and a significant rise in landfill tax. The area to the north of the Thames will over time be relatively better served by access to landfill than south of the river, which may give rise to local shortage of access or increased transport distances.

Energy-from-waste

The zone has also been at the forefront of the export of refuse derived fuel and solid recovered fuel to overseas markets, with around 50% of all UK exports in 2016 originating within its boundaries.

There are a large number of new plants in build which will become active in the next two to three years, as well as prospected plants that are likely to progress through the financial close and build phase. There is a significant subset of prospects that will fail to deliver and write off their development costs.

Prospects

We have applied probability assessments to all the projects that are not yet in build for new residual waste treatment – including combustion, gasification, mechanical biological treatment and alternative fuels. We have taken a market view on fuel exports – before and after Brexit – and the anticipated costs of exported material, and have compared against modelled domestic price switch points. This has given a delivery forecast of new facilities which, when deducted from the headline residual rates, gives a net capacity gap. In both presented scenarios there will still be a need for landfill through to at least 2028 and very probably well beyond 2030. Over-capacity will occur only with unconstrained fuel export growth through to 2030, which could almost double the trading zone's export of fuel to Europe.

Supply and demand balance will be maintained though the majority of the period through the use of landfill and fuel export. If fuel export becomes constrained (by either price or access to capacity) it is unlikely that significant new landfill void space would become available and as such prices may rise for residual disposal in this scenario.

Landfill sites and void space

- Void space remaining (m³)
- Number of operating sites

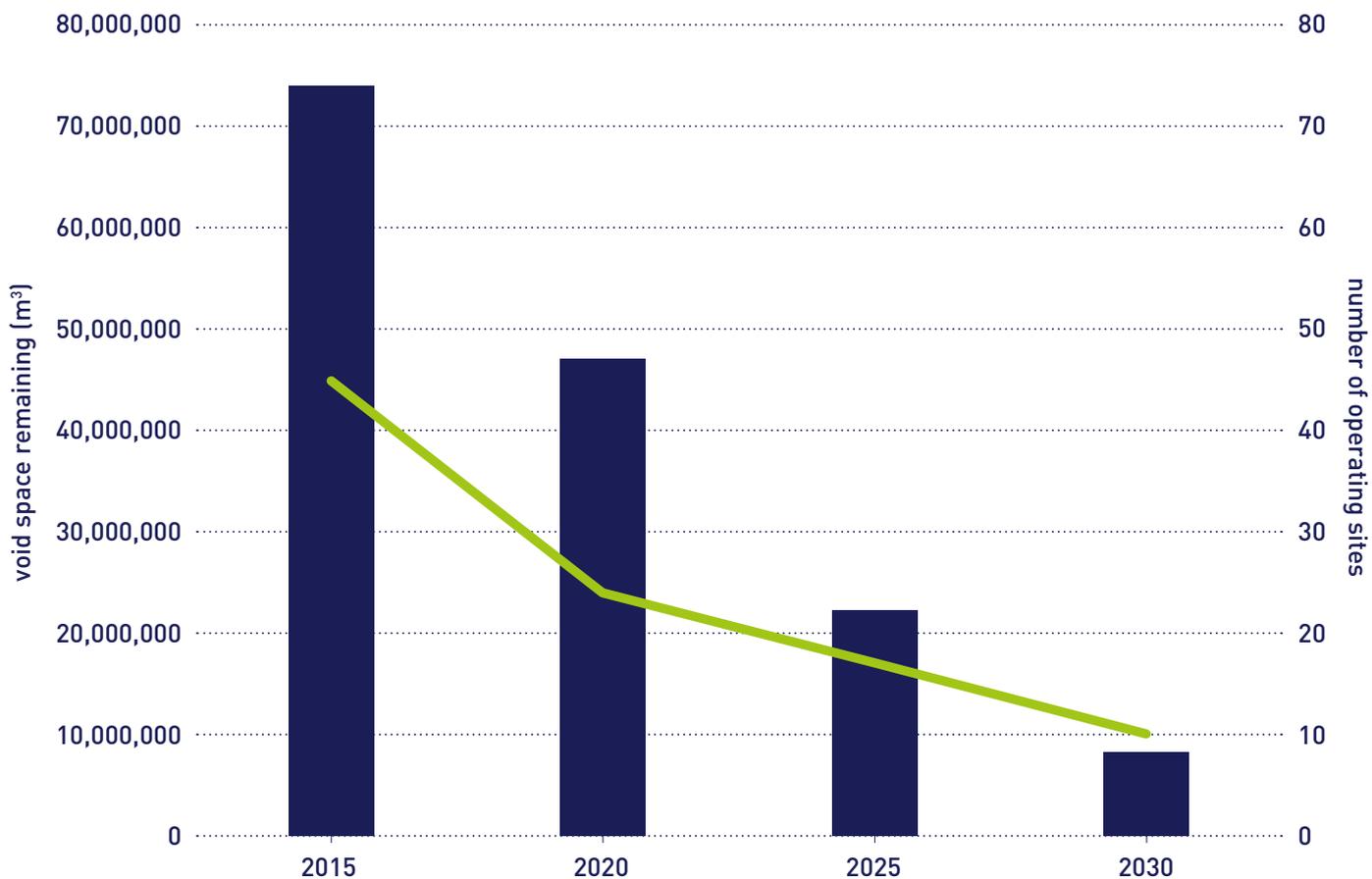
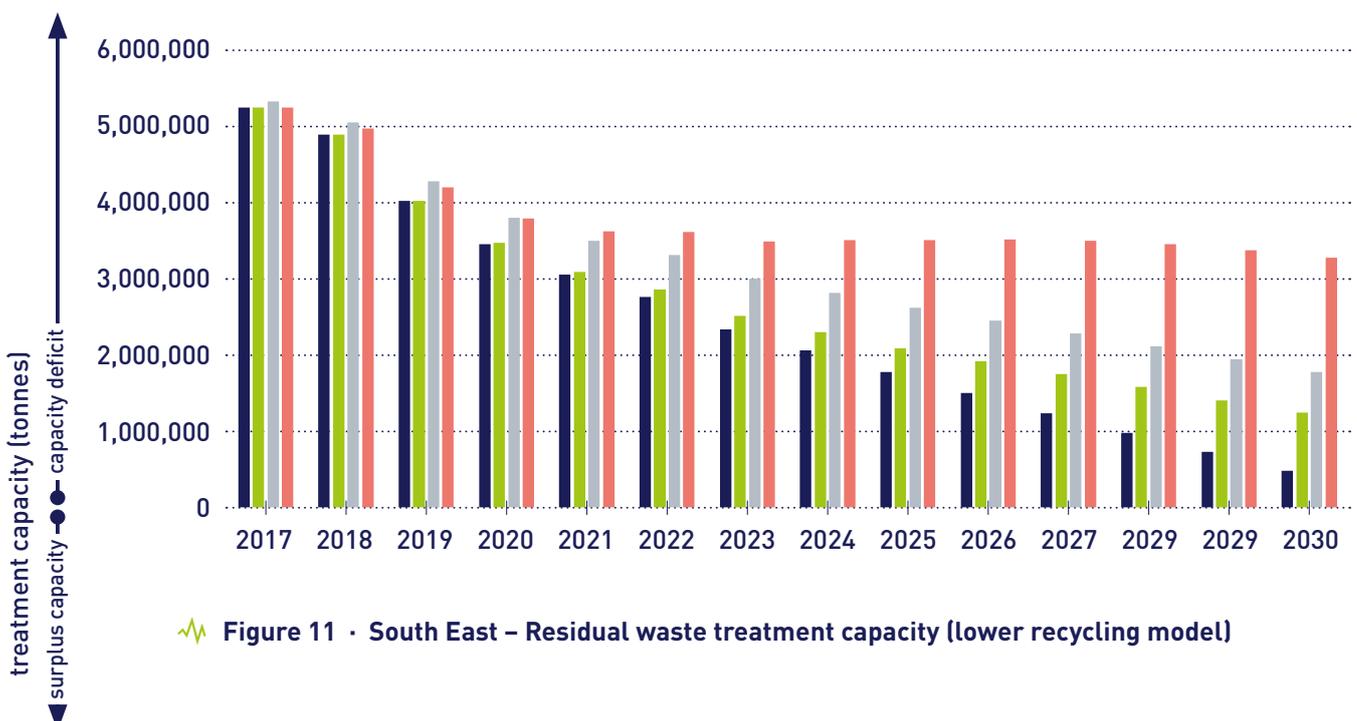
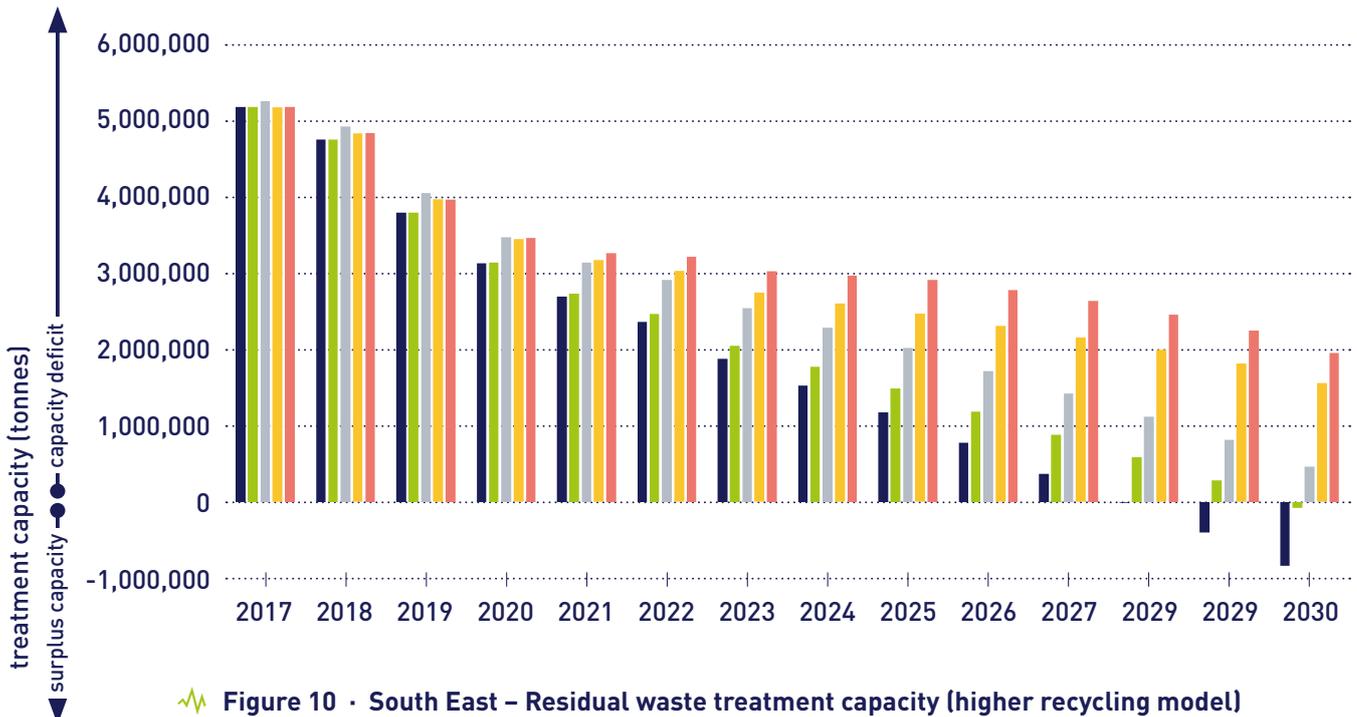


Figure nine - South East trading zone - Landfill sites and void space model

Refuse derived and solid recovered fuel

- Estimated export volumes if European infrastructure capacity increases
- Estimated export volumes if European infrastructure capacity is maintained
- Baseline profile
- Estimated volumes re-shored at £65/tonne domestic gate fee
- Estimated volumes re-shored at £55/tonne domestic gate fee



the capacity gap

Our study indicates that national assessments of residual waste infrastructure capacity mask significant differences in landfill and energy-from-waste availability across the country. Furthermore, these national studies have tended to treat individual treatment options as ring-fenced entities insulated from the dynamics of the wider residual waste market. On the contrary, we contend that residual waste movements into landfill and energy-from-waste infrastructure are closely aligned:

- ▶ In zones where adequate landfill capacity remains, landfill gate fees (plus transport costs) in effect cap energy-from-waste gate fees. Going forward, the rate of landfill tax will influence feedstock availability into energy-from-waste facilities reliant on the same catchment.
- ▶ In other zones, operating landfills are in decline or will become so few in number within five years as to not significantly influence local energy-from-waste gate fees – the latter will be set by spare capacity in thermal and other residual waste solutions, and/or the cost of transport to alternative treatment facilities.

In turn, domestic energy-from-waste gate fees, set against gate fees at European off-takes (which are influenced by market drivers related to current and future EU waste management legislation), will determine the commercial viability of re-shoring of exported refuse derived fuel and solid recovered fuel. The ability to capture materials and cost-efficiently distribute them will become more important going forward, as materials move from under-capacity to surplus-capacity regions.

Fuel export markets will influence energy-from-waste availability and price in some UK regions more than in others – overseas capacity availability, exchange rate and quality standards on products and fines will all impact on the gate fee struck at domestic energy-from-waste facilities.

Our zonal and national assessments of energy-from-waste capacity are presented here in figure 12 and the following table.

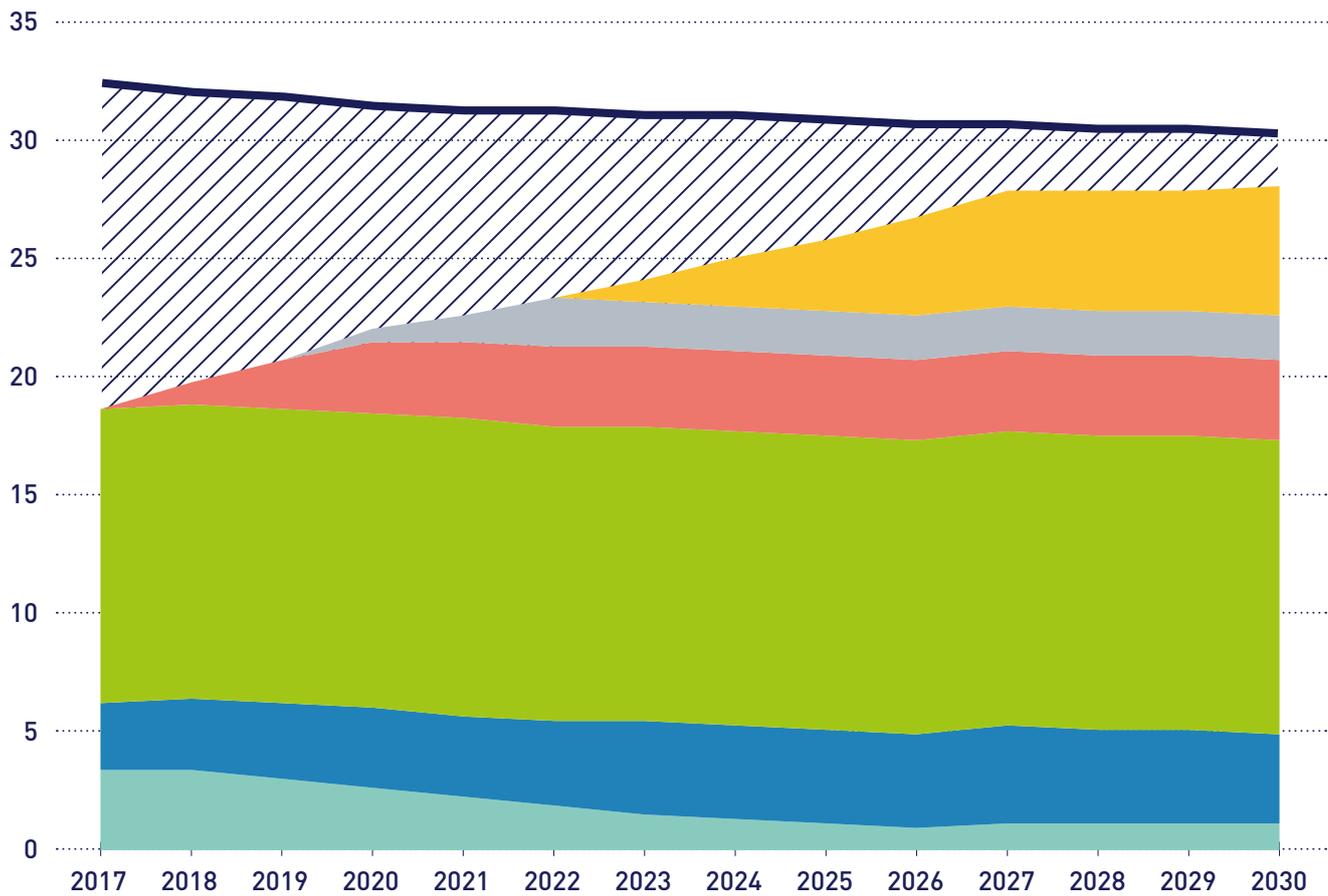


Figure 12 - The UK residual waste treatment capacity gap 2017-2030

	UK residual waste treatment capacity gap (million tonnes)		
	2017	2025	2030
Total UK waste arisings	32.2	30.8	30.4
Total UK treatment capacity (energy-from-waste + exports + others)	18.6	26.2	28.0
Net residual capacity gap	13.6	4.6	2.4

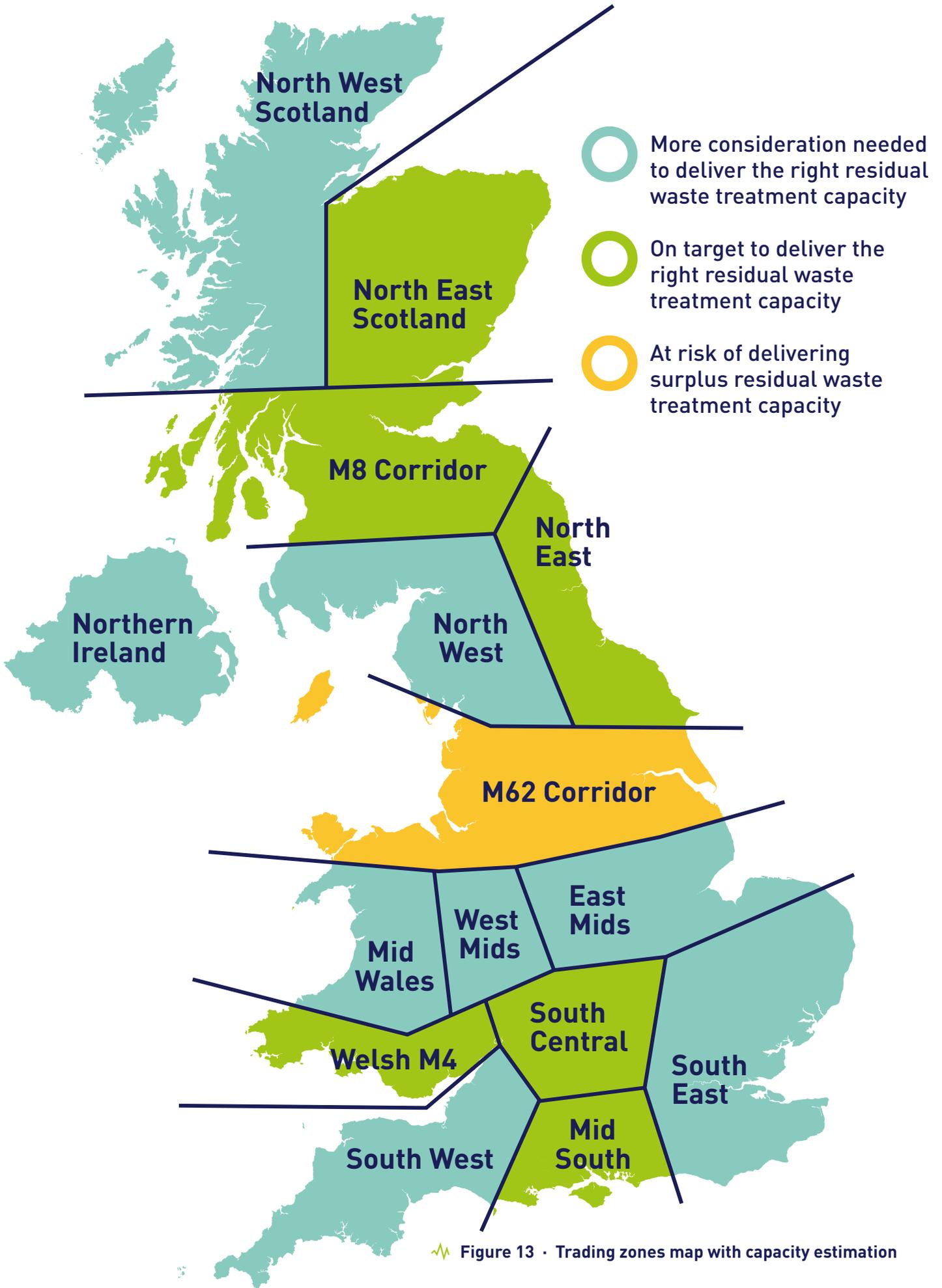


Figure 13 · Trading zones map with capacity estimation

To summarise SUEZ's assessment of waste growth and energy-from-waste capacity requirements to 2030:

- 1 We estimate that the normalised UK average municipal and commercial / industrial total waste arisings will grow by 9% through the period 2017 to 2030.
- 2 Based on current infrastructure deployment and market trends, we estimate total residual waste treatment capacity will rise from 18.6 million tonnes per year in 2017 to 28 million tonnes per year in 2030 – a net rise of over nine million tonnes per year of new capacity. Total recycling is modelled to generally increase and therefore the required rise in new treatment capacity is adjusted for a gradual and modest decrease in the overall volume of residual waste requiring treatment. However, it is expected that over £1 billion of new investment will be required to deliver the associated new recycling infrastructure.
- 3 The trading zones themselves show significant variation in residual capacity treatment need, but all zones in 2017 require significantly more treatment than they currently have in place. A number of areas are making good progress to meet their capacity needs whilst others are heading towards under or surplus capacity.

- 4 Taking into account waste growth and projections of new waste infrastructure deployment based on current trends, we estimate the national net capacity gap for energy-from-waste and other non-landfill residual waste treatment facilities to be around 4.6 million tonnes in 2025 and 2.4 million tonnes in 2030, albeit with significant zonal variations, assuming no re-shoring of exported refuse derived fuel and solid recovered fuel beyond that modelled.
- 5 Switch prices of £55 and £65 per tonne (ex-transport) support a business case for re-shoring exported refuse derived fuel and solid recovered fuel. The degree to which this occurs will vary according to the availability of overseas capacity and full costs of service (transport, tariffs, etc) and domestic landfill and energy-from-waste capacity and price. Under these conditions of complete re-shoring, the national net capacity gap for energy-from-waste is forecast to be one to two million tonnes per year higher than shown in the modelling scenarios.

Our study indicates that a more nuanced approach to future national infrastructure requirements is called for, and that new facility delivery must take into account regional conditions.

addressing the capacity gap

The stand-out conclusion from our assessment of the UK's future residual waste infrastructure requirements is that landfill capacity is declining faster than anticipated, so much so that trading zones such as the South East, incorporating Kent, and East and West Sussex, face the virtual elimination of local landfill site access by 2025. This has a knock-on effect on other forms of residual waste treatment, notably thermal treatment, currently the only other management option that can treat residual waste at scale. But even here, as many as eight of our modelled trading zones are forecast to still be in capacity deficit by 2030. Taken in conjunction with an uncertain European export market for refuse derived fuel and solid recovered fuel, the general outlook for the UK in the medium to long term is not encouraging.

In considering the capacity gap, one should also factor in planned shutdowns for energy-from-waste facilities which remove capacity for a number of weeks per year. Whereas with landfill there is an opportunity and flexibility for the waste to be delivered at alternative times, with energy-from-waste and most other residual waste treatment solutions, there is no opportunity to recover that treatment capacity. Facilities that suffer

unplanned shutdowns exacerbate the problem. In 2017, the volume of waste diverted through shutdowns at existing energy-from-waste facilities is likely to exceed one million tonnes, the equivalent of three to four average sized plants.

A confluence of adverse market signals threatens to derail the government's "long term vision for ... a more resource efficient and resilient economy", as stated in the green paper Building our Industrial Strategy (2017). A fall in recycling performance in 2016, presaged by flat-lining recycling rates in previous years, is a wake-up call and an advance warning that, without decisive policy action, there is a risk that the UK's hard-won resource productivity gains of the past 15 years will stagnate, or at worse slide into reverse. There exists a lack of future drivers to keep residual waste out of landfill, other than landfill tax – which despite its success to date is at best a blunt instrument.

While the UK has made admirable progress in moving up the value chain by diverting waste from landfill, we still sent to landfill upwards of 26.6 million tonnes in the last reported 12 months and are expected to need landfill capacity for over 2.4 million tonnes per year of active residual waste in 2030. Landfill capacity will also be required for wastes such as inert or some hazardous materials which are not included in these figures. Raising recycling rates goes hand-in-hand with the treatment of residues in processes that also recover value (such as in the form of energy). Perversely, with a forecasted shortfall in thermal capacity, especially if exported calorific material is re-shored, and the absence of a government-supported build initiative similar to the now-completed Private Finance Initiative programme, residual waste might well revert to landfill as the option of first resort were it not for the strong likelihood that, as noted above, landfill capacity could be in terminal decline in some parts of the UK.

To safeguard the progress the UK has made and to support continued resource productivity improvements, we make the following recommendations:

Recommendation 1

Admit that there is a capacity gap.

Government does not accept the view shared by the rest of the recycling and waste management industry that a capacity gap exists. Until Defra reviews its model and works with the waste management sector to agree the scale of the problem, no change will occur. This is a crucial first step.

Recommendation 2

Present a clear ambition for UK recycling and waste policy outside of the EU, backed up with hard policy measures.

UK recycling and waste management policy has been historically led by the EU. Once we leave the EU, what is the UK government's ambition and vision? Setting long-term targets supported by policy levers such as taxation, levies and incentives (see recommendation 5), will be the key to unlocking more private sector investment in treatment capacity.

The government must update the Waste Management Plan for England. The 2013 Plan has been rendered obsolete by stagnating recycling rates, a squeeze on domestic residual waste infrastructure capacity and an uncertain European export market – collectively constituting an impending market failure that England, the UK's largest waste management constituency, must address. In focusing on a 25-year horizon, the Defra Environment Plan will not address the immediate capacity crunch we face in the here-and-now. A dedicated, updated Waste Management Plan for England is called for – which must also be coherent with, and fully integrated into, the proposed UK Industrial Strategy, driving resource efficiency and resource productivity through the UK economy.

Recommendation 3

Address the UK's residual waste infrastructure requirements within the National Infrastructure Assessment programme. The waste management sector requires a regionally appropriate portfolio of assets. While on a local or regional basis our sector frequently falls below national infrastructure thresholds, when viewed as a source of supply of secondary raw materials and recovered energy, supporting the UK's industrial and domestic sectors, our sector in the aggregate assumes national strategic importance. The sectoral National Infrastructure Assessment should conduct a regional analysis of future processing and residual waste infrastructure capacity requirements, linking with the updated Waste Management Plan in addressing the immediate capacity shortfall identified in our assessment.

Recommendation 4

Recognise the contribution energy-from-waste makes to the UK's energy mix and integrate it into spatial plans for energy delivery to accommodate the repatriation of exported refuse derived fuel and solid recovered fuel back to the UK. Considering that the UK is searching for ways of addressing potential energy shortages in the years to come, making use of residual waste fuel is an obvious opportunity, both in the form of power and as heat. Energy generated from waste will generally be between 40% and 100% renewable and will therefore provide reliable green base-load power to the UK market. In addition to power, the potential for waste-related feedstock to engage in heat and transport fuel markets should also be addressed.

● Recommendation 5

Create and maintain a stable long-term policy framework.

Unlocking the significant private capital for the next generation of UK energy-from-waste facilities is contingent on the government committing to stable long-term policy and support mechanisms, so that companies have the confidence to plan for projects with an operating life of 20 to 25 years. Frequent changes and amendments to renewable energy and decarbonisation support policies, such as the Renewable Heat Incentive and the 95% cut in network connection payments to embedded generators (sometimes announced without consultation or adequate lead-in times), has drastically slowed the deployment of renewable energy and biomass projects and put future investment in these technologies at risk. Long-term visibility and stability are also needed with respect to the future trajectory of landfill tax and recycling targets.

● Recommendation 6

Put sustainability targets in place for industrial and commercial waste, and implement a reliable data-collection system to measure performance. For too long the UK has relied on small-scale ad hoc waste surveys which do not provide comprehensive national coverage and soon lose their currency. We urge government to continue with the collaborative approach building on the recommendations in the report *Waste Data in the UK*, involving sector operators and the devolved administrations, and to take this initiative to completion.



More information

For more information or to talk to us about this report, please contact our Technical Development Director, **Stuart Hayward-Higham**, on **01628 513100**

