Viridor Response to the NIC second baseline review Call for Evidence

Summary
Waste management is a significant infrastructure sector and a substantial source of emissions. Major investments into new UK waste infrastructure will be needed to deliver statutory recycling targets, meet Government carbon capture and storage ambitions, and enable delivery of net zero. This will have economic as well as environmental benefits: 100 new green jobs would also be created in UK reprocessing for each tonne of waste produced. Current policy frameworks are not sufficient to support waste infrastructure investment at the necessary scale. For recycling, EPR and other new policies will need mechanisms to mitigate the impact of short-term supply contracts and price volatility. For residual waste, Industrial Carbon Capture funding and business models should prioritise deployment of carbon capture and storage on energy from waste, on the basis it is cost-effective, scalable and can provide baseload CO_2 into the network. New heat policy and regulation is needed to address entrenched heat network investment barriers such as demand risk, otherwise Government heat ambitions will not be met.

Viridor is one of the UK's leading waste management companies, taking what British homes and businesses throw away and transforming it into essential, quality materials, resources, and energy.

The waste sector is the UK's seventh largest emitter of greenhouse gases. While deep emissions reductions have been achieved (63% between 1990-2019), this has largely been achieved through reduction in landfill, and over the past five years progress has stalled. Defra is enacting much-needed reforms to boost recycling rates and resource efficiency, but the Government's net zero policy is notably quiet on the contribution of sustainable resource management to meeting climate goals. Diverting one tonne of waste from landfill into an energy from waste (EfW) facility delivers a 41% reduction in emissions. While there will continue to be a requirement for residual waste treatment, recycling provides major resource and emissions savings. The production of virgin plastic generates lifecycle emissions up to 6 times greater than their recycled equivalent. The successful delivery of net zero will, therefore, require a fundamental shift towards a more circular economy.

Viridor is focussing its recycling and reprocessing efforts on plastic – a highly versatile material but one that needs to be carefully managed to prevent it becoming a harmful pollutant. The UK is not achieving a circular plastics economy due to a lack of recycling and reprocessing infrastructure. The UK's recycling rate for municipal waste is around 50% and domestic recycling capacity is currently insufficient to support achieving the 2035 target of 65%. The infrastructure gap is even bigger than it might appear: of the 50% of plastic packaging that is collected for recycling, 60% is exported.

It is a stated Government aim for new policy to stimulate an increase in domestic reprocessing capacity for packaging material. This ought to be a realistic proposition: a plastics reprocessing facility would typically require £50-60m CAPEX. Defra has been explicit that it expects current or planned policy to provide sufficient clarity and incentives for the market to provide the necessary scale and quality of recycling and reprocessing capacity. However there has been no evidence that demonstrates how these policies will materially change the investment landscape to enable financing of infrastructure at the necessary scale. For plastic packaging alone, new recycling capacity to hit 2025 targets would be in the region of 800kt, while the equivalent reprocessing would require eleven new 60kt plants.

While maximising recycling rates is vital, there will continue to be a sizeable proportion of waste that cannot be recycled: even high recycling ambition would still leave about a third of residual waste in 2030, according to the CCC. EfW represents the lowest carbon solution that can reliably operate at scale for the treatment of non-recyclable waste. The development of carbon capture (CCUS)

technologies on EfWs will be critical to start decarbonising residual waste from the late 2020s. The design of the Government's Industrial Carbon Capture business model will be key to enable investment in infrastructure to decarbonise residual waste. Furthermore, half of the waste treated in an EfW is biogenic (comes from renewable wastes), enabling CCUS to deliver negative emissions by capturing and permanently storing more CO_2 than the total fossil emissions from the EfW.

Finally, while EfW facilities' primary role is the safe treatment of waste, they can also harness waste heat and use this to generate electricity and, where heat networks exist, supply heat for industrial and domestic use. Government heat policy can help overcome investment barriers for heat networks, for example by introducing heat network zones with mandatory connection requirements, enabling heat providers to invest in the deployment of heat offtake from these facilities.

Question 1: Do the nine challenges identified by the Commission cover the most pressing issues that economic infrastructure will face over the next 30 years? If not, what other challenges should the Commission consider?

Collectively, the nine challenges identified by the Commission address the most critical issues facing waste infrastructure. However, the baseline report does not explicitly pick-up some important contributions the waste sector has to addressing some of these challenges. This includes the role of the circular economy in delivering net zero carbon emissions, as well as the potential for EfWs to anchor heat networks. Heat offtake from EfWs both supports the decarbonisation of heat and provides heat price stability by delinking fuel costs from the volatility of international gas prices, helping to combat sharp price rises in the midst of a cost of living crisis. We pick up this potential contribution in more detail in our answers to later questions.

Question 2: What changes to funding policy help address the Commission's nine challenges and what evidence is there to support this? Your response can cover any number of the Commission's challenges.

Challenge 2: The Government has brought forward substantial and welcome new funding to support infrastructure development in relation to industrial carbon capture and storage (CCS). Reforms to recycling policy will also substantially increase the money available to support development of new recycling and reprocessing infrastructure from 2023, as Extended Producer Responsibility (EPR) replaces the existing Packaging Recovery Note (PRN) system.

However for this funding to meet Government's CCS and recycling infrastructure goals, additional policy will be needed to mitigate specific risks faced by infrastructure project developers in these sectors. For infrastructure projects the risks need to be clearly understood and manageable. The greater the risk profile, the harder it is to make an investment.

The design of the Industrial Carbon Capture (ICC) business model for energy from waste facilities (EfWs) will be key in determining the viability of these projects. Unlike other eligible industrial sectors, EfWs are not subject to the UK's Emissions Trading Scheme. The sector will need clarity over how a carbon price will be applied within the ICC business model for EfWs – in particular what will happen if any carbon price cannot be passed through to customers – or there is a risk that the resulting lack of certainty over project revenues will inhibit or prevent projects being brought forward. The interplay with the Greenhouse Gas Removal (GGR) business model will also be significant, given the potential for EfWs to deliver negative emissions by permanently capturing and storing CO_2 from biogenic waste that is not considered to contribute to climate change.

Challenge 7: There is currently insufficient recycling infrastructure to meet the UK's recycling targets. In the absence of proposed new policies such as EPR, the policy framework is insufficient to underwrite strong investment cases. The current structure of the recycling market is built around

short-term supply contracts. Furthermore, as plastic is a globally traded commodity, recycling market participants are exposed to price volatility linked to movements in the oil price. Coupled with the historical financial bias for packaging export recovery note (PERN) over domestic PRN, this has resulted in the UK exporting significant volumes of recyclable material. This is not in line with the UK's current circular economy ambitions, offshores jobs and has the potential to undermine the UK's net zero ambition.

Question 3: How can better design, in line with the design principles for national infrastructure, help solve any of the Commission's nine challenges for the next Assessment and what evidence is there to support this? Your response can cover any number of the Commission's challenges.
No comment.

Question 4: What interactions exist between addressing the Commission's nine challenges for the next Assessment and the government's target to halt biodiversity loss by 2030 and implement biodiversity net gain? Your response can cover any number of the Commission's challenges.
No comment.

Question 5: What are the main opportunities in terms of governance, policy, regulation and market mechanisms that may help solve any of the Commission's nine challenges for the Next Assessment? What are the main barriers? Your response can cover any number of the Commission's challenges.
Challenges 2 and 4: In relation to decarbonisation and net zero, EfWs provide the lowest carbon, technically viable option to deal with waste that cannot be recycled, however this still produces CO_2 emissions. There are two ways which Viridor is currently exploring to decarbonise these facilities, through front end decarbonisation of the waste and the capture and usage/storage of CO_2.

Removing plastic from the residual waste stream prior to combustion is a promising route towards reducing EfW emissions and increasing the material available for recycling. Viridor has run trials at two facilities in Scotland that have indicated an ability to remove 16% of waste (70% in the form of plastics), thereby reducing the fossil emissions of a tonne of black bag waste by up to 281 $kgCO_2e$ i.e. it reduces the fossil emissions by more than half. However the separated material is highly contaminated with other materials, including food waste, and recycling these plastics to a good standard through mechanical processes is often not feasible. In response to this challenge, a rapidly growing field of exploration is chemical recycling. This converts plastics back into their constituent molecules and should enable potentially infinite recycling of plastics (plastic, like paper, has a finite life when mechanically recycled). Viridor is actively exploring chemical recycling.

CCUS is currently the only currently viable technology that can capture the CO_2 emissions from EfW to achieve reach net zero. The majority of EfWs are of very similar design therefore making CCUS replicable across the UK's fleet of EfWs with 41 currently operating with another 20 in development. This presents an opportunity to deploy at pace, rapidly decarbonising the waste sector and accelerating progress towards the UK's 2050 net zero goal. Some of the largest EfWs are close to industrial clusters, which if successfully included in the forthcoming CCUS funding rounds, could help reach the Government's target of capturing 20-30MT of CO_2 a year by 2030. EfWs also operate as baseload, 24 hours a day more than 90% of the year. With a typical operation lifespan of 25-40 years, backed by long term contracts, EfW with CCUS could provide a steady state CO_2 providing security of supply to early-stage transport and storage operations.

As we explained on page 1, the biogenic content of the waste processed in EfWs with CCU enables so-called negative emissions, which can help to decarbonise hard to abate sectors such as aviation and shipping. Current waste analysis shows an approximately 50% split in anthropogenic/biogenic

CO_2 arising from EfW. We are continuing to work alongside BEIS to develop the technical aspects of quantification of negative emissions potential.

Challenge 3: EfWs can also provide heat to local commercial and domestic premises. However the infrastructure needed for heat networks to meet at least 20% of overall heat demand is considerable – at least a five fold growth in infrastructure assets. Developers face a number of investment risks in relation to heat networks, such as unpredictable demand. These are set out in detail in question 9.

Government policy could support the deployment of heat networks through its emerging policy framework on heat network zoning. This will likely require the UK Government to set out standardised methodologies by which regions designate the most appropriate areas for heat networks. In addition, there will be new powers for Local Authorities to collect information about the local building stock, existing infrastructure, waste heat sources etc. and then to create heat network zones which will mandate connections by certain types of building e.g. larger commercial buildings. Whilst there remain many questions still to resolve in this policy (including resources and funding for Local Authorities or other regional bodies acting as Zoning Coordinators), it represents a positive step forward and a possible model for regional approaches across heat decarbonisation infrastructure. Nevertheless, the Government does not have a clear strategy at present as to how this scale of infrastructure deployment will be achieved. Whilst zoning is welcome, existing programmes (e.g. subsidy support programmes for heat networks such as the Green Heat Network Fund) and zoning are projected to achieve investment to meet 7% of heat demand by 2050 – far short of what is considered cost-optimal on a systems basis by the CCC.

Challenge 7: To date the recycling market has delivered limited infrastructure measured by both capacity and quality. There is little to indicate that current reforms will address this issue without additional intervention. The short-term nature of contracts in the waste sector makes infrastructure investments risky, and therefore expensive to finance. If a developer only has revenue contracted for three years, lenders will charge a high interest rate to ensure they make the absolute level of return they are looking for within those three years (fig 1). The typical breakeven point for a plastics reprocessing facility is around 8 years, yet the average contract duration in the market today is c. 3 years. This market structure results in reprocessors taking on high levels of merchant risk, which is passed onto consumers via higher pricing and costs/tonne. The ability to develop a long-term contract structure has the potential to materially reduce costs to the end consumer.

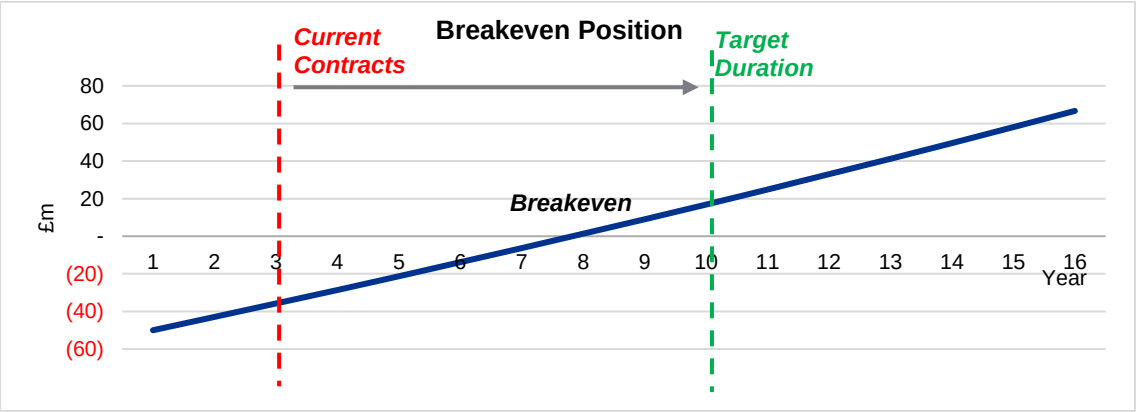

Fig 1: The challenges for recycling infrastructure investment: 3-5 year supply contracts do not cover the investment amortisation, which occurs after 7-8 years. New facilities built under these conditions are merchant plant i.e. take-on a high level of risk.

Yet absolute recycling and processing capacity is not the only thing that matters. A successful circular economy requires infrastructure capable of supporting the production of high-quality raw materials

through effective recycling and reprocessing. Therefore, while EPR and DRS will together significantly increase the money available to support recycling, strong policy will be needed to ensure that money is allocated to new infrastructure in ways that maximise value for money and the move towards a circular economy.

The Government's Resources and Waste Strategy (RWS) presents an opportunity to revolutionise the UK's waste sector, delivering environmental value built around world-class infrastructure. For this to happen the Extended Producer Responsibility (EPR) scheme needs to support strategic investments into the right assets in the right places. It would be appropriate for EPR to look to address infrastructure financing, because less money that is spent on financing a loan, the greater the investment capital that will be available to build the asset. If done well, RWS reforms can position recycling and reprocessing as a low-risk, infrastructure asset class, supporting significant capital investment into high quality new facilities. This will make a material difference to the quality of facilities within the sector – and therefore the environmental benefits they can deliver.

Future recycling infrastructure could usefully be supported through measures to stimulate the demand for recycled materials. The introduction of the plastics tax from April 2022 will increase demand for recycled plastics to a point however both the tax rate and the recycled content threshold will need to increase over time (similar to the landfill tax escalator) to drive higher domestic investment in reprocessing capacity. Viridor supports the application of a percentage content escalator, as seen in the landfill tax, which would require the recycled content threshold to move from 30% to 50% over a 10-year period.

The Government's recycling reforms under the RWS should also prioritise the supply of materials to domestic reprocessing facilities to stop our ongoing reliance on waste exports. This could potentially be met through the requirement for the EPR and DRS scheme administrators to prioritise domestic reprocessing where possible.

Question 6: In which of the Commission's sectors (outside of digital) can digital services and technologies enabled by fixed and wireless communications networks deliver the biggest benefits and how much would this cost?

Challenge 2: In decarbonising the electricity system, including collecting and using better data to support decisions on electricity network operation and reinforcement. Ensuring that new assets such as electric vehicles, individual heat pumps and heat pump-led heat networks are designed and operated in a way that allows their remote control and dispatch in response to electricity markets, and that their patterns of import and export are visible without incurring excessive cost will allow better understanding of the future challenges posed to the sector.

Challenge 3: In decarbonising the heating system, the digitalisation of the heat network sector will also be important. This will be needed to improve customer outcomes; for example, by improving information available to heat network customers and providing online means by which to monitor energy use and bills. From a heat network operation perspective, digitalisation will also be important in improving system data to identify any operational issues (e.g., very variable or too high return temperatures) and improve system efficiency.

Challenge 7: The Government accepted the Commission's recommendation in the first Assessment for a common data reporting framework for businesses that handle commercial and industrial waste. The Environment Act includes powers to introduce a digital system to track waste movements, an important initiative which will replace a multitude of paper based and disjointed digital systems. A coherent system will provide clarity on the volumes and treatment of all waste arisings, will make it much easier and less time consuming for legitimate waste companies to comply

with reporting requirements, whilst making it much harder for rogue operators to compete in the industry and commit waste crime including fly tipping, deliberate misclassification of waste, illegal waste exports and the operation of illegal waste sites.

Question 7: What barriers exist that are preventing the widescale adoption and application of these new digital services and technologies to deliver better infrastructure services? And how might they be addressed? Your response can cover any number of the Commission's sectors outside digital (energy, water, flood resilience, waste, transport).

Challenge 2: The main barriers to achieving this currently seem to be: legacy IT infrastructure, a lack of data standards (although this is being progressed by BEIS) and a more cultural tendency within the Government, Ofgem and the ESO to approach this question from a mindset of how existing data processes developed for a system of a small number of fossil fuel plants can be expanded to meet the challenges of a decarbonised, flexible system of thousands, if not millions, of assets. More innovative thinking and a whole systems approach are required here.

Challenge 3: The main barriers to achieving this include the lack of strong, enforceable technical standards for heat networks, the lack of a clear strategy on digitalisation for the sector and insufficient Government support to overcome specific barriers in parts of the market (e.g., not for profit schemes).

Challenge 7: Current barriers to waste digital services include lack of comprehensive software, increased associated costs, additional time requirements and a lack of policy support to enforce such change. However, in order to allow improvements in waste infrastructure and to meet the governments recycling and waste reduction targets better data collection is necessary. This approach is under consideration by DEFRA with a recently published consultation on mandatory digital waste tracking.

Question 8: What are the greatest risks to security of supply in a decarbonised power system that meets government ambition for 2035 and what solutions exist to mitigate these risks?

No comment.

Question 9: What evidence do you have on the barriers to converting the existing gas grid to hydrogen, installing heat pumps in different types of properties, or rolling out low carbon heat networks? What are the potential solutions to these barriers?

The table below sets out barriers and solutions with respect to heat network development.

Barriers	Potential Solutions
Demand risk: uncertainty over the extent and timing of connections creates risks to investment and cash flow	• Obligation to connect placed on businesses within heat network zones (as being progressed by UK Government) • Government guarantees / under-writing of investment risk for heat networks (for example, through a Regulated Asset Base model)
Lack of regulation on consumer protections or technical standards	• Consumer protections are being progressed through the UK Government's Heat Network Market Framework • Technical standards will be introduced through the Heat Network Market Framework but this is less well-developed and may require further policy (e.g. quality assurance and enforcement)
Decarbonisation strategy: zero carbon heat networks cost more to build than those using gas. Therefore are not	• The fossil-fuel phase-out in the off-gas grid will support this switch. However, this leaves the on-gas grid sector where there are currently only weak commitments to phase out gas boilers. • In combination with the introduction of mandated connections within heat network zones and decarbonisation regulation on

competitive with gas suppliers.	those heat networks, this is potentially creating the situation where on-gas grid commercial buildings in heat network zones will face costs to decarbonise earlier than those outside of heat network zones. On-gas grid domestic homes will have very little incentive to connect to heat networks given the higher costs required and the lack of policy requiring them to decarbonise

Question 10: What evidence do you have of the barriers and potential solutions to deploying energy efficiency in the English building stock?
No Comment

Question 11: What barriers exist to the long-term growth of the hydrogen sector beyond 2030 and how can they be overcome? Are any parts of the value chain (production, storage, transportation) more challenging than others and if so why?
No comment.

Question 12: What are the main barriers to delivering the carbon capture and storage networks required to support the transition to a net zero economy? What are the solutions to overcoming these barriers?
Viridor welcomes the Government's increased ambition on CCUS. The Net Zero Strategy provides key milestones for 20-30Mt of CO_2 storage per year by 2030, increasing to 50Mt per year by 2035, as well as a number of commitments for capture of CO_2 across a multitude of CO_2 sources, including industry and engineered GGRs. What is now required is a comprehensive 10-20 year funding and policy framework which can deliver CCUS cluster projects at pace in the 2020s. This will provide the clarity that is required for private sector investors and the supply chain on the future pipeline of projects and lead-in times that are required. Visibility on the roll out programme of CCUS in the UK is also key to attracting inward investment from overseas.

Viridor has committed to becoming climate-positive by 2045.[1] This will require substantial investments into carbon capture and storage. Viridor has formed a partnership with Aker Carbon Capture with the potential to deliver £1bn of investment into CCS across seven of our EfW facilities, with the potential to capture 1.5MT of CO_2 emissions annually.[2] The foundation of these plans will be a first-of-a-kind carbon capture project at our flagship Runcorn energy from waste facility as part of the HyNet Industrial Cluster. This would decarbonise the treatment of nearly 1 million tonnes of non-recyclable waste from homes and businesses in northwest England every year. The plant will be capable of capturing almost one million tonnes of CO_2 annually. With around half the captured carbon emissions coming from renewable wastes, this project will make Runcorn's operations climate positive – it will permanently capture more CO_2 than it emits through incineration of fossil-based waste. Runcorn will also continue to supply industrial heat and power to the local grid, decarbonising the local energy supply.

The main barrier to the deployment of a CCUS sector at the scale require to achieve net zero and the intermediate targets is that the pipeline of projects fails to maintain through the 2020s and beyond. BEIS announced the Track-1 CCUS clusters in 2021. However to ensure the industry can deploy at scale, a strong pipeline of projects – both capture and storage – will be needed in the 2020s and 30s. The industry currently has many projects looking to progress, what is vital is that Government provides certainty across three main areas:

[1] *Decarbonising our waste: Viridor's Roadmap to net zero and net negative emissions*, 2021, viridor-decarbonisation-strategy-ebook.pdf
[2] Viridor announces acceleration of deep decarbonisation of the waste sector

1. Clarity on future cluster sequencing phases and infrastructure development. Outside of the Track-1 and Phase-2 process for CCUS deployment, there is little clarity on the future allocation process and timelines for both the next stage of infrastructure development (Track-2) or future opportunities to access announced infrastructure. It is essential that industry can see the forward timeline for these processes to allow for applications in keeping with business timelines. At the moment, for unsuccessful clusters and capture projects, the forward timelines are unknown, without clarity this will prevent projects and the supply chain materialising.
2. A long-term funding envelope to support the business models. The CCUS industry requires support by a long-term funding framework, detailing future allocation rounds, through the business models. Without a proportionate framework in place, a strong pipeline of projects would not materialise as companies will not be able to justify investment with uncertainty around the business model funding envelope throughout the contract. There must be sufficient scope and clarity in the business models to support development of robust financial models with clarity of revenue post construction.
3. A clear funding framework mapped against the deployment timelines for projects. For companies deploying first of a kind (FOAK) and early CCUS projects, support from a funding framework which can facilitate projects and technologies to move to deployment and market is essential. As CCUS can potentially cover many applications and sectors, funding has the potential to become segmented and disjointed. If this funding timeline presents gaps, projects may struggle to pass internal investment decisions, preventing projects moving towards deployment.

Question 13: In what ways will current asset management practice need to improve to support better infrastructure resilience? Your response can cover any number of the Commission's sectors.
Ensuring flexibility will be critical to driving long-term resilience within the waste management system to ensure the sector can respond to market changes and enable a smooth and stable transition towards a circular economy. Putting contingency measures in place so that waste has a viable and environmentally safe end destination will therefore be critical. The introduction of landfill bans in Scotland in 2025 and England in 2028 will remove the flexible back-stop option for disposing of waste when EfW facilities are down for maintenance. To address this issue there is a need to build extra capacity or find alternative solutions, such as temporary storage offsite and co-ordinated maintenance plans in different regions.

Question 14: What are the barriers to and solutions for expanding recycling capacity, both now and in the future to deliver environmental and net zero targets?
Viridor's Circular Economy Ambition sets out proposals for how to achieve circularity for plastics[3], noting that decarbonising the UK waste sector will require fundamental changes touching on product design, consumption patterns as well as the capacity to process these materials at end of life through, recycling and reprocessing and ultimately disposal. The UK is not achieving a circular plastics economy due to a lack of recycling and reprocessing infrastructure. The UK's recycling rate for municipal waste is around 50% and domestic recycling capacity is currently insufficient to support achieving the 2035 target of 65%.

Nowhere is this more evident than in plastics, where domestic capacity for both recycling and reprocessing is well below demand. This has resulted in heavy reliance on export of plastic wastes for recycling, creating concern around poor management of the UK's exported plastic waste. In 2019 the UK generated 2.3 million tonnes of plastic packaging waste, of which only 51% was recycled. This

[3] *Closing the loop: Viridor's Roadmap to a truly circular plastics economy*, 2021, 07416-01-viridor-circular-economy-document_v6-final-hi-res-dispatch.pdf.

amounts to 1,172m tonnes of plastic packaging being recycled, of which just under 40% took place in the UK with just over 60% being exported for recycling.

While there has been a steady growth in UK-based recycling capacity, there will need to be significant growth in the next 3 to 4 years if both UK Plastics Pact and UK Government recycling targets are to be met. The UK would require a minimum of 440kT of additional plastic packaging to be effectively recycled by 2025 (equating to approximately 550kT captured for recycling to account for losses during collection and sorting). As export markets are increasingly restrictive and consumers are demanding greater accountability for plastic recycling, a reduction in export would seem both inevitable and desirable. Reducing plastic packaging waste exports to 30% by 2025 would require UK-based recycling activity of 1.13m tonnes per annum, an increase of around 650kT over the next four years. New capacity to recycle this material, accounting for process losses, would be in the region of 800kT, while the equivalent reprocessing would require eleven 60kt plants, costing £50-60m each. This would bring total UK plastic recycling capacity to around 1.1m tonnes per year.

Building infrastructure on this scale will require significant investment decisions being taken by multiple companies within the next 2-3 years. Given the fixed nature of project development timelines, the Government's ongoing RWS reforms are perfectly-timed to provide the new policy and legislation that is urgently required to underpin investment cases for these new assets. This in turn will support UK-wide 'levelling-up' – over 100 new green jobs would be created in UK reprocessing per tonne of waste produced.

However absolute recycling capacity is not the only thing that matters. A successful circular economy requires infrastructure capable of supporting the production of high quality raw materials through recycling and reprocessing. The UK will need to upgrade existing sorting and reprocessing infrastructure to meet Defra's target of doubling resource efficiency by 2050. However driving down emissions from the consumption of products in line with the needs of Net Zero is likely to require improving resource efficiency further still. The quality of the UK's recycling and reprocessing assets will materially impact how close we get to achieving this:

- Consistent collections will reduce contamination levels in municipal recyclate, primarily from the separate collection of biogenic waste. However, densely-populated urban areas will continue make effective segregation of waste challenging, necessitating some degree of material sorting prior to reprocessing. The quality of these Material Recovery Facilities (MRFs) determines the quality and volumes of output material, and therefore impact the effectiveness of reprocessing facilities at extracting the maximum quality and volume of secondary materials from the waste.
- This will be further impacted by the incoming Deposit Return Scheme (DRS) which will remove high value target materials from the waste stream. Currently there is limited recycling capacity for the remaining lower grade plastics e.g. jazz, black plastics, rigids.
- Plastic films are widely used but technically challenging to recycle and reprocess. They must be collected separately due to litter and mechanical processing issues. They are generally not single polymers so are currently better suited to chemical reprocessing.
- Closed loop recycling is integral to circularity. Achieving this for some food grade polymers requires highly effective sorting beyond what is possible with existing standard technologies.

Defra's ongoing reforms to recycling address the challenge in multiple ways:

- Consistent collections and DRS will increase the supply of more recyclable (i.e. better segregated) waste streams
- Plastic packaging tax will increase demand for more recycled polymer

- Extended Producer Responsibility (EPR) and DRS will provide the funding to support investment into new capacity, starting at c.£2.7bn p.a.

However it is not clear that these policies, welcome as they are, will effectively address the risks faced by infrastructure investments in the sector. As set out in our answer to question 5, the inherently short-term nature of the current market structure limits major investment. Supply contracts for recycling last only 3-5 years which, when coupled with volatile commodity prices for secondary materials, makes investments into new facilities inherently risky (as described in question 5). Typical CAPEX for a reprocessing facility would be approximately £50-60m, which investors would look to pay off over 10 years, making this sector unattractive or even unviable to long-term investors. This drives the sector to instead focus on running down old assets and implementing life extensions, rather than investing in modernising the recycling fleet. The transition from the current system based on PRNs to the new one based on EPR will initially create new risks to investment, given the given the final details of how the new system will work in practice have not been finalised. What is more, revenue available under EPR will ramp up gradually as recycling rates increase, meaning money will not be immediately available to support new infrastructure investments.

Therefore while EPR and DRS will together massively increase the money available to support recycling, there is a material risk it will be allocated in sub-optimal ways, undermining value for money and the move towards a circular economy. The substance of these new policies will need to be carefully designed to ensure they deliver infrastructure of the right scale and quality, early enough to hit the 2035 targets.

From an investment perspective, higher risks equate to increased costs. Risk for an investor is the ability to be assured about future revenues that underpin today's investment. These risks include input (feedstock) supply, offtake demand and the fee obtained for processing. Together these affect the probability of paying back the lender of up-front capital (for example a bank) whilst making an appropriate commercial return.

The biggest barriers to investment in expanding recycling capacity are a lack of demand for recycled materials and a lack of security of supply for reprocessors. The Government should introduce stronger demand-side measures (such as an escalator on the plastics tax) and should also clarify how the scheme administrators for the future deposit return scheme and producer responsibility will guarantee feedstock for domestic reprocessors.

Restrictions on exports, particularly of lower-grade materials, would also be helpful. As will measures to incentivise producers to phase out difficult-to-recycle formats, and clearer binary labelling to make it easier for consumers to separate their recycling properly.

Question 15: What is the likely environmental impact of waste streams from construction across economic infrastructure sectors, over the next 30 years, and what are the appropriate measures for addressing it?
No comment.

Question 16: What evidence is there of the effectiveness in reducing congestion of different approaches to demand management used in cities around the world, including, but not limited to, congestion charging, and what are the different approaches used to build public consensus for such measures?
No comment.

Question 17: What are the barriers to a decision-making framework on interurban transport that reflects a balanced approach across different transport modes
No comment.