

CREATING A COMPETITIVE, CARBON-NEUTRAL CIRCULAR ECONOMY IN YORK & NORTH YORKSHIRE

A Strategy and Action Plan for Transformation:
2019 - 2030



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EXECUTIVE SUMMARY



CREATING A COMPETITIVE, CARBON-NEUTRAL CIRCULAR ECONOMY IN YORK AND NORTH YORKSHIRE

This means a thriving economy that creates business opportunities, a sustainable environment and social wellbeing, by keeping products and materials in use; eliminating waste and pollution; and regenerating natural systems.

WHY ARE WE CREATING A CIRCULAR ECONOMY?

Our current economy is reliant on a ‘take-make-dispose’ model. This wasteful use of resources results in economic loss, environmental damage, substantial carbon emissions and widening social inequalities. With two national parks in our area, high quality agricultural land and a large food manufacturing base, our economy is vulnerable to the impacts of climate change, declining natural capital and increased prices of raw materials. We must future-proof our economy to remain competitive and contribute to addressing our climate emergency. Our Strategy and Action Plan provides a pathway for York and North Yorkshire to become recognised as a leader in the circular economy – developing a more competitive economy, where economic activity is decoupled from the consumption of finite resources and greenhouse gas emissions, and materials stay circulating within our economy.

HOW WILL THIS BE ACHIEVED?

Applying circular economy principles at scale we can create restorative and regenerative systems that increase value from assets, improve economic growth, enhance our natural environment, boost skills and wellbeing, and build community resilience. Our Action Plan will deliver this shift from a linear to a circular economy through a series of levers to create behaviour and systems change, including collaboration, demonstration and policy. The impact of the Action Plan will be measured against whether it improves the financial, manufactured, human, social, intellectual and natural capital within York and North Yorkshire.

WHAT IS OUR PLAN OF ACTION?

The Action Plan includes a series of phases, from understanding local circular economy opportunities to implementing demonstration projects and accelerating change. Action will be delivered across a number of systems – including sectors and places. We have prioritised sectors where moving towards a circular economy will contribute most to improving economic competitiveness and addressing climate change. Action will be targeted in agri-food, manufacturing, construction, transport, utilities, and the public sector.

WHO NEEDS TO BE INVOLVED?

Our Strategy and Action Plan have been developed collaboratively, and will be delivered collaboratively. Every local authority, business, charity and community has a role to play. Every individual can make a difference.

The Circular Economy Steering Group set up by the LEP will provide strategic leadership to the implementation of the Action Plan.

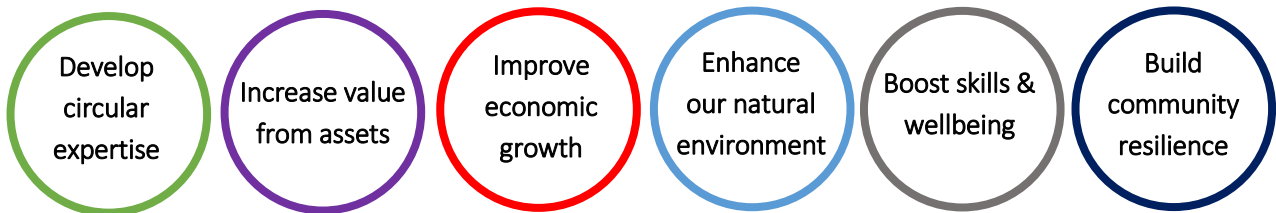
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VISION

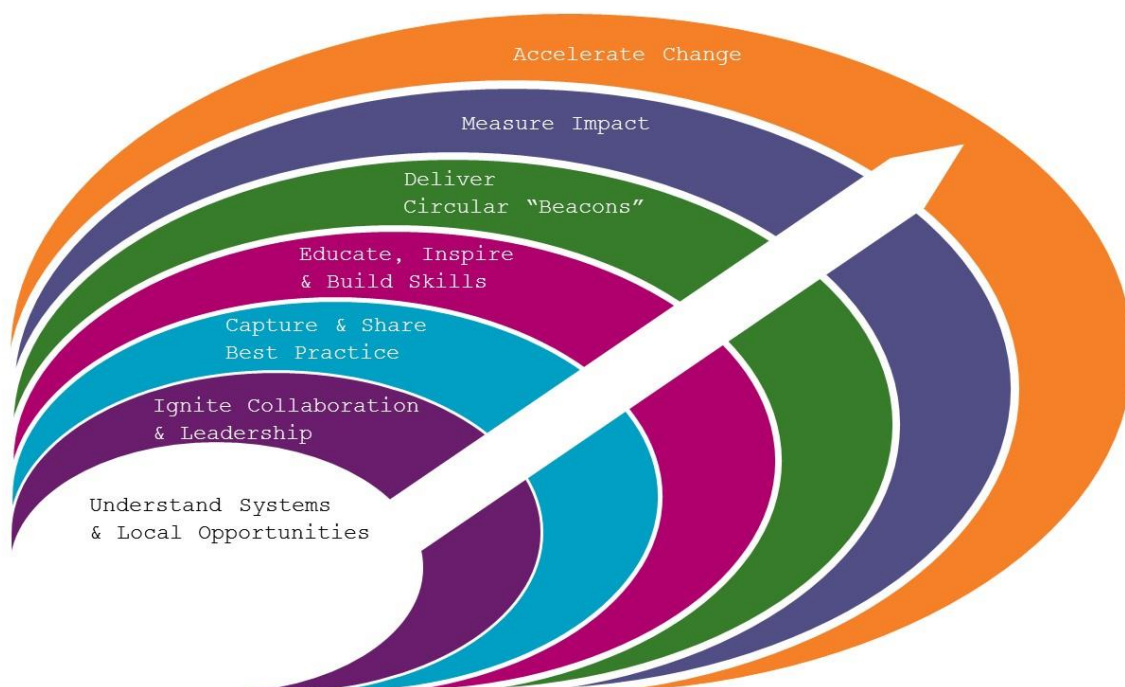
York and North Yorkshire thriving as a competitive, carbon-neutral circular economy that benefits businesses, society and the environment.

STRATEGIC GOALS

Our mission is to work collaboratively to transform systems at scale and speed, so York and North Yorkshire are recognised as leaders in the delivery of circular economy excellence and addressing climate change. This will deliver economic, environmental and social benefits.



ACTION PLAN



INTRODUCTION

The problem...

We're consuming our planet's resources faster than they're being replaced and we're continuing to produce substantial amounts of carbon emissions – spearheading us into a climate crisis. Across the world, and in our patch, governments and local authorities are declaring climate emergencies. As the world looks for solutions to decarbonise economies, we know that existing policy measures to reduce carbon emissions from energy generation and products being used (e.g., vehicle tailpipe emissions, heating buildings) are not enough.

The conflict lies in the hesitation (a) from business due to a belief that actions may add cost, reduce productivity and must sit behind other priorities and (b) from the public resisting a change in lifestyle, habits and perceived prices.

The solution...

Looking beyond the current take-make-dispose extractive industrial model, a circular economy offers a win – win for all. Moving towards a circular economy means decoupling economic activity from the consumption of finite resources and greenhouse gas emissions, ensuring that materials stay circulating within our economy. In practical terms, this means reducing waste throughout supply chains, designing products to last longer and switching to using more sustainable materials. The UK's National Industrial Strategy includes a commitment to moving towards a regenerative circular economy, as part of the Clean Growth Grand Challenge, recognising the circular economy concept as a key lever to boost productivity, increase resource efficiency and restore natural capital. The UK is currently not on track to meet its fourth and fifth carbon budgets. The circular economy provides a cost-effective carbon cutting policy to enable the UK to meet these carbon budgets¹.

For adopters, this can create new business opportunities, add value to waste, create competitive advantage, build new skills and retain talent. With much circular economy technical expertise already based in our region, we can leverage this at pace, offer solutions to our region's businesses and communities and establish our region as the leaders in delivery of circular economy excellence, with the broader benefits that will bring.

Our strategy and action plan...

Our mission is to stimulate a transformation to a circular economy at scale and speed in a diverse region. Our 2030 vision is to be thriving as a competitive, carbon-neutral circular economy that benefits businesses, society and the environment.

This document first sets out the background behind *why* we need to move towards a circular economy – outlining the benefits for York and North Yorkshire, and why we need to act now. We then move onto *how* we are going to achieve the transformative systems change necessary and outline in our Action Plan *what* needs to be done to deliver this change. The final section details *who* needs to be involved in the transition; collaboration is critical, as every organisation and person has a role to play.

¹ CIEMAP (2018) Less in, more out: using resource efficiency to cut carbon and benefit the economy
https://www.green-alliance.org.uk/resources/Less_in_more_out.pdf

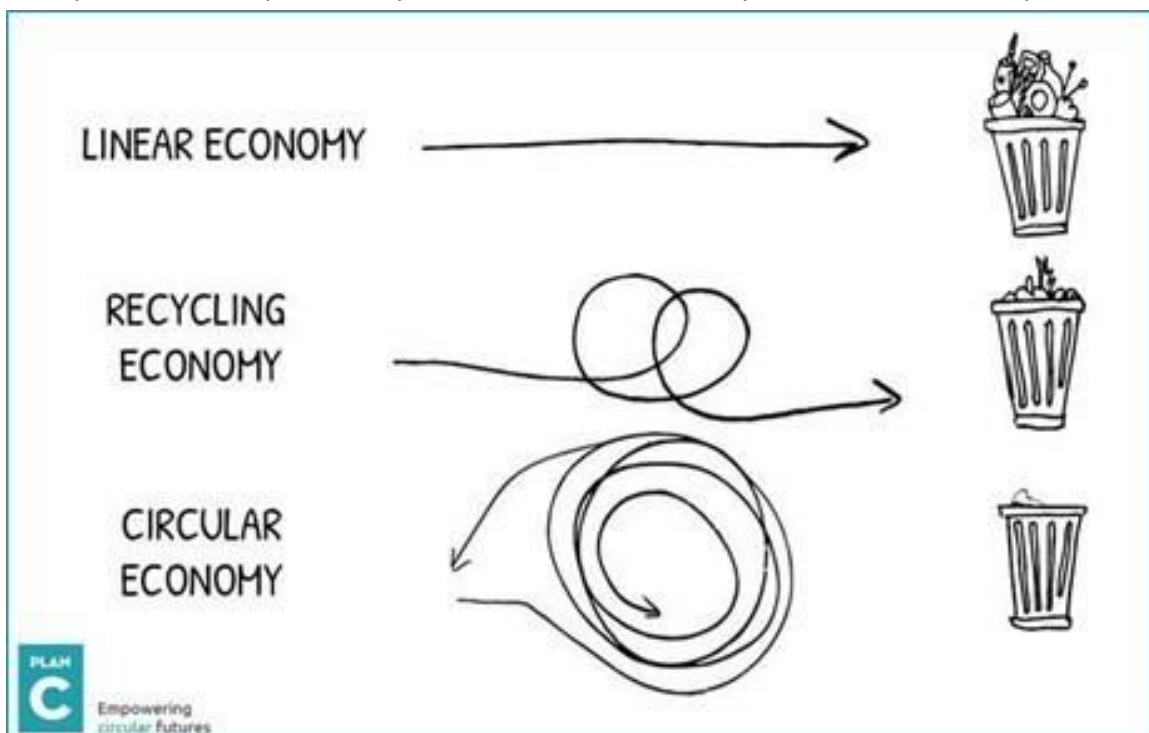
WHY DO WE NEED TO MOVE TOWARDS A CIRCULAR ECONOMY IN YORK & NORTH YORKSHIRE?

1. Why do we need to move towards a circular economy?

Our existing economy functions on a model where we ‘take’ raw materials from the ground, ‘make’ lots of things out of them, we then use these things for a short amount of time and ‘dispose’ of them. Our current economy is reliant on this ‘take-make-dispose’ economic model. This is not only incredibly wasteful with millions of tonnes of valuable materials leaking from our economy each year, but is also damaging our planet.

Looking beyond the current take-make-dispose extractive industrial model, a circular economy aims to decouple economic activity from the consumption of finite resources and greenhouse gas emissions, and ensure that materials stay circulating within our economy. This means designing-out waste and creating restorative and regenerative systems, which keep materials in use and do not damage our environment. Underpinned by a transition to renewable energy sources, the circular model builds economic, natural, social and human capital.

The circular economy is increasingly being recognised by businesses, entrepreneurs, academia, local and national governments as a way to drastically reduce carbon emissions and address the climate crisis. Reducing waste throughout supply chains, designing products to last longer and switching to using more sustainable materials are all practical steps we can take to cutting carbon emissions. The UK’s National Industrial Strategy includes a commitment to moving towards a regenerative circular economy, as part of the Clean Growth Grand Challenge.² The circular economy concept is recognised as a key lever to boost productivity, increase resource efficiency and restore natural capital.



² HM Government (2017) Industrial Strategy: Building a Britain fit for the future

2. Why Yorkshire?

The importance of taking a regional approach

The concept of 'circular cities' is now well advanced, with cities such as London, Peterborough, Glasgow, Amsterdam and New York leading city-scale circular economy initiatives. However, rural areas have been somewhat neglected in the global agenda to transition towards the circular economy. This is surprising considering the resource-intensive industries active in rural areas, such as farming and manufacturing. Whilst cities may be aggregators of materials, resources and innovation, rural areas are the providers of food, energy, water and products to power cities. Taking a more regional approach provides the opportunity to explore the interdependencies between rural and urban areas and develop interventions that truly create circular systems. It's difficult for one organisation alone to move towards circular operating models, achieving scale is important to close the loop on material flows and develop investable, commercially-viable projects.

Applying circular economy principles at scale across the area is expected to contribute to a wide range of benefits, including:

- Increased resource productivity
- Reduced costs and increased competitiveness for resource intensive businesses
- Additional opportunities to generate commercial revenue streams
- Reduced finite resource consumption
- Reduced CO₂ emissions
- Increased export opportunities of circular knowledge and technologies
- Increased inward investment

Strategic leadership

The York, North Yorkshire and East Riding Local Enterprise Partnership established leading in the bioeconomy a strategic priority since 2013. In 2018, this priority evolved to encompass the wider circular economy to enable other sectors to realise the benefits, proactively address the climate crisis and reflect the national government's commitment to moving towards a regenerative circular economy. As a LEP, we have the ambition to do more than develop a series of discrete circular economy projects, we are aiming to move the regional economy from linear to circular. We have already ensured that the circular economy underpins our [Local Energy Strategy](#) and intend for the circular economy to be central to our forthcoming Local Industrial Strategy.

Local Enterprise Partnerships (LEPs) are uniquely positioned to catalyse the transition towards a circular economy at scale across the UK, with an unrivalled oversight of local economies, remit to support businesses grow, invest in infrastructure and support the development of the local skills base. As a unit of change, LEPs are small enough to understand the nuances of local economies and stakeholder needs, yet large enough to be able to convene local authorities, businesses and other organisations to build momentum, create circular systems and deliver impact.

We want to demonstrate this working in action at scale, in collaboration with industry-leading businesses and nationally-recognised research expertise in the circular economy, including the likes of Nestlé, Yorkshire Water, University of York, FERA, BioVale and the Biorenewables Development Centre. Taking learnings from this approach, we can develop best practice models, tools and guides to enable other LEPs to stimulate the transition from a linear to circular economy across their economic geographies. The diversity of the area means that we can develop and test a number of different circular approaches that can be replicated across the North of England and beyond.

A diverse region to innovate, trial and demonstrate circular economy solutions at scale

Encompassing the historic city of York, voted UK's best place to live; a thriving rural economy with two national parks; distinctive market towns; and a stunning coastline, York and North Yorkshire provides a unique testbed to trial truly circular solutions across urban and rural areas, with a diverse population, geography and economy.

- **City of York** - As a hub of consumption, attracting 6.9 million visitors each year³, the City of York is a large consumer of products, producer of waste and emitter of greenhouse gas emissions. The city has strong foundations in sustainability to build upon, including initiatives such as One Planet York, Sustainable Food City York, Edible York and grassroots share/reuse/recycle community projects. York also has unique strengths in the bio-economy, med-tech, digital tech and the creative industries, which provides a great opportunity to bring these designers, creatives, tech experts and entrepreneurs together with the public sector to redesign city systems to eliminate waste, congestion and social inequalities to develop a smart, circular City of York.
- **Rural Powerhouse** - With two national parks in our area and an abundance of agricultural land, our natural capital underpins our economy, from providing flood resilience to supporting food production to attracting and retaining talent. The circular economy provides us with a model to ensure our natural capital is maintained and enhanced.

With Yorkshire being the only region in the UK to be home to every farming type, we have a regional strength in agriculture. As agriculture and food manufacturing are resource- and emissions-intensive sectors, creating a local, circular agri-food system would reduce operational costs, retain money in the local economy and deliver environmental improvements. The region has built a global reputation as a leader in the bio-economy, with the UK's only bioeconomy innovation cluster – BioVale. Alongside innovation assets, including the Biorenewables Development Centre, University of York and FERA, Yorkshire is well placed to be at the forefront of rethinking our food system.

Communities are at the heart of our rural economies, and the remote nature of many areas in North Yorkshire brings a number of challenges associated with moving towards carbon-neutral, circular rural communities, from creating efficient reverse logistics networks to installing electric vehicle charging points. Co-developing and trialling circular economy solutions to address such challenges provides the opportunity to demonstrate that the circular economy can work and provide substantial benefits in rural areas.

- **Market Towns** - Our distinctive market towns across North Yorkshire provide the opportunity to test circular economy approaches at a micro-scale. They are small enough to convene a high proportion of stakeholders to achieve critical mass of support, yet large enough to achieve the scale required to close the loop on material and resource flows. With increasing pressures on high streets, the circular economy is a vehicle we can use to drive collaboration, increase operational efficiencies and attract new businesses to our towns.
- **Opportunity Coast** - The circular economy provides a way for us to systemically tackle major issues on our coastline – including ocean plastics, water pollution, rising sea levels, and pockets of deprivation. The circular economy can improve the quality of the natural environment through designing-out waste and restoring natural capital, which can benefit the wider economy through supporting tourism and health benefits. The issue of plastics in our oceans

³ Make It York (2019) Accessed 8th August 2019: <https://www.makeityork.com/#StrategicPriorities>

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has emerged as a high-profile global challenge in the media. We can start addressing this issue locally through education, changing business practices and removing plastic currently on our coastline.

The circular economy can also provide a range of social benefits and address social inequalities on our coast, particularly through sharing economy solutions. The sharing of skills, products and assets can improve access to services and goods, strengthen social ties and build community resilience.

3. Why Now?

We're in a climate emergency

The 2018 IPCC Report on Global Warming of 1.5°C evidences the increased climate related risks to health, livelihoods, food security, water supply, human security, and economic growth associated with an increase in global warming of 1.5°C and beyond. With 12 years to ensure that we keep temperature increase within 1.5°C before climate catastrophe, we need to take urgent action now to avoid irreversible damage to the Yorkshire we love and call home.

Local research has shown that across North and West Yorkshire, we need to commence rapid decarbonisation to make our fair contribution to delivering the Paris Agreement's commitment to staying well below 2°C and pursuing 1.5°C global temperature, initiating an immediate programme of CO₂ mitigation to deliver annual cuts in emissions averaging 13% - 15%.⁴

Local authorities in our area, including the City of York Council, Craven District Council and Scarborough District Council have declared climate emergencies, whilst other local authorities are setting targets for their operations to be net-zero or carbon neutral.

York, North Yorkshire and East Riding Local Enterprise Partnership have already developed a [Local Energy Strategy](#) for the area to decarbonise the energy sector and energy-intensive sectors, but we critically need to do more to keep within the 1.5°C of warming. The circular economy provides us with the framework to cut emissions through designing-out waste and making sure we make the most of all the resources, products and assets we have.

A low carbon future must be a circular future.

To improve resource security and organisational resilience

Minimising waste, improving efficiencies and using alternatives to virgin raw materials will reduce reliance on the earth's finite resources and consequently increase the resilience of organisations and our regional economy. With increasing costs of finite raw materials and changing political landscapes, applying circular economy principles provides a way to future-proof organisations against sudden changes.

We have a number of resource intensive sectors that are important to our local economy, including agriculture, food and drink, construction and transport.⁵ The agriculture sector in particular is facing

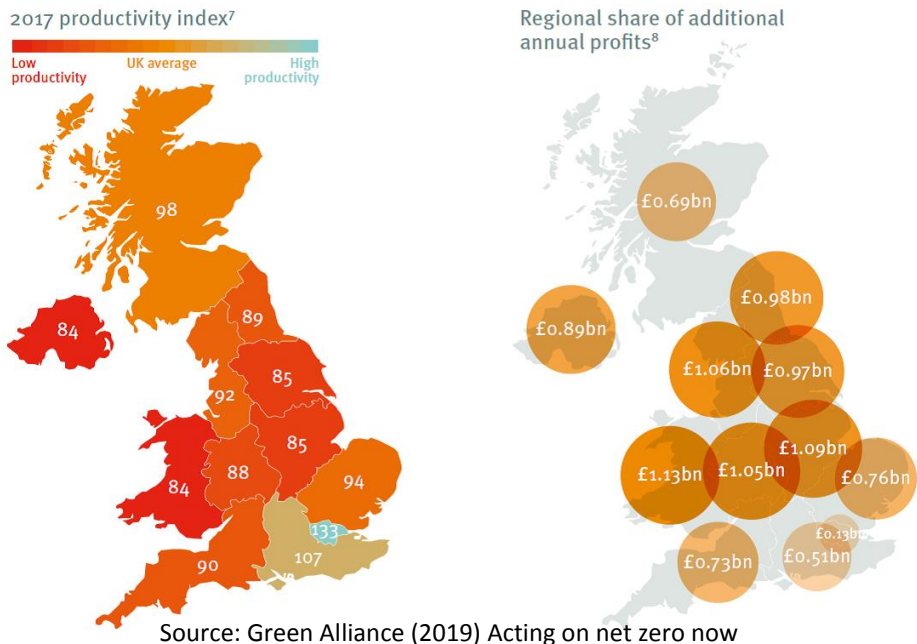
⁴ Tyndall Centre (2019) Setting Climate Change Commitments: Quantifying the implications of the United Nations Paris Agreement on Climate Change for North and West Yorkshire

⁵ Cambridge Econometrics (2019) Clean Growth Audit, Sector Analysis and Delivery Plan

Creating a Circular York & North Yorkshire competition for raw materials. ⁶ This means that reducing virgin resource inputs and minimising waste, are issues of resource security and supply chain resilience, which are critical for our economy.

To improve economic growth & competitiveness

Through designing circular systems it will enable us to keep both resources and money circulating within the regional economy, supporting economic growth. Increasing resource efficiency will increase the competitiveness of businesses in our region and our economy. Productivity is below UK levels in all parts of our region. Although in absolute terms productivity is increasing in all parts of North and West Yorkshire, it is still below the UK average. With a strong manufacturing base, North Yorkshire is well positioned to benefit from the circular economy transition. Research has shown that areas in the UK with large manufacturing bases have the most to gain from the circular economy, in terms of improving productivity and increasing business profits^{7 8} (see Fig. below).



The challenges around making use of ‘waste’ and redesigning systems to be regenerative provide new business opportunities, such as using agri-food waste to make bio-based products. This is a powerful lever to attract innovative businesses to our area. Providing the right system conditions, such as funding, policy incentives, infrastructure and collaborative networks, will enable us to support businesses in Yorkshire to adapt and benefit from the circular economy, and also attract new businesses to our area. With unprecedented interest in the environment and consumer pressures, the time is now to make our region a leader in the circular economy.

⁶ Cambridge Econometrics (2019) Clean Growth Audit, Sector Analysis and Delivery Plan
⁷ Green Alliance analysis based on Office for National Statistics, 2019, *Subregional productivity: labour productivity indices by UK NUTS₂ and NUTS₃ subregions*
⁸ Green Alliance, 2019, *Acting on net zero now*

HOW CAN WE CREATE A COMPETITIVE, CARBON-NEUTRAL CIRCULAR ECONOMY IN YORK & NORTH YORKSHIRE?

2030 Vision: York and North Yorkshire are thriving as a competitive, carbon-neutral circular economy that benefits businesses, society and the environment.

Our mission is to work collaboratively to transform systems at scale and speed, so York and North Yorkshire are recognised as leaders in the delivery of circular economy excellence and addressing climate change. This will deliver economic, environmental and social benefits.

To achieve this, we have established the following strategic goals:

- Develop circular expertise
- Increase value from assets
- Improve economic growth
- Enhance our natural environment
- Boost skills and wellbeing
- Build community resilience

1. We Need Systems Change

Working closely with our stakeholders, we've developed our mission and vision for a circular economy in York and North Yorkshire. We know that moving towards a circular economy requires transformation of how our economy currently works, we know that we need to achieve scale in doing this and we know that there is critical urgency.

Our economic system is made up of financial flows (*financial capital*) and its performance is dependent on: infrastructure, products and technologies (*manufactured capital*); people – their skills, health, wellbeing, expertise and relationships (*human, intellectual & social capital*); and the natural environment (*natural capital*). Our vision and strategic goals are underpinned by this six capitals model. Following a linear economic model means we're consuming our stocks of natural, human and social capital faster than they are being produced. This means economic growth is degrading our environment, negatively impacting human health and wellbeing, and widening social inequalities. In contrast, a circular economy aims to rebuild capital, ensuring that we maintain and/or enhance our stocks of natural resources and create new value for society i.e., a win-win.

This means, an economy that:

- *Protects and regenerates material stocks, restores and maintains effective natural processes (e.g., climate regulation, flood resilience) and ensures no energy is lost [natural capital]*
- *Boosts people's health, skills, motivation and wellbeing [human capital]*
- *Empowers and supports institutions and relationships to thrive (e.g., families, communities, businesses, trade unions, schools, and voluntary organisations) [social capital]*
- *Retains and builds the knowledge and expertise of individuals, organisations and institutions [intellectual capital]*

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- Ensures material goods or fixed assets (e.g., tools, machines, buildings) are designed to last, are maintained and repaired, stay in use and fully optimised. [manufactured capital]



Using the six capitals model provides a lens for us to consider the inter-dependencies between economic, human and natural systems. It critically shows how natural capital is inherently tied to social and economic outcomes, which is particularly pertinent for our area considering our rich natural landscapes. Following this approach captures our local stakeholders' challenges and opportunities, puts people at the heart of the economy, aligns with our remit and core activities as a LEP, and promotes framing the circular economy around value and measuring associated impacts. For further details on why we're using a 6 capitals model to frame our thinking and define our vision, see Appendix 1.

2. Achieving Transformative Systems Change

We need transformative systems change to create a circular economy which rebuilds capital, ensuring that we maintain and/or enhance our stocks of natural resources and create new value for society. This means disrupting how the whole economy works, rethinking value, transforming business models and redesigning systems. The scale of the challenge is immense. To make meaningful progress and to achieve tangible benefits, we need to change mindsets and yield system change.

From listening to our stakeholders and applying thought leadership in systems thinking, design thinking and the circular economy, we have developed a series of 'system changers'. These are the levers we can pull to create a spiral of impacts to catalyse a step-change towards the circular economy, including:

- **Understanding & Knowledge – uncovering how systems work can stimulate change**
We need to first understand how our systems work, identify opportunities in moving towards more circular systems and develop our knowledge of the economic, social and environmental benefits of doing so. This is critical to develop buy-in and unlock investment.

Creating a Circular York & North Yorkshire

- **Collaboration – creating new relationships and new ways of working**
Unprecedented collaboration across sectors and value chains can change the relationships between actors in systems, creating a new social structure which has the power to self-evolve and transform at a rapid pace.
- **Education, Skills & Leadership – can change the goals of systems and enable systems to evolve**
Educating people around the circular economy, building skills and inspiring leadership can change mindsets and empower people to be change makers.
- **Technology – can enable new processes and new ways for actors to interact**
New technologies can enable the development of circular flows of materials, resources and products that were previously not possible. Digital technology can enable the real-time tracking of resources and assets, and enable sharing.
- **Policy & Standards – can change the rules of the game and goals of the system**
Policy and regulation can incentivise systems to change, stimulate markets and innovations, and provide the direction of travel for sectors to move towards the circular economy. Standards can support the growth of new sectors and products for the circular economy.
- **Demonstration & Measurement – can change mindsets and raise ambition**
Making the circular economy real and tangible to people through visible demonstration projects is a critical starting point to changing systems. Capturing and measuring impacts is vital to continue building momentum and confidence in the circular economy.

To achieve the required transformative change, we have created an [Action Plan](#) which is underpinned by the above ‘system changers’. To ensure that we have a strategic, prioritised approach and we know our direction of travel, we have broken up our journey into key phases.

3. Measuring Systems Change

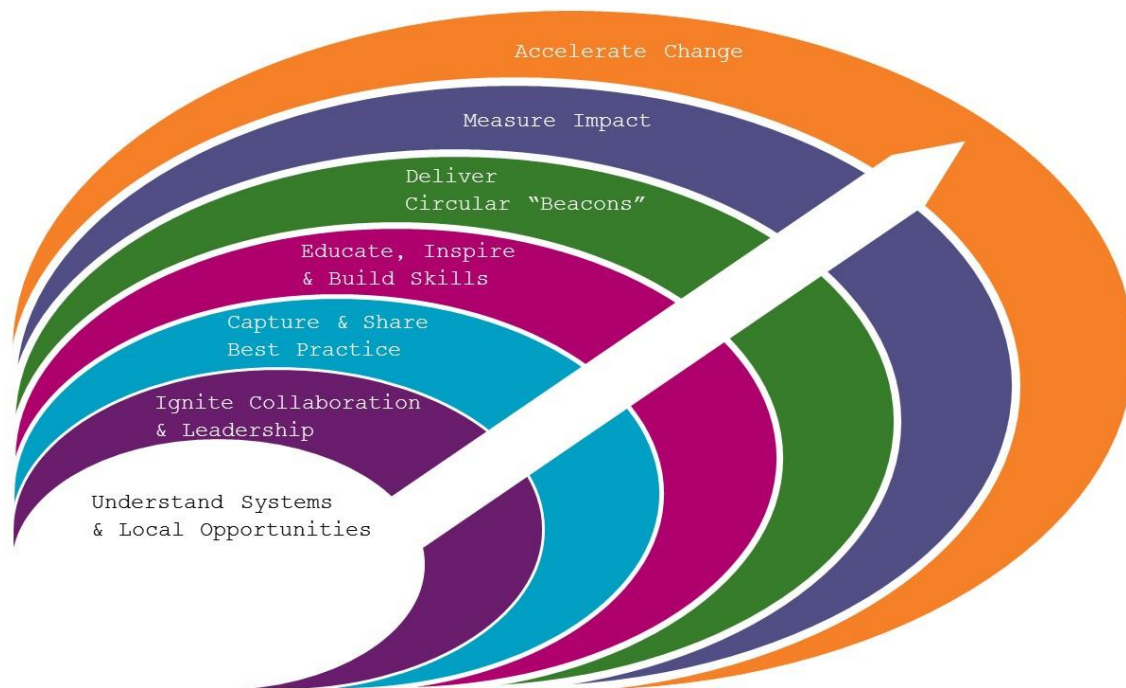
We will measure the impact of implementing our [Action Plan](#) against our strategic goals – monitoring changes to York and North Yorkshire’s financial, manufactured, human, intellectual, social and natural capital. See the following section for further details on measurement.

WHAT ARE WE GOING TO DO TO CREATE A COMPETITIVE, CARBON-NEUTRAL CIRCULAR ECONOMY IN YORK & NORTH YORKSHIRE?

1. Action Plan Overview

Transforming our economy, from a linear model to a circular model, requires an immense amount of change and will take time. To ensure that we have a strategic, prioritised approach and we know our direction of travel, we have broken up our journey into key stages. This phased approach will ensure that we're not trying to do everything at once, and instead we will be able to strategically allocate resources.

However, it is worth noting that the approach is not 'linear', it will be an iterative approach, feeding back learnings into the process. For example, the learnings from delivering circular 'beacons' will be captured and shared as best practice, which will then be used to inspire and engage a wider community of stakeholders.



2. System Focus

Action will be delivered across a number of systems – including sectors and places. Sectors and places where we can have most impact have been prioritised, and form our 'demonstration systems'.

Due to stakeholder appetite, we have initially prioritised the following places (i.e., initiatives across sectors): market towns and industrial sites. Creating circular market towns allows us to trial and demonstrate innovative circular approaches at a smaller, more manageable scale, than at the regional level. Industrial sites in North Yorkshire are resource- and energy-intensive, and hence applying circular economy principles provides substantial economic benefit. Further places across our geography will become part of our action plan as the movement develops.

Creating a Circular York & North Yorkshire
We have prioritised the following sectors:

- Agri-Food
- Manufacturing
- Construction
- Utilities – energy, water, waste management
- Transport & Logistics
- Public Sector

Key strategic opportunities within these sectors are outlined below. It is worth noting that whilst the LEP has a role in realising some of these opportunities, this is a call to action to local authorities, businesses and other organisations to play their part in creating a carbon-neutral circular economy.

AGRI-FOOD

- **Develop local, resilient and circular agri-food chains to re-localise our agri-food system**
- **Support farmers to adopt regenerative practices**
- **Establish networks of businesses willing to co-invest in our landscapes**
- **Support organisations seek innovative ways to use surplus, by-products and side streams that would otherwise be going to waste**
- **Support the further roll-out of anaerobic digestion - increase local feedstock availability and capacity for anaerobic digestion**
- **Strengthen the region's clean agri-tech sector to enable a circular agri-food industry and to benefit from export opportunities**
- **Support our insect protein industry grow**
- **Support innovation in sustainable food packaging to position Yorkshire as a leader**

MANUFACTURING

- **Support and enable businesses to replace existing inputs with bio-based materials and develop innovative solutions to make use of agri-food waste streams**
- **Create resource efficiency clusters – design-out waste, explore opportunities for industrial symbiosis and stimulate collaboration**
- **Engage, educate and support businesses to adopt circular business models that enable optimisation of product use, recovery of valuable components and remanufacture.**

CONSTRUCTION

- Develop local, circular supply chains for bio-based construction materials
- Keep construction materials in the local economy - increase material and resource processing, sharing and repurposing capabilities/capacities
- Apply circular principles to the design of infrastructure and regeneration projects e.g., York Central, Leeming Bar Industrial Estate
- Repurpose and retrofit buildings to extend their life and reduce energy consumption
- Develop a regional strength in designing and constructing modular homes with circularity principles

PUBLIC SECTOR

- Co-create visions and action plans for smart, circular cities / towns / communities to achieve carbon neutral targets and better meet residents' needs
- Demonstrate leadership through embedding circular economy principles in public procurement
- Update local planning policy to enable circular flows of materials, reverse logistics, establish critical infrastructure, ensure connectivity and ease of access to products and services
- Convert brownfield sites to new uses
- Shift department focus from waste management to waste prevention and resource management
- Explore sharing economy innovations to tackle loneliness and social isolation
- Support and incentivise businesses to design products with circularity, adopt circular business models and make use of the region's bio-economy assets

UTILITIES

- Increase adoption of high impact low carbon energy technologies – with circularity designed-in
- Explore synergies and industrial symbiosis between water, waste management, energy production and other industries
- Use of captured carbon dioxide and associated by-products from CCUS technologies
- Shift mindsets from 'waste management' to 'resource management'

TRANSPORT & LOGISTICS

- Increase uptake of electric vehicles and design infrastructure with circular principles
- Develop local supply chain opportunities for clean, smart transport
- Support a shift to using bio-fuels as an alternative fuel to fossil fuels in appropriate areas and industries
- Increase vehicle utilisation and sharing to reduce congestion, emissions and economic loss
- Change planning policy to move towards multi-modal transportation systems

Further details surrounding these opportunities can be found in Appendix 3, which outlines a summary of the economic importance of each of these sectors to the local economy, critical issues with how these systems currently operate in a linear model and key strategic opportunities associated with these sectors moving towards more circular models. The strategic opportunities have been identified from a number of studies and engagement with local stakeholders.

3. Action Plan

	UNDERSTAND SYSTEMS & LOCAL CE OPPORTUNITIES	IGNITE COLLABORATION & LEADERSHIP	CAPTURE & SHARE BEST PRACTICE	EDUCATE, INSPIRE & BUILD SKILLS	DELIVER CIRCULAR "BEACONS"	ACCELERATE CHANGE... AND MAKE CE BUSINESS AS USUAL
Key Tasks/ Milestones	<p>Establish a benchmark for the existing state and performance of each of the six capitals</p> <p>Develop the evidence base to unlock investment</p> <p>Develop our understanding of how systems can be changed</p>	<p>Share lessons learnt from establishing our internal C-Team</p> <p>Launch the Circular Movers & Shakers of Yorkshire</p> <p>Establish a programme for young leaders in the circular economy</p>	<p>Develop, launch, test and improve an online suite of circular economy case studies, guides and tools for businesses</p> <p>Develop, launch, test and improve an online suite of circular economy resources for local authorities</p> <p>Support action clusters to capture and share best practice</p> <p>Work in partnership with other cities, regions and LEPs to share best practice</p> <p>Develop templates, tools and best practice guides from our circular beacons</p>	<p>Establish and deliver Circular Yorkshire Month</p> <p>Engage nurseries, schools and colleges to embed the circular economy in education</p> <p>Engage local universities to embed the circular economy in academic courses</p> <p>Identify skills shortages/gaps and co-develop interventions with partners</p> <p>Inspire and support a network of change makers</p> <p>Establish the foundations for a circular economy innovation ecosystem to grow</p>	<p><i>Beacon projects include:</i></p> <p>Circular Malton</p> <p>Industrial sites resource exchange</p> <p>York Central</p> <p>Lowfield Green</p> <p>York Food Waste Pilot</p>	<p>Support anchor institutions to realise CE opportunities at scale</p> <p>Support start-ups to scale their CE solutions</p> <p>Support businesses to transform their business models</p> <p>Support industry develop system level action plans</p> <p>Identify and develop local policy levers to stimulate a CE</p> <p>Develop investment mechanisms to finance the transition towards a CE</p> <p>Establish standards and guiding principles to support circular industries develop</p>

Creating a Circular York & North Yorkshire

<p>Key Tasks/ Milestones Achieved</p>	<p>Priority sectors identified</p> <p>Key opportunities within priority sectors established</p>	<p>Key stakeholders convened to spark collaboration</p> <p>Circular York and North Yorkshire vision co-created</p> <p>Convene, facilitate and support stakeholders to develop action clusters</p>				
<p>KPIs</p>	<ul style="list-style-type: none"> • High impact opportunities identified 	<ul style="list-style-type: none"> • Number of stakeholders engaged • Number of action clusters established 	<ul style="list-style-type: none"> • Number of CE case studies/tools/guides published • Number of organisations engaged with online resources • Number of active collaborations with LEPs/cities/regions 	<ul style="list-style-type: none"> • % of businesses with a strong understanding of CE • % of students with a strong understanding of CE • % of students with an ambition to have a career in CE 	<ul style="list-style-type: none"> • Number of circular beacon projects implemented 	<ul style="list-style-type: none"> • Number of templates/tools/guides shared • Number of organisations supported • % of population aware of/making change towards circular economy • 6 capitals positive shift

Please note the measurement phase is outlined in section 4.

ACTION PLAN DETAIL**PHASE 1: UNDERSTAND SYSTEMS & LOCAL CIRCULAR ECONOMY OPPORTUNITIES**

Our starting point is understanding what moving towards the circular economy really means for our local economy and where the greatest opportunities are to have the most impact. We then need to understand how to realise such opportunities and how we can change systems.

- **Priority sectors identified:** To ensure a strategic approach to moving towards a circular economy, we first needed to understand the local opportunities that the circular economy could provide. A semi-quantitative approach was used to compare the circularity potential and importance of sectors to the local economy. This resulted in a prioritisation of the following sectors:
 - food and agriculture
 - manufacturing
 - construction
 - transport and logistics
 - utilities
 - public sector.
- **Key opportunities within priority sectors established:** Engagement with local stakeholders, accompanied by analysis from a series of studies has informed the development of a series of high-impact opportunities within these sectors. These studies included research to identify resource-intensive industries, future regionally significant clean growth sectors, and the value of natural capital assets to the local economy.
- **Establish a benchmark for the existing state and performance of each of the six capitals:** Through existing research, we have a partial view of the existing state and performance of each of the six capitals. Further research is needed to fill knowledge gaps, so that we can benchmark our progress in improving our financial, manufactured, social, human, intellectual and natural capital.
- **Develop the evidence base to unlock investment:** We will continue to deepen our understanding of local circular opportunities and develop our evidence base. Using the 6 capitals framework, we will evidence the economic, social and environmental benefits of moving towards the circular economy in particular areas to unlock investment opportunities within the region.
- **Develop our understanding of how systems can be changed:** Collaboratively with our stakeholders we have identified key leverage points within our priority sectors to change these systems from linear to circular (i.e., our 'system changers'). However, further collaborative work is needed to understand how these changes can practically be brought about and to understand the complexities of the systems at work. This work will provide the foundation to develop industry-led, system level action plans.

PHASE 2: IGNITE COLLABORATION & LEADERSHIP

Unprecedented collaboration and leadership is needed to create truly circular systems across the region. We aim to enable, facilitate and support collaboration to create a movement towards the circular economy in Yorkshire.

- **Key stakeholders convened to spark collaboration:** In October 2018, the LEP convened over 80 stakeholders to introduce the circular economy to key anchor organisations and kick-start our circular journey. Delegates collaboratively identified opportunities and challenges in moving towards a circular economy, and established the levers we can pull

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to catalyse systems change. This set the foundations for our collaborative approach to moving towards a circular economy.

- **Circular York and North Yorkshire vision co-created:** We have collaboratively developed a vision for a competitive circular region, where the economic system enhances natural, human, social, intellectual, manufactured and financial capitals. The vision aims to unite and align stakeholders.
- **Convene, facilitate and support stakeholders to develop action clusters:** The LEP convened over 80 stakeholders in April 2019 to unpack a series of big challenges in creating a circular economy locally, from how we can embed the circular economy in education to realising the collaboration to create the UK's first circular market town. Many of these groups have flourished and are now stakeholder-led action clusters building momentum to transform Yorkshire. The LEP will initiate additional clusters of activity (e.g., anchor institutions actioning climate emergency declarations), as necessary, and continue to support existing groups by identifying funding opportunities, facilitating discussions, providing strategic leadership, linking initiatives and clearing barriers.
- **Share lessons learnt from establishing our internal C-Team:** Support other organisations embed circular economy thinking into their activities through sharing guides/models/templates from how the LEP have developed its crossing-cutting circular economy team.
- **Launch the Circular Movers & Shakers of Yorkshire:** Establish a community of change makers to drive change within their organisations and sectors. These circular economy champions will share challenges and lessons learnt, and act as a support network.
- **Establish a programme for young leaders in the circular economy:** With partners and young professionals, co-design a programme of activities to support young leaders have greater impact in addressing climate change and catalysing a shift towards a circular economy.

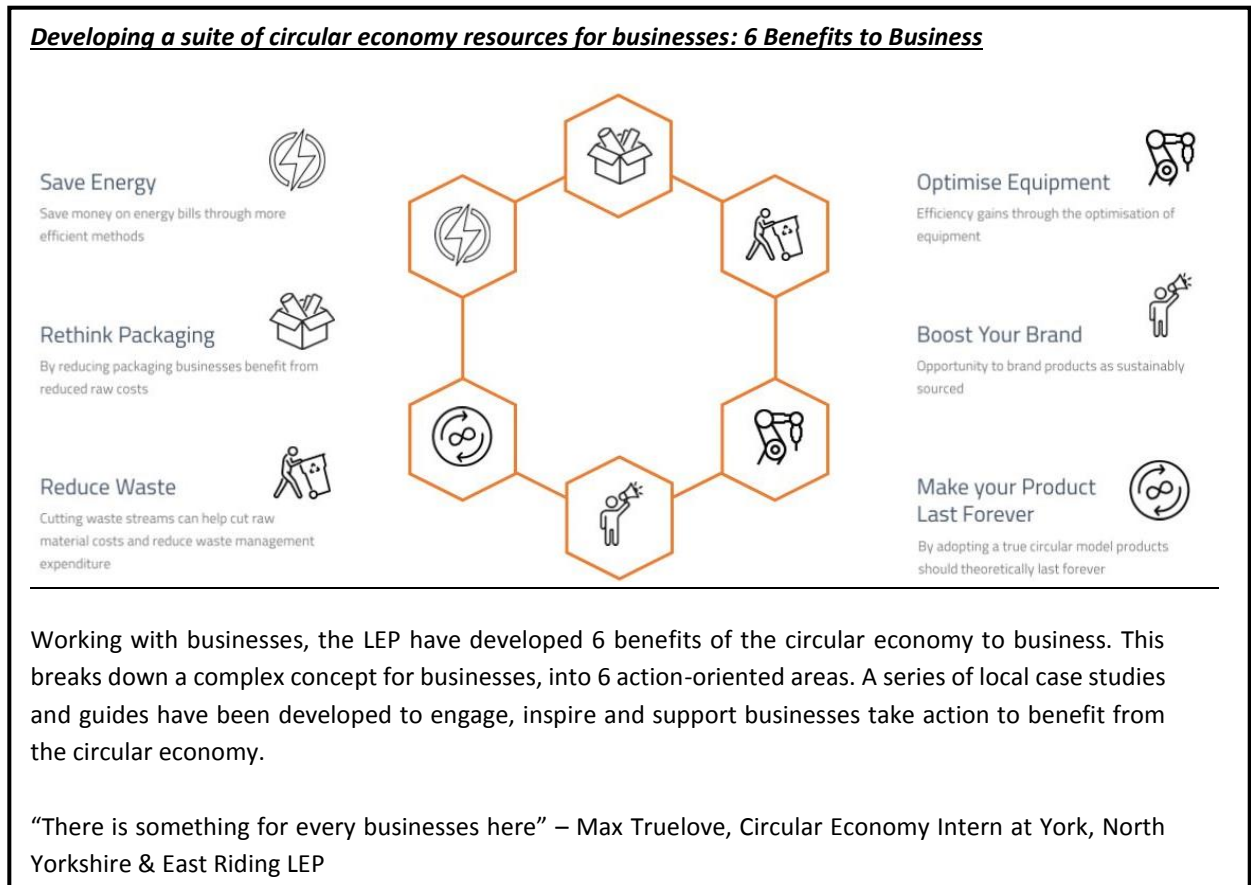
PHASE 3: CAPTURE & SHARE BEST PRACTICE

Whilst the circular economy is often considered as an abstract concept, there has already been a substantial amount of work in the area and there are a proliferation of examples of the circular economy in action, both locally and internationally. We need to work collaboratively with other cities and regions, and local businesses, to capture existing best practice.

- **Develop, launch, test and improve an online suite of circular economy resources for businesses:** The LEP has engaged with local businesses to understand the types of resources and information they need to support them to move towards more circular operating models. The online bank of local circular case studies and best practices guides will be launched in November 2019, and following a period of testing will be refined.
- **Develop, launch, test and improve an online suite of circular economy resources for local authorities:** Co-develop a suite of resources with local authorities to support them to achieve ambitious carbon reduction targets and reduce costs.
- **Support action clusters to capture and share best practice:** Research local, national and international best practice to support action clusters to design interventions and address challenges.
- **Work in partnership with other cities, regions and LEPs to share best practice:** Via existing networks, including the UK Circular Cities Network (convened by the London Waste and Recycling Board), the LEP Network and international forums, share what's worked and what hasn't and learn from others.

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- **Develop templates, tools and best practice guides from our circular beacons:** Identify what has worked well from and what hasn't from our demonstrator projects and create best practice templates, tools and guides to support other areas implement circular economy projects.



PHASE 4: EDUCATE, INSPIRE & BUILD SKILLS

We need to raise awareness of the circular economy and develop our human capital: educating, inspiring and building skills within society. This will change mindsets and empower people to be change makers.

- **Establish and deliver Circular Yorkshire Month:** Convene partners to deliver a month of circular economy events and activities to raise awareness of the circular economy, increase adoption of principles among local organisations and build Yorkshire's international profile in the circular economy.
- **Engage nurseries, schools and colleges to embed the circular economy in education:** Develop an awareness of how students understand and engage with the circular economy concept. Identify opportunities to embed the circular economy in education and careers guidance, and develop a 'flight-path' to inspire and build skills from nursery age for the circular economy.
- **Engage local universities to embed the circular economy in academic course:** Work with our local universities and industry partners to identify opportunities across

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academic courses to include relevant modules / lectures/ seminars on the circular economy to develop knowledge and skills.

- **Identify skills shortages/gaps and co-develop interventions with partners:** Identify existing and anticipate future skills shortages and gaps that will be needed for a circular economy. These will include technical skills (e.g., engineering, construction) and transferable skills (e.g., systems thinking, leadership). With key partners we will then collaboratively develop interventions to address these skills shortages and gaps.
- **Inspire and support a network of change makers:** Through the Circular Movers and Shakers of Yorkshire community, support individuals to implement circular economy initiatives within their organisations and scale their impact.
- **Establish the foundations for a circular economy innovation ecosystem to grow:** Work with key partners, including BioVale, University of York and Nestlé, to develop an ecosystem in York and North Yorkshire which enables and stimulates circular economy innovation.

PHASE 5: DELIVER CIRCULAR “BEACONS”

Making the circular economy real and tangible to people through visible demonstration projects is critical. The beacon projects have been developed from phase 1 – understanding local circular opportunities and systems. The “beacons” will showcase the art of the possible, attract interest and provide anchors to build a critical mass around. We will develop beacon projects across our geography: in our market towns, industrial clusters, the City of York, rural areas and coast.

The projects detailed below include our pioneering initiatives. We will continue to work with partners to develop additional “beacons”.

Pioneering “beacons” include:

- Circular Malton & Norton: Create the UK’s first circular market town
- Industrial Sites Resource Exchange: Sharing of ‘resources’ / ‘waste’ between businesses
- York Central: Design a circular, carbon-neutral ‘living lab’
- Lowfield Green: Create a circular, sustainable community
- York Food Waste Pilot: Find the highest value for York cafes and restaurants’ food waste

Circular Beacon Case Study: Circular Malton & Circular Norton Summary

Vision: A successful, appealing, healthy, happy market town

Mission: Creating a culture of collaboration and a circular economy legacy that prospers

Audacious Goals:

- Everyone in Malton and Norton is aware of the circular economy in 6 months
- A resource efficient market town where nothing of value is lost
- A pilot for Yorkshire and UK demonstrating approach and impact on the 6 capitals

Key Projects:

- Anaerobic digestion pilot: turning Malton's sewage, silage and food waste into energy to power the town, using an innovative anaerobic digestion kit in storage containers.
- Drinking fountain: installing a drinking fountain in Malton and giving out reusable water bottles to discourage plastic use and educate students and citizens about the circular economy through the water cycle.
- School renewable energy: develop a business model and secure finance to install renewable energy technologies to power a school.
- Electric vehicle charging points: install two electric vehicle charging points to encourage local residents and visitors to make the shift to electric cars.
- Models and templates: create models, templates and guides to support other towns realise the benefits of moving towards a circular economy.

Core Partners: Visit Malton CIC, Possibilities Realised, Fitzwilliam Estate, A Fresh View, St Nick's, Malton Town Council, Ryedale District Council, Hambleton District Council, City of York Council, The Market Managers.

PHASE 6: ACCELERATE CHANGE... AND MAKE CE BUSINESS AS USUAL

We need to embed circular economy principles in how our economy works. This includes developing policy and regulation, standards, business support programmes and investment mechanisms. The end goal here is for circular economy to be business-as-usual.

- **Support anchor institutions to realise circular economy opportunities at scale:** Work collaboratively with our anchor institutions to co-design ambitious circular economy projects that can systemically tackle social, economic and environmental challenges.
- **Support start-ups to scale their circular economy solutions:** Identify barriers for circular economy start-ups scaling solutions and co-design interventions (E.g., Accelerator programmes) to overcome these challenges.
- **Support businesses to transform their business models:** Establish a circular economy support programme for SMEs and other measures to support businesses move towards more circular operating models.
- **Support industry to develop system level action plans:** Building on the identification of key sector opportunities, work with industry to co-develop sector or system level action plans towards the circular economy.

System Transformation Case Study: Building a Carbon-neutral Construction sector in Yorkshire Summary

Vision: A carbon-neutral construction sector in Yorkshire

Mission: Through collaboration develop local circular value chains that challenge the status quo and revolutionise the construction industry

Aims:

- Champion local biobased products,
- Construct healthy affordable homes,
- Produce evidence to empower the construction industry
- Promote the construction skills of the future, and
- Grow the local economy.

Core Partners: Hempcrete UK, YorSpace and York, North Yorkshire & East Riding LEP.

- **Identify and develop local policy levers to stimulate the circular economy:** Work with partners to identify local policy level to support the development of a circular economy. Ensure all LEP emerging policy aligns and supports, where relevant, the transition towards a circular economy. This includes ensuring our Local Industrial Strategy will deliver a circular economy.
- **Develop investment mechanisms to finance the transition towards a circular economy:** Engage partners to develop investment models and mechanisms to enable public and private investment in circular economy projects (E.g., A Circular Economy Innovation Challenge Fund).
- **Establish standards and guiding principles to support circular industries develop:** Support our action clusters to develop standards or guiding principles to accelerate change within their places or industries.

4. Measurement

To track our progress towards creating a competitive circular economy in York and North Yorkshire by 2030, we will measure (1) progress and performance implementing our Action Plan (*outputs*); and (2) progress achieving our strategic goals - impacts (*outcomes*). As learning matures, KPIs and other measures will be reviewed and adjusted. As we move through the phases of the Action Plan, focus will shift from measuring outputs to measuring outcomes.

(1) Measuring progress and performance implementing our Action Plan

Progress implementing the Action Plan and associated performance will be tracked using a series of KPIs, as included in the table above.

(2) Measuring progress achieving our strategic goals - impact

A series of targets and metrics will be developed to capture and measure progress against achieving our strategic goals and improving each of the six capitals. These will be developed in the process of establishing a benchmark for the existing state and performance of each of the six capitals in York and North Yorkshire (phase one).

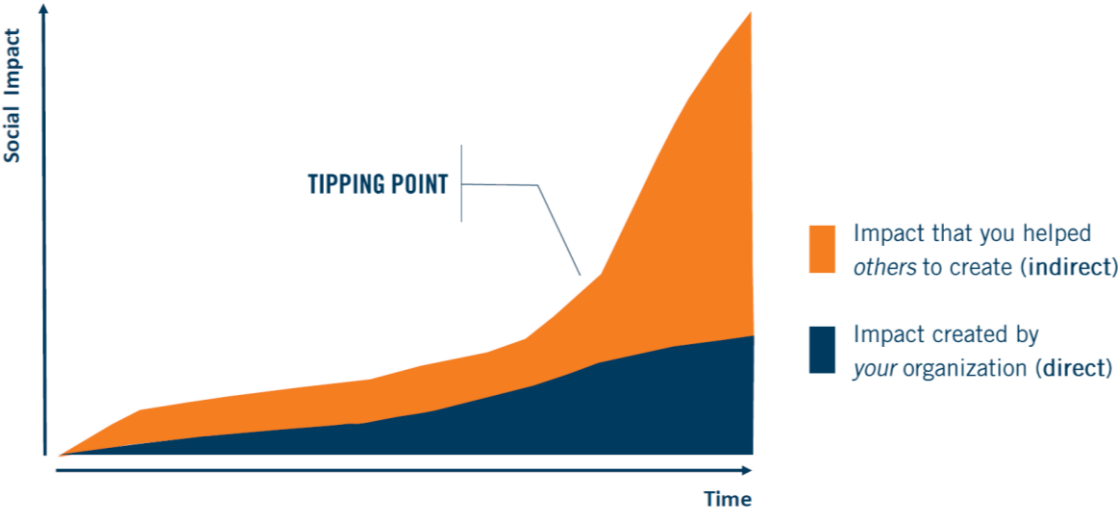
WHO WILL BE INVOLVED IN CREATING A COMPETITIVE, CARBON-NEUTRAL CIRCULAR ECONOMY IN YORK & NORTH YORKSHIRE?

1. Collaboration – ‘lighting the match’

Our strategic priorities and Action Plan have been developed collaboratively, and will be delivered collaboratively, with a range of stakeholders. Collaboration between stakeholders, across sectors and value chains, is integral to achieving systems change. Local authorities, small and large businesses, academia, industry bodies, charities and community groups need to work together to create a new way of working to achieve change. Creating such a new model of working has the potential to have a transformative impact on our social structures: strengthening relationships, building social capital and improving economic resilience.

As a Local Enterprise Partnership (LEP), we believe our role is to firstly, ‘light the match’ – engage, convene, educate and facilitate conversations between stakeholders to identify opportunities and stimulate project development. To support the development of projects, the LEP has a further enabling role in providing strategic direction, leadership, funding, infrastructure and clearing barriers.

As an organisation acting alone, the amount of direct impact we can have over time is limited (as shown in the blue area in the graph below). By identifying how we help others to create impact we can have a far greater impact (as shown by the orange area in the graph below) and make far greater progress to moving towards a circular economy.

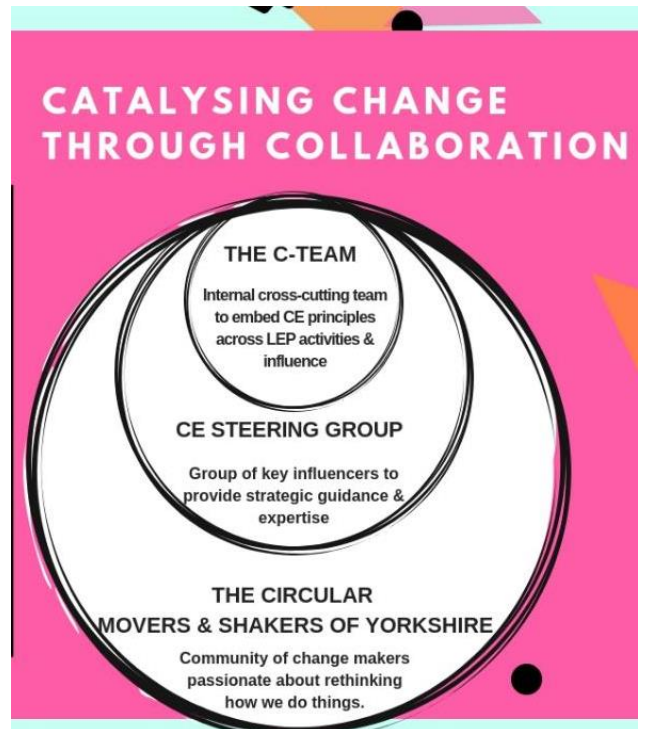


Source: Ashoka (2018)

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2. Creating Impact through Collaboration

Internally, we've created a cross-cutting group, the 'C-Team', made up of representatives from each of our core teams, tasked with embedding circular economy principles across all LEP activities and our sphere of influence. Opportunities to influence how the local economy works include policy levers, changing funding requirements/ investment evaluation, raising the profile of the circular economy as a strategic priority, providing support for businesses and establishing the infrastructure required for a circular economy. This is essentially ensuring there are favourable system conditions in place to enable and drive movement towards the circular economy.

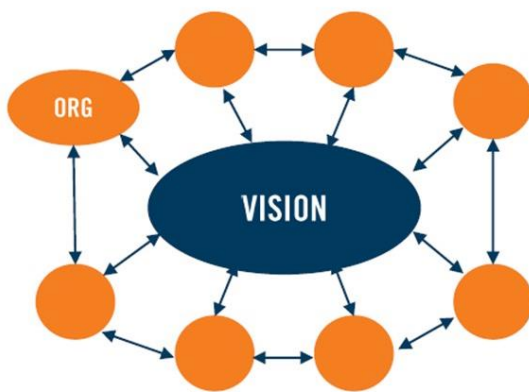
Externally, we have also established a steering group made up of key stakeholders and influencers to provide strategic direction to our circular economy work. Beyond that, we're creating a community of change makers who are empowered to challenge the status quo and drive change within their own organisations and provide the leadership for a Circular Yorkshire.



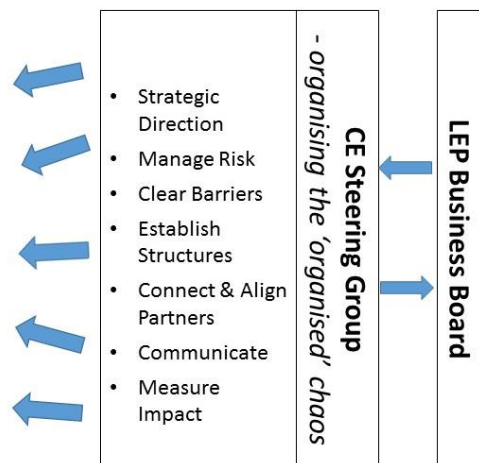
3. Our Governance Structure

Our CE Steering Group is tasked with providing strategic direction, managing risk, clearing barriers, establishing structures, connecting and aligning partners, communicating key messages and measuring impacts. The CE Steering Group will then report to the LEP Business Board.

We've co-created a vision to unite stakeholders, this provides the starting point for a movement towards a Circular Yorkshire. Through a series of workshops, we've initiated and supported local organisations to develop a series of stakeholder-led action groups based around specific challenges. These clusters of activity will continue to grow and develop, with strategic direction from the CE Steering Group.



Adapted from: Ashoka (2018)



Appendices

Note: Appendices will be available online in early 2020 as a suite of resources in to support:

- 1. Other cities and regions move towards a circular economy**
- 2. Local industry and local authorities realise key opportunities within the circular economy**

Appendix 1. The 6 Capitals Model: Framing our thinking

<p style="text-align: center;"><u>Mission:</u> To stimulate a transformation to a circular economy at scale and speed in a diverse region</p> <p style="text-align: center;"><u>2030 Vision:</u> A competitive, carbon-neutral circular economy that provides benefits for businesses, society and the planet.</p>
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Working closely with our stakeholders, we've developed our mission and vision for a circular economy in York and North Yorkshire. We know that moving towards a circular economy requires transformation of how our economy currently works, we know that we need to achieve scale in doing this and we know that there is critical urgency.

Our vision and strategic goals are underpinned by the six capitals framework. Following a linear economic model means we're consuming our stocks of natural, human and social capital faster than they are being produced. This means economic growth is degrading our environment, negatively impacting human health and wellbeing, and widening social inequalities. In contrast, a circular economy aims to rebuild capital, ensuring that we maintain and/or enhance our stocks of natural resources and create new value for society.

This means, an economy that:

- *Protects and regenerates material stocks, restores and maintains effective natural processes (e.g., climate regulation, flood resilience) and ensures no energy is lost [natural capital]*
- *Boosts people's health, skills, motivation and wellbeing [human capital]*
- *Empowers and supports institutions and relationships to thrive (e.g., families, communities, businesses, trade unions, schools, and voluntary organisations) [social capital]*
- *Retains and builds the knowledge and expertise of individuals, organisations and institutions [intellectual capital]*
- *Ensures material goods or fixed assets (e.g., tools, machines, buildings) are designed to last, are maintained, stay in use and fully optimised. [manufactured capital]*

SIX CAPITALS FRAMEWORK & UN SDGs

- Using the six capitals framework captures stakeholders' challenges & opportunities, enables a people-centre approach, aligns with LEP remit and supports measuring impacts.
- Applying circular economy principles at the regional scale aims to create restorative and regenerative systems that improves Yorkshire's financial, manufactured, human, social, intellectual and natural capitals.

Why are we using a six capitals framework?

Using a six capitals approach provides a lens for us to consider the inter-dependencies between economic, human and natural systems. It critically shows how natural capital is inherently tied to social and economic outcomes, which is particularly pertinent for our area considering our rich natural landscapes. Following this approach captures our local stakeholders' challenges and opportunities, puts people at the heart of the economy, aligns with our remit and core activities as a LEP, and promotes framing the circular economy around value and measuring associated impacts.

1. Alignment with Stakeholders' Challenges & Opportunities

We found that key themes from our initial engagement with a wide range of stakeholders, in relation to the circular economy, mapped across to a six capitals approach. Natural capital was already a phrase used by many of our partners and identified as a key area that the circular economy could bring benefits. The need to develop skills (human capital), improve wellbeing (human capital), change culture (social capital), secure investment (financial capital) and better utilise assets (manufactured capital) were also key themes identified. Therefore, it makes a lot of sense to use a six capitals approach which encompasses all of these opportunities and challenges into a logical framework.

2. A People-Centred Circular Economy

Using a six capitals framework puts people at the heart of the circular economy, and opens up the conversation from not only taking about the circular economy designing-out waste, but also designing-out poverty. We believe the circular economy can be used to tackle critical social issues we face, such as loneliness, food and fuel poverty, and housing affordability, through connecting people and organisations with each other, and the resources and assets they need.

3. LEP Remit & Activities

In terms of the remit and core activities within the LEP, a six capitals approach makes sense. Our key teams – infrastructure, skills, business and communications – are all well positioned to drive change towards the circular economy across the six capitals. For example, our infrastructure team has a direct interest in ensuring infrastructure is built to last, designed using cradle-to-cradle principles, and the use of our assets are optimised.

4. Value, Measurement & UN SDGs

A capitals approach reminds us that the circular economy is more than reducing waste, it's about maintaining, rebuilding and creating new value, whether that be people's skills, assets or natural resources. Within a circular economy, at any time all materials, resources and products have value to someone, and nothing of value is lost from the economy.

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A capitals approach also lends itself to measuring impact and value, beyond traditional indicators such as job creation and GVA. By developing key metrics for each capital, we can establish an existing baseline and track our progress towards creating a circular economy and the corresponding impacts.

Using the six capitals framework also enables us to direct and track our contribution to achieving the UN Sustainable Development Goals through moving towards the circular economy. With different businesses, local authorities, universities and communities all having different priorities, the Sustainable Development Goals provide an aligned vision and direction of travel for all. Applying circular economy principles can significantly support the achievement of the Sustainable Development Goals.

Our Vision for the Six Capitals in a Circular York and North Yorkshire

Applying circular economy principles at the regional scale aims to create restorative and regenerative systems that improve Yorkshire’s financial, manufactured, human, social, intellectual/knowledge and natural capitals.

The following section outlines:

- A vision for each of the capitals in a circular economy
- The rationale for each of these capitals being important to our area and the circular economy
- A tangible example which brings to life how each type of capital needs to change in the transition to a circular economy.

Table 1. The 6 Capitals Framework in a Circular York and North Yorkshire

Natural Capital – Any material stock, flow of energy or natural process (e.g., climate regulation)
<p>Our Vision</p> <ul style="list-style-type: none"> • Our natural capital assets are protected, restored and regenerated. • Materials are not taken from the earth at a faster rate than they can be replaced. • The capacity of the environment to provide vital ecosystem services is maintained and enhanced where needed, including flood resilience, climate regulation, resilient soils.
<p>Why does it matter to us?</p> <p>We have rich, high value natural capital assets in our area, including two National Parks and abundance of Grade A agricultural land. These landscapes are intrinsic to our economy and provide a number of services, determining water supply, flood risk, the desirability of the region as a place to live or visit, and the reliability of agri-food supply chains. From a practical perspective, this means natural capital underpins tens of millions of pounds worth of value, year on year. Locally, there are growing concerns surrounding water and soil quality, which is integral to our agricultural sector.</p>
<p>Example: Nestle</p> <p>“Yorkshire landscapes matter to Nestlé. Based in York since the 1830s and producing famous brands like KitKat, Milkybar and Aero, factories like ours need resilient supply chains, with local sourcing options for ingredients. For example, the biscuit flour for our KitKat production is sourced from Yorkshire, Humberside and North Lincolnshire. This gives us a vested interest in resilient soils and farm businesses in the region. Our logistics operations can be disrupted by flooding, and so the performance of river catchments above the city (the Swale, Ure, Nidd and Ouse) all have a material impact on our business.”</p>

- Andy Griffiths, Head of Value Chain Sustainability at Nestle

Human Capital – people’s health, skills, motivation and wellbeing

Our Vision

- People’s skills, health and motivation support and benefit from moving towards a circular economy – all enjoy a high standard of health, quality learning opportunities and employment.
- The local workforce have the skills required for a circular economy - including leadership, systems thinking, innovation, creativity, and both ‘new’ and ‘old’ technical skills - from advanced tech skills in blockchain and autonomous vehicles to traditional skills in repair and maintenance.
- People feel motivated and work for organisations that are purpose-driven.

Why does it matter to us?

Existing systems within our area, such as mobility, built environment, energy and agri-food systems, do not have healthy outcomes for people. Traffic congestion, waste, poor air quality, food and fuel poverty, obesity and loneliness are all symptoms of unhealthy linear systems. A recent study by the Ellen MacArthur Foundation found that for every \$1 spent on food, \$2 are spent by governments and charities in cleaning up the negative impacts on health and the environment. An uncomfortable fact when we consider the food manufacturing businesses in our patch.

The circular economy narrative has been criticised by some for focusing on resources and materials flows, rather than humans. The ‘Circular Economy 2.0’ aims to address this critique in designing-out poverty, as well as waste. By using a 6 capitals approach, we will very much be putting people at the heart of a more effective economy, delivering positive impacts not only for the planet, but for all of society.

In the context of skills, local stakeholders have highlighted the need to address ‘brain drain’ and ensure graduates can find high skilled, high paid jobs locally. There are a number of existing skills shortages, such as for anaerobic digestion plant operators and modular housing construction workers, that are impeding the development of a low carbon, circular economy and consequently means we’re missing out on the associated economic opportunities.

Example: Skills for modular housing

We want to build more modular housing in York and North Yorkshire, providing low cost housing to fulfil government targets. We have the producers of modular housing in our patch, but we don’t have enough people trained in modular technologies to develop the units in factories and assemble the houses on sites. This requires a range of skills from engineering to building skills. We need to develop and retain a sustainable skills base to support more modular homes being built in our area.

Social Capital – institutions and relationships that help us maintain and develop human capital (e.g., families, communities, businesses, trade unions, schools, and voluntary organisations)

Our Vision

- People value materials and resources; mindsets have shifted away from a throwaway culture
- Leasing and sharing, rather than owning, products and assets is the norm
- The structures and institutions of society promote looking after our planet
- The circular economy delivers society-wide benefits, strengthening social ties and building community resilience

Why does it matter to us?

The resounding response from the 80+ plus stakeholders at the end of our first circular economy stakeholder workshop was that collaboration is key to moving towards a more circular economy; we need to build our social capital to enable the transition to a circular economy. We already have a number of thriving

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business networks that we can tap into, and we are ideally placed to convene other stakeholders and strengthen public-private partnerships.

In the context of communities, we already have pockets of communities in our patch thriving from circular principles, such as the Bishy Road/South Bank area in York which already has a furniture re-use network, bulk-buy/zero waste packaging store and supports the edible York initiative. Tang Hall is simultaneously addressing food poverty and food waste through using surplus and local food to make ‘pay as you go’ meals. The challenge is to further develop circular values, mindsets and communities and to extend the benefits across the patch to rural and coastal communities and all parts of society. To tangibly demonstrate the benefits of all different actors within an area working together to move towards the circular economy, we have a stakeholder-led group working to create the UK’s first ‘circular market town’ in Malton, North Yorkshire.

Example: Ownership vs sharing

The average European and US household spends 20% of gross income on car ownership⁹. At the same time, the average European car remains stationary for 92% of the time¹⁰. This doesn’t make sense.

Cars are not the only under-utilised asset we own. It’s thought that 80% of the things in our homes are not used each month. If people’s value shifted from a preference of owning stuff to leasing/sharing this could save households money and reduce resource extraction for consumption.

Intellectual Capital – people and organisation’s knowledge and expertise

Our Vision

- Understanding and knowledge is developed to enable circular systems.
- Knowledge and innovation capacities are developed to solve challenges associated with the circular economy transition.
- Circular knowledge and innovation are used to create and deliver new value.

Why does it matter to us?

With significant knowledge assets in our area, including the University of York, FERA, BioVale and the BDC, there is an exciting potential to create new knowledge and export it to other areas and industries. Disrupting the existing linear economy and moving towards a more circular economy requires deepening our understanding of how systems work and how we can create system change. This requires shifting mindsets and unprecedented innovation, from developing new business models to influencing behaviour.

Manufactured/built Capital – material goods or fixed assets (e.g., tools, machines, buildings)

Vision

- All infrastructure, technologies and processes make minimum use of finite, natural resources and maximum use of human innovation and skills.
- We have the infrastructure and innovative technologies in place to enable a circular economy.
- The use of technologies, infrastructure and other physical assets is optimised in highly effective systems.

Why does it matter to us?

With regional strengths in resource intensive sectors, including manufacturing, food & agriculture, there is a need to make sure that we’re making the most of resources to avoid economic losses and ensure resource security. Businesses can gain an economic advantage through improving resource efficiency and switching to circular business models.

⁹ Ellen MacArthur Foundation, SUN, and McKinsey Center for Business and Environment, Growth Within: a circular economy vision for a competitive Europe (2015), p. 54

¹⁰ Ibid

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In terms of material goods, we know from partners that there are currently a number of post-consumer products that are expensive and problematic to recycle or dispose of – e.g., mattresses, carpets, electronic waste. There’s an opportunity to make use of these valuable materials and redesign these products to ensure value is maintained (or increased) throughout their lifecycle.

Engagement with local stakeholders has shown there a number of assets within the built environment and transport system that we could be making better use of, such as, office spaces, university campus buildings, cars, agri equipment.

Example: Carpets

Although carpets can be recycled, there isn’t a local processing facility in our area. Post-consumer carpet is a challenging waste stream for local authorities to dispose. Carpets are designed to be used by consumers, but not designed for re-use or materials to be recovered at end-of-life. This results in an economic burden for local authorities and often a cost (time & money) for consumers. This is a typical scenario for many consumer products in today’s take-make-use dispose model, from used mattresses to electronic equipment. We need to ensure that products are designed for reuse, repurposing, remanufacturing, recycling and recovery, and that we have the infrastructure locally to support this.

Financial Capital – enables other types of capital to be owned and traded, but unlike other types, it has no real value itself as it is representative of the other types of capital (e.g., shares, bonds, banknotes)

Our Vision

- Financial capital accurately represents the value of natural, human, social and manufactured capital
- The economic system is aligned with the ambitions of the circular economy
- Necessary investment is made to support households, businesses and other organisations to participate and benefit from a circular economy

Why does it matter to us?

Currently, the existing financial system does not accurately reflect the costs of production on the environment and people. This particularly affects our rural landscapes, where accelerating rates of soil degradation has the potential to impact on farm productivity and livelihoods.

In relation to financing the transition to a more circular economy, local businesses are currently struggling to finance required consultancy support and pilot projects to support them moving towards more circular operating models.

Example: Financing the transition to a circular economy

The transition towards a low carbon, circular economy requires a substantial amount of investment. A significant barrier to project development in our area is obtaining finance. Although the private sustainable investment market is over \$750bn and growing, investors simply do not have the time or resources to invest in individual low value projects. Hence the problem that arises is a dislocation between available funds and projects. We need to develop a mechanism to aggregate smaller projects and bridge the gap between investors and investable projects.

Appendix 2. What is Systems Change?

Systems Change

What is a system?

A system is ‘a set of things — people, cells, molecules or whatever — interconnected in such a way that they produce their own pattern of behaviour over time’ (Meadows, 2010)

So a system can be ecosystems, such as the marine environment, that also include our social systems such as food systems, they can be socially created systems such as education, or describe a place. They can be small, such as ourselves or large — like the whole economy.

What is system change?

System change is the emergence of a new way for the system to work. It’s likely to involve a combination of changes to:

- *Structures* — changes in the physical structures of a system for example the way a transport, energy system or place is organised
- *Flows* — changes in how flows of information, finance or how value might be distributed, are configured and relate to each other
- *Rules* — the rules dictate how the system is organised, so if they change they will have an impact on the flows, patterns and structures of the system
- *Power to evolve* — the power to add, change, evolve or self-organise system structure. So can we put in place the ability for the system to change, adapting to different responses to maintain the goal of the system. If a system is self-organising it has the power to keep evolving itself.
- *Goal* — if the goal of the system (i.e., its purpose and function) change, it will ultimately determine how the rest of the system operates.
- *Paradigm* — a paradigm is a set of assumptions or a view about how the world works, it is a pattern of organising our thoughts, which informs how we act and how structures, flows, rules, goals arise.

Adapted from: School of System Change

Appendix 3. Strategic Opportunities within Priority Sectors

Priority Sectors: Systems ripe for change

To develop a strategic approach, we worked to understand the importance of sectors to the local economy and their circularity potential. Following this analysis, we have prioritised the following sectors:

- Agri-Food
- Manufacturing
- Construction
- Utilities – energy, water, waste management
- Transport & Logistics
- Public Sector

This section outlines a summary of the economic importance of each of these sectors to the local economy, critical issues with how these systems currently operate in a linear model and strategic opportunities associated with these sectors moving towards more circular models. The strategic opportunities have been identified from a number of studies and engagement with local stakeholders.

Economic importance & regional strengths:

- The Yorkshire and Humber had the highest concentration of food and drinks businesses in the UK.
- There are 8,916 farms in the area covering 841,404 hectares, which accounts for 12% of the UK's farmland.
- Yorkshire has the ambition to be a global leader in the bioeconomy.

Problems with the current linear system:

“For every dollar spent on food, society pays two dollars in health, environmental, and economic costs. Half these costs – totalling USD 5.7 trillion each year globally – are due to the way food is produced. These USD 5.7 trillion costs are a direct result of the ‘linear’ nature of modern food production, which extracts finite resources, is wasteful and polluting, and harms natural systems. Currently, the agrifood industry is responsible for almost a quarter of greenhouse gas emissions globally, degrades the natural resources on which it depends, and pollutes air, water, and soil.”

– Ellen MacArthur Foundation (2019)¹¹

- Degrading Soil - globally, it's forecast that we have less than 60 years of topsoil remaining.
- Greenhouse Gas Emissions – the sector is responsible for methane and nitrous oxide emissions which contribute to climate change.¹²
- Waste Intensive - in Yorkshire and the Humber, 300,000 tonnes of food is wasted each year¹³

Strategic opportunities in moving towards a circular system:

- Re-localise agri-food systems and create resilient, circular supply chains
With a large agricultural base, distinctive food manufacturing, thriving rural communities and a sustainable food city in our patch, creating more localised value chains has the potential to reduce food miles and keep money in the local economy. One key lever to support the re-localisation of our food system is to leverage the procurement power of anchor institutions, such as local authorities, hospitals and big businesses. In addition, with agriculture being one of the most vulnerable sectors to the impacts of climate change, we need to ensure measures are taken to improve the resilience of our farms, supply chains and landscapes, such as improving the health of soils.
- Move towards regenerative farming – support farmers to adopt regenerative practices
Regenerative agriculture that mimics natural processes aims to close nutrient cycles, returning organic matter to the biosphere. This enriches soils, increases biodiversity and enhances ecosystem services, whilst reducing the need for costly chemicals. These environmental benefits that regenerative agriculture can deliver, position farmers well to benefit from the future Environmental Land Management Scheme. Regenerative practices can also provide direct economic benefits through reducing costs associated with artificial fertilisers and pesticides, and there is evidence that practice increase productivity.

¹¹ Ellen MacArthur Foundation (2019) Cities and Circular Economy for Food

¹² Cambridge Econometrics (2019) Clean Growth Audit, Sector Analysis and Delivery Plan

¹³ BioVale & University of York (2018)

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Furthermore, regenerative agriculture aims to capture carbon in soil and aboveground biomass, and can therefore play an important role in climate change mitigation.

- Create Landscape Enterprise Networks (LENS) - develop networks of business willing to co-invest in our landscapes
Recent research has shown that whilst Yorkshire's landscapes have a material impact on the success of Yorkshire's economy, few businesses in the region have practical options to improve the performance of natural landscapes.¹⁴ Through developing networks we can aggregate business demand for landscape functions to enable businesses to co-invest in improving our natural landscapes. This approach creates business value from healthy landscapes, and at the same time drives investment in healthy landscapes by mobilising their value to business.
- Turn 'waste' into value - seek innovative ways to use surplus, by-products and side streams that would otherwise be going to waste
This involves identifying things currently being wasted or not being utilised at their highest economic value, and forging collaborations so that another organisation can make use of this resource. With 300,000 tonnes of food in Yorkshire and Humber wasted each year¹⁵, this is a significant economic opportunity. Making use of these resources will require us to think differently about the inputs going into food and drink production, and other manufacturing processes.
- Support the further roll-out of anaerobic digestion - increase local waste feedstock availability and capacity for anaerobic digestion
Due to the availability of food waste, animal manure and slurry, anaerobic digestion has further roll-out potential in our area, providing economic benefits and carbon savings.¹⁶ Our area currently has a competitive edge in AD technology, with a high proportion of AD capacity compared to the rest of the UK, plus a state-of-the-art household waste AD facility, and various bioeconomy research assets and innovation clusters. The regional AD network convened by BioVale is a major opportunity and a nationally unique capability to share best practice, increase innovation and attract inward investment. Currently 0.09 MCO₂/year are prevented through AD, and it is forecast this could be increased to approximately 0.2 MCO₂/year with further deployment. AD also provides the potential to reduce waste management costs for local authorities, with the use of 300 kt/yr of waste for AD estimated to have the potential to mitigate waste disposal costs in the region of £3-14 million/yr.
- Strengthen the region's clean agri-tech sector - develop the sector to enable a circular agri-food industry and to benefit from export opportunities
Recent research has identified the City of York as an important cluster for clean agri-tech and highlighted its ability to attract businesses providing market-based research on the bioeconomy, as well as local laboratories and manufacturing¹⁷. Export opportunities exist through being able to promote the uptake of new technologies as well as skills developed in the region. This could include the knowledge and experience gained through the potential creation of a circular agri-food sector, as well as expertise on the use of biomass for fuel and exciting developments in precision agriculture and in-field monitoring technologies via the Crop Health and Protection Centre for Agricultural Innovation (CHAP).

¹⁴ 3 Keel (2019) Connecting Landscape and Economy in Yorkshire – the case for doing business with Yorkshire's landscapes

¹⁵ BioVale & University of York (2018)

¹⁶ Cambridge Econometrics and Element Energy (2018) Low carbon value chains study

¹⁷ Cambridge Econometrics (2019) Clean Growth Audit, Sector Analysis and Delivery Plan

- Support insect protein production - Support for the closing of the 'protein gap' through insect protein
The global demand for protein vastly outweighs supply, an issue that will become more acute with a growing population to feed and as emerging economies move to higher protein diets.¹⁸ The innovative new sustainable and 'clean' industry could transform agri-food productivity in the UK, generating 3,900 jobs in 5 years and worth £1bn to the economy. FERA are active in this research area and are currently convening the Insect Protein Biomass Conversion Task and Finish Group for the UK government. With research strengths, availability of agri-food waste streams and (over 4,000 livestock farms in the area, York and North Yorkshire are ideally positioned to be at the forefront of developing the insect protein industry in the UK.
- Support innovation in sustainable food packaging - position Yorkshire as a leader in sustainable food packaging
In the context of food, packaging plays a vital role protecting food from damage and extending shelf life i.e., avoiding food waste. Reducing single use plastic packaging is a global problem and has emerged as high profile media issues, putting pressures on businesses to change how they package their products. With innovative research institutes, such as FERA, BioVale and the Biorenewables Development Centre, and global food manufacturers committed to tackling the challenge, including Nestle and McCain, Yorkshire is well placed to develop innovative alternatives to single use plastic food packaging. As well as technical solutions, the food and drink industries in York and North Yorkshire can explore more traditional options such as zero packaging shops, container return schemes and reusable materials for business-to-business transit (e.g. farm to local restaurant).

Key Challenges:

- Policy & Risk – anaerobic digestion is particularly reliant on government policy and uncertainty around the future direction of policy is holding back developments. Regulation is also preventing further progress in the development of the insect protein industry in the UK.
- Business Support – lack of time, expertise and finance is preventing local SMEs from realising opportunities within the circular economy.

¹⁸ FERA (2019) Call on Government to narrow the global 'protein gap' with support for insect protein production

Manufacturing

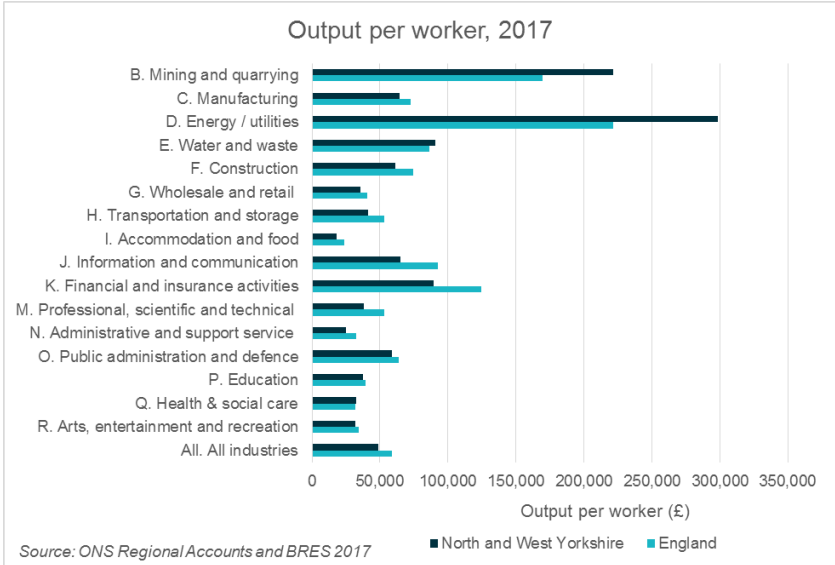
Economic importance & regional strengths:

- The manufacturing sector in York, North Yorkshire and East Riding provides 54,000 jobs, accounting for 10.8% of total employment. In Selby and Ryedale, the manufacturing sector employs at least 1 in every 5 people (that’s more than twice the national average).
- The manufacturing sector currently contributes 12% of total GVA and is a forecast growth sector.

Problems with the current linear system:

“Despite material costs in the UK rising nine times faster than labour costs over the past 15 years, little has been done to use resources more efficiently. The UK is suffering from a lack of productivity and an imbalanced economy. Manufacturing regions would benefit from the new jobs that more circular economy would create. In Yorkshire and the Humber, improvements in resource efficiency could be worth £0.97 billion to manufacturers alone each year.”

- Green Alliance, 2019¹⁹



- Low Productivity Levels – productivity levels in manufacturing are relatively low compared to other industries, as shown in the graph above.
- Energy and Emissions Intensive – large manufacturing industries tend to be characterised by high levels of electricity and energy consumption per unit of output.²⁰ Due to their strong dependency on energy as key production input, these sectors are particularly exposed to fluctuations in energy prices and are at risk of production losses from a lack of competitiveness against other national and international competitors.²¹ Locally, growing energy demands from some manufacturing companies is outpacing local grid capacity, which means companies may relocate.

¹⁹ Green Alliance, 2019, *Acting on net zero now*

^{20,15} Cambridge Econometrics (2019) *Clean Growth Audit*

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- Resource and Waste Intensive – manufacturing is resource intensive by nature. 130,000 tonnes of waste from the manufacturing sector is received by waste processing sites in York, North Yorkshire and East Riding each year.²²

Strategic opportunities in moving towards a circular system:

- Use bio-based material inputs – replace existing inputs with bio-based materials and develop innovative solutions to make use of agri-food waste streams
With substantial agricultural and food manufacturing sectors, world class research facilities and a growing bio-based industry, manufacturing businesses in Yorkshire are conveniently located to make the switch to using bio-based materials. From using bio-based plastics to cellulose-based textiles, businesses can take advantage of such innovations to develop new products, improve consumer perceptions of their products and reduce their environmental impact, yielding further economic benefits for the burgeoning bio-based industry here in Yorkshire. The availability of agri-food waste streams and bio-economy expertise in the patch is increasingly attracting innovative businesses to the area and there is the opportunity to develop a strong inward investment offer to support more businesses to relocate.
- Create resource efficiency clusters – design-out waste, explore opportunities for industrial symbiosis and foster collaboration
Research suggests that UK businesses could save £3 billion annually through short-term investments to make their processes more resource efficient. This means cutting resource use and designing-out waste. 131,000 tonnes of waste from manufacturing is currently processed each year in York, North Yorkshire and East Riding. With a number of industrial sites in our patch, the close proximity of businesses means there is significant opportunity for the sharing of resources and wastes between business through industrial symbiosis and resource exchange.
- Adopt circular business models and build partnerships - to enable optimisation of product use, recovery of valuable components and remanufacture.
This may require redesigning the product, rethinking how it will be used and developing the necessary reverse logistics and infrastructure network. Circular models provide business benefits in relation to building customer loyalty, receiving valuable components back to the business and supply chain and reducing raw material consumption.
Circular business models include:
 - Product life extension – design components and products to extend their active life. For example, ensuring ease of maintenance, repair, upgrade or resell.
 - Sharing platforms – optimise the use of products and equipment (that are either being manufactured or used in the manufacturing process) through enabling sharing.
 - Product-as-a-service – lease your products as a service and retain ownership to enable ease of repair, maintenance, recovery and remanufacture.

Key Challenges:

- Lack of CE awareness – local SMEs in the manufacturing sector currently lack awareness of the circular economy and how it can benefit their business.

²² Environment Agency (2017) Waste Data Interrogator 2017

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- Finance – the high upfront costs for businesses to invest in equipment to improve resource efficiency is a barrier to SMEs.
- Problematic Products – stakeholder engagement has identified a number of manufactured items that are particularly problematic to recover and recycle locally, including mattresses, carpet and electronic equipment.

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Construction

Economic importance & regional strengths:

- The construction sector in York, North Yorkshire and East Riding provides 25,000 jobs, accounting for 5% of total employment in the area
- The construction sector currently accounts for 6% of GVA and is a forecast growth sector.
- A number of manufacturers of modular homes have set up production plants in Yorkshire, who are now producing 5,500 dwellings each year.

Problems with the current linear system:

The construction sector uses the most materials, and produces the most waste, in absolute terms, of any sector. Most of the emissions are embodied in construction materials, with the remaining share originating during the lifetime of buildings for heating.²³

- Resource and Waste Intensive - Construction accounts for 50% of raw material consumption and 60% of waste in Europe.
- Climate Change – the construction industry contributes 60% of the UK's total carbon emissions.
- Indoor Air Quality – the use of conventional construction materials results in a lack of “breathability” and build-up of toxic gases, which is heading towards to a public health crisis
- Under-developed UK Supply – most innovative, low-embodied carbon, bio-based construction products have to be imported from mainland Europe

Strategic opportunities in moving towards a circular system:

- Use bio-based materials in the construction sector – developing local, circular supply chains for bio-based construction materials.
In our area, we have local agro-industry waste streams needed for bio-based construction materials (e.g., hemp, straw), bioeconomy innovation assets (e.g., BioVale, the Biorenewables Development Centre), a construction college in York and construction skills village in Scarborough, and an established network of local architects, developers and contractors who want to use bio-based construction products. Consequently, Yorkshire is well positioned to be a leader in bio-based construction and in doing so realise the social, economic and environmental benefits for residents and businesses.
- Keep construction materials in the local economy - increase material and resource processing, sharing and repurposing capabilities/capacities
Approximately 1 million tonnes of soils and stones (not containing dangerous substances) and 13,000 tonnes of concrete, bricks and ceramics are currently going to landfill each year in our area. This could be avoided through waste prevention and sharing/reuse/recycling of materials. The development of technologies, processing facilities, transport logistics and digital solutions are needed to eliminate waste from the construction sector. This will help ensure economic value remains within Yorkshire.

²³ Cambridge Econometrics (2019) Clean Growth Audit, Sector Analysis and Delivery Plan

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- Apply circular principles to the design of infrastructure and regeneration projects e.g., York Central, Leeming Bar Industrial Estate.
Designing for adaptability, energy efficiency, ease of repair/maintenance, deconstruction and disassembly can eliminate demolition waste, reduce raw material use and provide massive financial savings in the long term.
- Repurpose and retrofit buildings – to extend their life and reduce energy consumption
Improving the insulation and fabric efficiency of the housing stock in York, North Yorkshire and East Riding can deliver savings of 0.3 Mt/ year CO₂.²⁴ Reusing and retrofitting buildings where possible before new structures are considered can have a substantial impact in terms of reducing waste.²⁵
- Develop a regional strength in designing and constructing modular homes with circularity principles
In the domestic sector, building modular homes is a key cost effective option to reduce carbon emissions.²⁶ If 30% of all new homes built were of modular construction, this would lead to c800 modular homes being built in our area per year through 2035. With the costs equivalent to other new builds, but with higher housing quality leading to similar levels of electricity use but 26% reductions in gas use this would lead to annual fuel savings per household of c£230 and annual carbon savings per household of c1.3 tonnes CO₂.²⁷ Off-site construction and modular components reduce the amount of waste produced on-site and enable reuse and repurposing.²⁸ Modular buildings can also be designed for the changing use of a building over its lifetime, and by being able to easily change the structure means that demolition can be avoided. With a number of modular housing manufacturers in our area, we have the potential to develop specialist skills, expertise and technologies in the growing industry.

Key Challenges:

- Budget pressures – environmental considerations on development plans are often the first thing to go when there are budget constraints.
- Financing housing retrofits – high upfront currents are currently a barrier to retrofitting our existing housing stock.
- Skills shortages – we currently have skills shortages in relation to new construction methods, including modular housing and bio-based construction.

²⁴ Cambridge Econometrics (2019) Low carbon value chains study

²⁵ ARUP (2016) The Circular Economy in the Built Environment

²⁶ University of Leeds (2018) Energy and Low Carbon Development Opportunities in York, North Yorkshire and East Riding and Kingston-upon-Hull: An Economic Analysis

²⁷ Ibid

²⁸ ARUP (2016) The Circular Economy in the Built Environment

Transport & Logistics*Economic importance & regional strengths:*

- West and North Yorkshire are located at the heart of the UK's transport network, and its strategic importance is likely to increase if and when the HS2 project is completed.²⁹
- Across West and North Yorkshire, the transport sector accounts for 3.14% of total employment.
- Selby is a particularly dominant area for transport with 9.7% of people being employed in Transport & Logistics compared to the national average of 4.7%.

Problems with the current linear system:

The transport sector still relies heavily on oil and only a small proportion of energy is delivered through alternative fuels such as biofuels, electricity and hydrogen. Consequently, transport is now the largest source of greenhouse gas emissions in the UK; emissions from the sector have increased year-on-year, as increased private vehicle usage has outweighed efficiency gains in vehicles. Little progress has been made in shifting mobility to new low-carbon technologies; the road vehicle fleet continues to be dominated by vehicles based upon fossil fuel combustion, as are air and maritime transportation, and the rate of electrification of the railways has slowed dramatically.³⁰

- Air Quality – emissions from road traffic are a contributor to air pollution. The majority of North Yorkshire has clean unpolluted air; however there are a few locations where emissions from road traffic combined with topography, road layout, and geography have resulted in the build-up of pollutants in areas close to residential properties. These pollutants (usually nitrogen dioxide) occasionally reach unacceptable levels which breach Government air quality objectives.³¹
- Greenhouse Gas Emissions – transport is the largest single source of greenhouse gas emissions in our area³², and emissions from the sector are forecast to continue increasing³³
- Congestion – in our area, the A64 and York City Centre regularly become congested. Sitting in traffic costs time and money. Globally, congestion costs 2-5% of global GDP annually in lost time, wasted fuel and increased costs of doing business.³⁴
- Under-utilised Vehicles – in Europe, the average car remains stationary for 92% of time.³⁵ This means a massive amount of value remains locked up, unused, in car parks and on streets.
- Costs of Car Ownership – the average European and US household spends 20% of gross income on car ownership.³⁶

²⁹ Cambridge Econometrics (2019) Clean Growth Audit, Sector Analysis and Delivery Plan

³⁰ Cambridge Econometrics (2019) Clean Growth Audit, Sector Analysis and Delivery Plan

³¹ North Yorkshire County Council (2018) North Yorkshire Air Quality Strategy

³² University of Leeds (2018) Energy and Low Carbon Development Opportunities in York, North Yorkshire and East Riding and Kingston-upon-Hull: An Economic Analysis

³³ Cambridge Econometrics (2019) Clean Growth Audit, Sector Analysis and Delivery Plan

³⁴ UN Habitat, Planning and design for sustainable urban mobility: global report on human settlements (2013) p. 8; McKinsey Urban mobility at a tipping point (September 2015),

³⁵ Ellen MacArthur Foundation, SUN, and McKinsey Center for Business and Environment, Growth Within: a circular economy vision for a competitive Europe (2015) p. 54

³⁶ Ellen MacArthur Foundation, SUN, and McKinsey Center for Business and Environment, Growth Within: a circular economy vision for a competitive Europe (2015), p. 54

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Strategic opportunities in moving towards a circular system:

- Increase uptake of electric vehicles and associated infrastructure
The adoption of electric and hybrid vehicles and the associated infrastructure presents significant potential in terms of economic opportunities and carbon savings. GVA associated with electric vehicles is expected to grow rapidly, and become around 12 times its current size by 2030. There are currently 500,000 vehicles in our area and conversion of all personal vehicles to electric would prevent 1.2 Mt CO₂/year. Although vehicles are not produced within the region, installation of home, industrial and public charging points will involve local skilled labour, including electricians and construction workers. There is also potential for increased manufacturing of components used within electric vehicle supply chain in the future. Circularity must be designed in from the outset, from ensuring that charging infrastructure is easy to maintain and upgrade to improving reuse and recycling of electric vehicle batteries.
- Supply chain opportunities
The region has low carbon vehicle manufacturers and surrounding green supply chains³⁷. For example, Optare, located in North Yorkshire, manufacture both low carbon Euro 6 diesel buses and electric buses. The presence of green supply chains nearby may encourage uptake of alternative technologies for transport. The region also has a significant transport and distribution sector, which will benefit from these local carbon vehicle solutions. There are potential supply chain opportunities with regards to hydrogen as a transport fuel source, especially for larger vehicles, with a hydrogen production plant in planning adjacent to Drax in Selby.
- Bio-energy – using bio-fuels as an alternative fuel to fossil fuels.
Due to the availability of agri-food waste streams and the presence of bio-economy innovation assets in our patch, there is the opportunity to use biofuels as a clean fuel to support the decarbonisation of the transport sector.³⁸
- Increase vehicle utilisation and sharing
Improving the utilisation of commercial and personal vehicles has the potential to reduce congestion and emissions, whilst providing cost saving benefits to individuals and organisations. Opportunities to strategically locate charging and alternative fuelling infrastructure to incentivise vehicle sharing should be explored, building on the existing success of car-pooling schemes in York.
- Changing planning policy to move away from car-centric and towards multi-modal transportation systems
To reduce the inherent waste associated with car ownership, we need to improve the support for other transport types through strategic investment choices. Investment in cycling and walking infrastructure will reduce GHG emissions and air pollution and save costs to the NHS thanks to active travel's health benefits. Improved local trains and buses (more frequent, reliable services) would reduce congestion around key employment/commuter centres and therefore reduce waste in human capital. Canals and waterways have the potential to divert hundreds of lorries from our region's roads and improve the natural capital if businesses are enabled to co-invest in the infrastructure. Public policy could help enable these investments over continued expansion and improvement of a road network that is traditionally geared towards sole use by cars.

³⁷ Cambridge Econometrics (2019) Clean Growth Audit, Sector Analysis and Delivery Plan

³⁸ Cambridge Econometrics (2019) Clean Growth Audit, Sector Analysis and Delivery Plan

Key Challenges:

- Rural challenge – the high proportion of remote rural areas limits the attractiveness of EVs and discourages uptake in North Yorkshire.
- Grid capacity - there is currently insufficient power supply grid infrastructure to support the required electric vehicle charging infrastructure in many areas. This means we need to reduce journeys and improve vehicle sharing.
- High upfront costs - the high costs of installing rapid charge points and other low carbon vehicle infrastructure creates a substantial barrier to investment.
- Awareness – lack of public and business awareness around electric vehicles and alternative fuels, and their benefits is a barrier to further adoption of low carbon vehicles.

Economic importance & regional strengths:

- Compared to the rest of the UK, energy demand is disproportionately high in the North, estimated to be 31,150GWh in York, North Yorkshire and East Riding in 2015.³⁹ This is due to the presence of energy intensive commercial and industrial sectors.
- The energy sector accounts for 1.9% of total GVA, which is above the national contribution of the energy sector (1.7%) to the UK's economy. In terms of employment, the energy sector is a relatively small component of total employment within the local area and nationally, reflecting the highly productive nature of the sector.
- All sectors of the economy are dependent ultimately on clean water, and Yorkshire Water's operations provides 2 million people with clean water.⁴⁰

Problems with the current linear system:

- Greenhouse gas emissions - the overall emissions associated with the power sector remain substantial, and about 246 tonnes of CO₂ were emitted per job in the sector in 2016.⁴¹
- Due to factors such as reductions in rainfall and water flow caused by climate change, demand for water in Yorkshire set to outstrip supply by 2035.⁴²
- Operational emissions from the water industry account for nearly 1% of the UK's total.
- Environmental protection expenditure by central government for Waste Management was £11.8bn in 2016.⁴³

Strategic opportunities moving towards a circular system:

- Increase adoption of high impact low carbon energy technologies – with circularity designed-in
Research has shown that in our area the following technologies have the highest potential for carbon savings and local economic benefits: domestic energy efficiency, electric vehicles, anaerobic digestion, heat pumps and biomass for heat. These technologies need to be designed and installed with circularity principles in mind to ensure that they are easy to maintain, repair, remanufacture and recover. These processes further support opportunities for local value accrual as they require installers, engineers and processing.
- Explore synergies and industrial symbiosis between water, waste management, energy production and other industries
Using side streams, flue gases and surplus heat generated by energy production, other industries and properties, provides the opportunity to reduce energy demand and realise cost savings for businesses.
There are number of opportunities for utility industries to work closer together. For example, there is a largely untapped resource of heat in sewage which could be exploited. There is also a significant opportunity in relation to anaerobic digestion – making use of sewage, food

³⁹ Carbon Trust (2017) LCR and YNYER LEP Energy Strategy: Energy Technology Appraisal

⁴⁰ 3Keel (2019) Connecting Landscape and Economy in Yorkshire – the case for doing business with Yorkshire's landscapes

⁴¹ National Atmospheric Emissions Inventory (NAEI), 2016

⁴² Natural Assets North: Water in the Northern Powerhouse 2019

⁴³ UK Environmental Accounts: 2018

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waste, agri waste, and the biogenic component of municipal solid waste and commercial/ industrial waste to produce biogas, which could either be turned into electricity, piped into the gas grid as 'green gas' or used directly as a compressed gas fuel for large vehicles (e.g. tractors) to further advance circular agri-food systems.

- Use of captured carbon dioxide – using CO₂ and associated by-products from CCUS technologies.
With Drax Power Station in our area, already capturing a tonne of carbon dioxide a day from its innovative bioenergy carbon capture and storage (BECCS) pilot project, and planning to scale up its operations, there is a significant opportunity for the captured CO₂ to be utilised by nearby industries in their processes. For example, it could be to produce concrete, within the food and drinks industry or creating synthetic fuels to use in hard-to-decarbonise sectors like aviation. Drax has set up a dedicated 'Incubation Area' at the power station that will give other technology companies the opportunity to test their processes on its carbon dioxide.⁴⁴
- Shift mindsets from 'waste management' to 'resource management'
Increasing processing, sharing and repurposing capabilities locally will help ensure economic value remains within the local area. For example, approximately 50,000 mattresses need to be disposed of each year in York, North Yorkshire & East Riding – the processing and recycling of these mattresses provides opportunity for local value accrual.

Key Challenges:

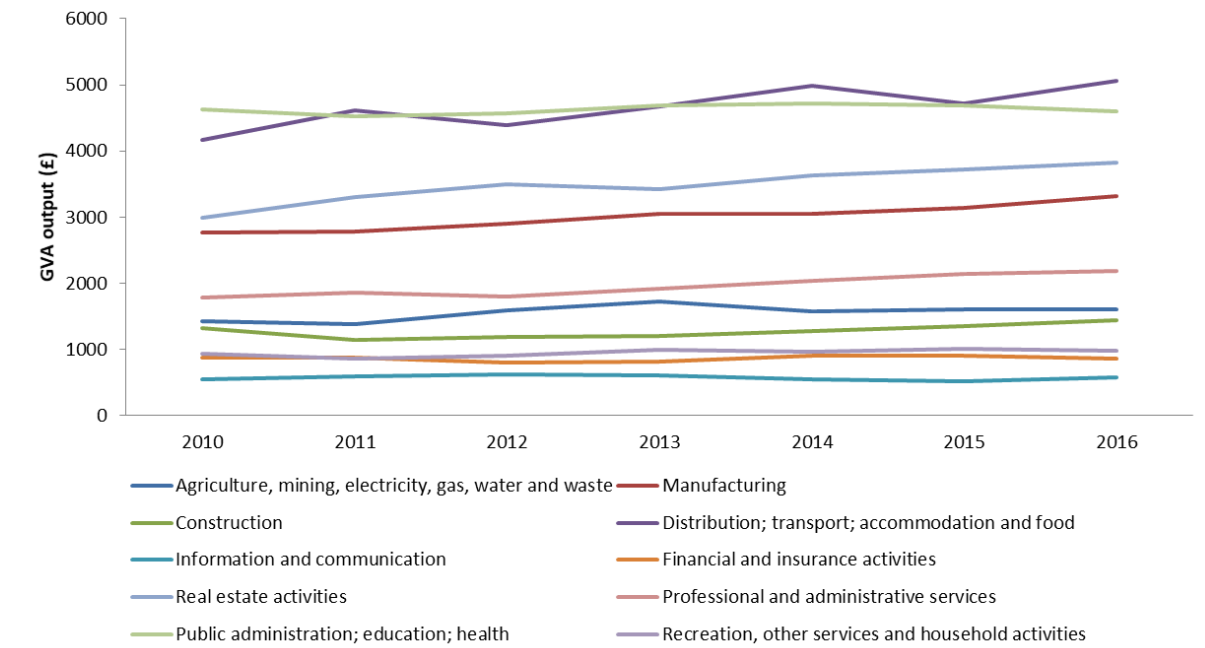
- Rurality – the rurality of North Yorkshire means the distribution of energy, water and waste networks are more disperse. Changing these networks is consequently costly and complex.
- Siloed working – understanding the interdependencies and joint working between the energy, water and waste management sectors is likely to unlock opportunities within the circular economy, but current siloed working is a barrier to this.
- Improving efficiencies – for technologies, such as anaerobic digestion, further research and innovation is needed to optimise the efficiencies of processes and get the maximum value from resource streams.

⁴⁴ Drax. 2019. "Leading energy companies announce new zero-carbon UK partnership." Accessed Aug 08, 2019. https://www.drax.com/press_release/energy-companies-announce-new-zero-carbon-uk-partnership-ccus-hydrogen-beccs-humber-equinor-national-grid/.

Public Sector

- In York, North Yorkshire and East Riding, public administration accounts for 5% of total employment. It is one of the top 5 sectors for employment in the region and is expected to grow by approximately 3,000 jobs.
- Public administration, education and health generate the second greatest value within YNYER, see graph below.

GVA (£) by industrial sector



Problems with the current linear system:

- Energy Cost – the annual energy bill across all public sector buildings in England and Wales is estimated to be around £2 billion⁴⁵
- Highways Cost - £3 billion is spent by UK local authorities on highway construction and maintenance⁴⁶
- CO2 emissions – emissions from North Yorkshire County Council’s buildings, linked buildings (such as schools) and street lighting in 2018/19 totalled 18,850 tonnes CO2e. Despite this being a 44% reduction on 2012/13 levels, this illustrates the challenge that will now be faced when trying to move past the low-hanging fruit, which have often been simple switches with short payback times, into deep retrofitting of council buildings in an age of austerity
- Municipal Waste – 75% of municipal solid waste consists of discarded consumer goods; of which 80% is burned, landfilled or dumped due to poor design and/or lack of end-of-life collection options⁴⁷
- Health and wellbeing – York, North Yorkshire and East Riding have a lower average anxiety rating (2.67) than the national figure of 2.93, both of which are below the regional level of

⁴⁵ BEIS (2016) Building Energy and Efficiency Survey <https://www.gov.uk/government/publications/building-energy-efficiency-survey-bees>

⁴⁶ WRAP, Recycled roads (2005), p.5

⁴⁷ Ellen MacArthur Foundation (2013) Towards the circular economy: opportunities for the consumer goods sector, p. 14, 86

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2.97. Craven, Hambleton and Ryedale are the lowest in YNYER, while York is the highest, potentially showing a link between anxiety and rural living.

- Budget pressures – the Local Government Information Unit has reported that 80% of councils are not confident in the sustainability of local government finance, with over half expecting to dip into their reserves. Departmental budgets outside of the protected areas such as health, defence and overseas aid could be facing cuts of up to 4% per capita by 2023/24. That could mean £80m less per year for public health by 2023/24, £70m less for prisons and £30m less for housing⁴⁸.

Within the UK Government's Clean Growth Strategy, there is a commitment to 'leading in the Public Sector', setting a voluntary 30 percent public sector carbon reduction target by 2020 and funding for energy efficiency improvements in England.

Strategic opportunities moving towards a circular system:

- Smart, circular cities and communities – developing smart, circular cities and communities will support local authorities take action to address our climate emergency and achieve carbon neutral targets. Connecting the concepts of 'smart' and 'circular' can enable cities and communities to systemically address key challenges, using big data solutions to optimise mobility, food, energy and product systems. Locally, research has also shown that there are opportunities for local businesses to benefit from growth in smart city solutions.
- Circular public procurement - demonstrate leadership through embedding circular economy principles in public procurement.
Public procurement is increasingly being recognised as a key enabler to the circular economy. Circular public procurement can be defined as the process by which public authorities purchase works, goods or services that seek to contribute to closed energy and material loops within supply chains, whilst minimising, and in the best case avoiding, negative environmental impacts and waste creation across their whole life-cycle.⁴⁹ Applying circular economy principles to public procurement can deliver substantial economic savings in the long term, through considering the costs incurred during use (such as energy consumption, repair and maintenance) and disposal.⁵⁰ As such, taking account of life-cycle costs makes good economic sense, whilst demonstrating public sector leadership and encouraging businesses to adopt circular economy principles. There are opportunities to incorporate circular principles into the majority of procurement areas, from highways contracts to IT equipment.
- Planning policy – align local planning policy with the shift towards a circular economy
Local planning policy can be used to enable circular flows of materials, reverse logistics, establish infrastructure, ensure connectivity and ease of access to products and services. The spatial planning of residential and industrial sites provides an opportunity to design the foundations for circular material flows and resource self-sufficiency.⁵¹ By integrating circular economy principles into the planning process for new developments, planners can ensure the physical location and infrastructure supports the effective reuse, collection, and redistribution of resources (e.g., water, organics, industrial by-products, building elements, household recyclables).⁵² Planning is also important to ensure there is sufficient infrastructure in our

⁴⁸ TUC, Action to protect the economy and public services, <https://www.tuc.org.uk/research-analysis/reports/action-protect-economy-and-public-services>

⁴⁹ European Commission (2017) Public Procurement for a Circular Economy: Good practice and guidance, p.5

⁵⁰ Ibid

⁵¹ Ellen MacArthur Foundation (2019) Circular Economy in Cities: Planning for compact, connected cities

⁵² Ellen MacArthur Foundation (2019) Circular Economy in Cities: Planning for compact, connected cities

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urban and rural areas for energy storage and to support electric vehicles and other low carbon alternatives.

- Eliminating 'waste' – shifting the focus from waste management to waste prevention and resource management. While appropriate product design is key to enabling local material loops, there is also a need for the right resource management infrastructure to be put in place. This includes standardised collection and sorting schemes, reverse logistics services, as well as local sorting and processing facilities that can recover and redistribute materials and products for further use. Sorting infrastructure can be supported by innovations in robotics and artificial intelligence that can increase rates of recovery and purity of secondary materials.
- Business support and incentives - policies and activities relating to business support and economic development can be used to incentivise businesses to design their products with circularity principles and move towards circular business models. The availability of agri-food waste streams and bio-economy expertise in the patch is increasingly attracting innovative businesses to the area and there is the opportunity to develop a strong inward investment offer to support more businesses to relocate.

Key Challenges:

- Siloed working – we need to break-down siloes across council departments to enable opportunities to be realised
- Budget pressures – pressures on budgets often prevent teams exploring different approaches which can deliver environmental benefits and reduce costs in the long term.
- Investment - large investments required for capital projects, requiring blends of public and private finance, presents a barrier to changes being made and implementation.