High-level strategic assessment of the natural capital assets of Leicester and Leicestershire

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Executive summary

The Leicestershire region supports a diverse economy which is underpinned by the benefits that flow from the area's natural capital assets. However, decision-making and initiatives that aim to deliver regional economic growth tend to undervalue the role of natural capital. There is now growing evidence, including the recent Dasgupta review, emphasising the need to account for nature in economics and decision-making. The Leicester and Leicestershire Local Enterprise Partnership (LLEP) recognising this need commissioned a high-level strategic assessment of the natural capital assets of the region. This included identifying existing evidence and any gaps, reviewing local policies that are likely to drive investment into natural capital, and detailing the required process towards producing a Natural Capital Investment Plan for the region.

The evidence review focused on four sources of data on natural capital and ecosystem services provision in the Leicestershire area: the Natural England Natural Capital Atlas for Leicestershire and Rutland, the new Environment Agency Natural Capital Register and Account Tool (NCRAT), the Local Action Project Leicester Evidence Review, and the National Forest Company (NFC) and Leicestershire and Rutland Wildlife Trust's (LRWT) Leicestershire county habitat and ecological permeability and connectivity mapping. These provided some useful information to better understand the quantity and quality of natural capital assets in Leicestershire. The EA NCRAT and the NFC and LRWT's mapping were the only projects that provided natural capital evidence just for Leicestershire. The former project was able to quantify both the physical and the monetary flows of a range of ecosystem services. The latter was able to use a range of data (including local data) to map the coverage of habitats across the county.

The asset registers from these projects did vary due to the different approaches and data used. Whist there was agreement between them in the overall dominance of agriculture in the region (estimated range from 65-82.7% of the county), the variation in the extent of other habitats, particularly woodland, was quite large. The NFC and LRWT's habitat mapping has the potential to provide the most accurate asset register for the county, as it incorporates local Phase 1 data (for which there is good coverage across the county) and woodland survey data. This has been combined with data on sites of conservation interest, OS MasterMap data (to characterise the urban areas) and local satellite data. It also has the advantage of demonstrating the spatial variation in natural capital assets across Leicestershire. This is in comparison to the courser-grained national scale satellite data used to inform the other projects. The NCRAT tool showed that the agricultural production service was the most valuable service provided by the natural capital assets of Leicestershire (£180.91 million annually). Overall, the natural capital assets of Leicestershire have an annual value of £388 million, which includes the annual value of other ecosystem services such as water supply, climate regulation, recreation, physical health and air quality. At this stage these results are indicative of the relative value of these services in the region. There may be inaccuracies in these calculations due to the type of data used to ascertain the area of the natural capital assets, and default assumptions when calculating physical and monetary flows of ecosystem services. The NFC and LRWT mapping could be built on in the future with additional data sets to create a more detailed basemap on which to base estimations of ecosystem service provision and demand. This could be used in the NCRAT tool to improve the accuracy of the results.

The NFC and LRWT's permeability and connectivity mapping demonstrates the extent of the current woodland, grassland and heathland habitats, but also where it would be ecologically feasible to create new habitat to ensure larger and better connected habitat networks across Leicestershire. This is a good start and it is important to be able to put these networks into context by comparing them to a detailed baseline natural capital asset map to assess the networks in relation to other assets. It would

also be ideal to combine this biodiversity network mapping with network mapping for enhancing ecosystem service provision across the region. Resultant maps would indicate where it is ecologically feasible to create new habitat to increase biodiversity and a range of other benefits at the same time. This will indicate key areas for investment.

The high-level policy analysis identified the key challenges faced in Leicester and Leicestershire and how these challenges are currently being tackled (policy goals and targets), whether these goals present opportunities or threats to natural capital, and what the gaps are that investment in natural capital could help to address. The approach was structured around the themes of the LLEP's draft Plan for Growth (places, ideas, people, infrastructure and business environment). A SWOT analysis showed that key strengths, among others, were recognising the need to enhance the environment, create a great place to live, work, study and visit, and the need for resilient clean growth; weaknesses were that there was a focus on development with no consideration of natural capital and a lack of integration across policies to support natural capital assets; opportunities exist to create, protect and enhance green infrastructure and to restore and regenerate urban environments; threats were existing environmental risks such as air pollution, flood risk and ecological decline as well as pockets of deprivation and limited affordable housing.

The stakeholder workshop was also structured around some of the key themes of the draft Plan for Growth (places, infrastructure, business and people), and it built on the SWOT approach used in the policy analysis. Participants from across sectors discussed these themes in relation to natural capital. There was some convergence in the analyses across the groups, with the need to understand the spatial distribution of natural capital assets to address inequalities in the provision of benefits across Leicestershire, to use existing strategies and programmes to deliver natural capital investment especially for achieving net zero carbon in farming and transport, to bring an understanding of natural capital to local businesses, across sectors and to use the monetary value of natural capital to engage key decision-makers.

It has been possible to start building an understanding of the extent and condition of the natural capital assets in Leicestershire, and the breadth and magnitude of the benefits that they deliver to the region, using existing studies and data. However, as we have highlighted, there are gaps in this baseline and areas where more detailed and reliable data sources can be used to build a more detailed and spatial evidence base. This is key for the production of a targeted investment plan for the region which will enhance the capacity of the natural capital assets to deliver ecosystem services, meeting the demand for them in an equitable way. We have recommended a route to delivering a Natural Capital Investment plan for Leicestershire. It outlines seven steps to creating a robust natural capital evidence base, which includes a detailed basemap of the natural capital assets, maps of the distribution of a series of ecosystem services, a biodiversity baseline to track biodiversity net gain at the development and county scale, and the creation of opportunity maps for biodiversity and ecosystem services that show how investment can deliver both. The completion of the evidence base then kicks-off a collaborative process of prioritisation informed by further information on policies, targets an initiatives in the region (housing allocations, infrastructure schemes, agri-environment schemes, catchment management plans etc), to focus investment in natural capital to where it will have the greatest benefit.

Contents

1. Introduction

Leicestershire's location at the heart of England places it in an advantageous position to conduct business as a logistics hub. Domestic and international trade connections made by rail, air and road support numerous traditional and emerging sectors which include life sciences, food and drink, textiles, automotive, manufacturing, space and sport. This economic activity is underpinned by the benefits that flow from the region's natural capital. Decision-making and initiatives that aim to deliver regional economic growth tend to undervalue the role of natural capital. This leads to an erosion in the quantity and quality of the natural capital assets, which in turn impacts on the benefits that provide economic prosperity, human wellbeing and environmental sustainability. There are a now a number of studies that emphasise the importance of accounting for nature in economics and decision-making, one notable recent example being the Dasgupta review (Dasgupta 2021[1]).

The Leicester and Leicestershire Local Enterprise Partnership (LLEP) have recognised the link between their economic aspirations and the need to incorporate the value of the natural capital assets in the region into their strategic ambitions. Consequently, they have commissioned a high-level strategic assessment of the natural capital assets of Leicester and Leicestershire. The LLEP identified the need for an assessment of the region's natural capital, the benefits that this provides and the opportunities to enhance it, taking into consideration the LLEP's economic and social development ambitions.

The specific aims of this strategic assessment were to:

- Review the current evidence on natural capital and identify any gaps in knowledge.
- Complete a high-level review of the national and local policy and institutional frameworks that are likely to drive investment into natural capital.
- Produce a SWOT analysis of the policy review informed by a stakeholder workshop.
- Suggest an appropriate work plan to deliver a Natural Capital Investment Plan for Leicester and Leicestershire.

The evidence review focuses on three sources of data on natural capital and ecosystem services provision in the Leicestershire area (Section 2). How appropriate this data is for building a natural capital baseline is assessed and the gaps in knowledge identified (Section 3) We include a review of the habitat network mapping that has been completed for the region, and demonstrate how the Phase 1 data held by Leicestershire County Council can be used to create a natural capital asset map. This is followed by a review of 15 local policies and strategies, illustrating how targets can be supported through investment in natural capital (Section 4). A SWOT analyses of the existing policies is then presented. A summary of the key outcomes from the stakeholder workshop are also included (Section 5). Recommendations for the next steps towards creating a Natural Capital Investment Plan for Leicester and Leicestershire are detailed and integrated with recommendations from the policy review (Section 6).

[1] Dasgupta, P. (2021), The Economics of Biodiversity: The Dasgupta Review. (London: HM Treasury).

1.1 What is natural capital?

The natural environment underpins our wellbeing and economic prosperity, providing multiple benefits to society, yet is consistently undervalued in decision-making. Natural Capital is defined as "*...elements of nature that directly or indirectly produce value or benefits to people, including ecosystems, species, freshwater, land, minerals, the air and oceans, as well as natural processes and functions"* (Natural Capital Committee 2014). Natural capital refers to the stock of assets provided by the natural environment with capacity to produce goods and services that are of value to people (NCC, 2014[2]), often classified into provisioning, regulating and cultural ecosystem services (EEA, 2016[3], Hein et al., 2016[4]) (see Figure 1).

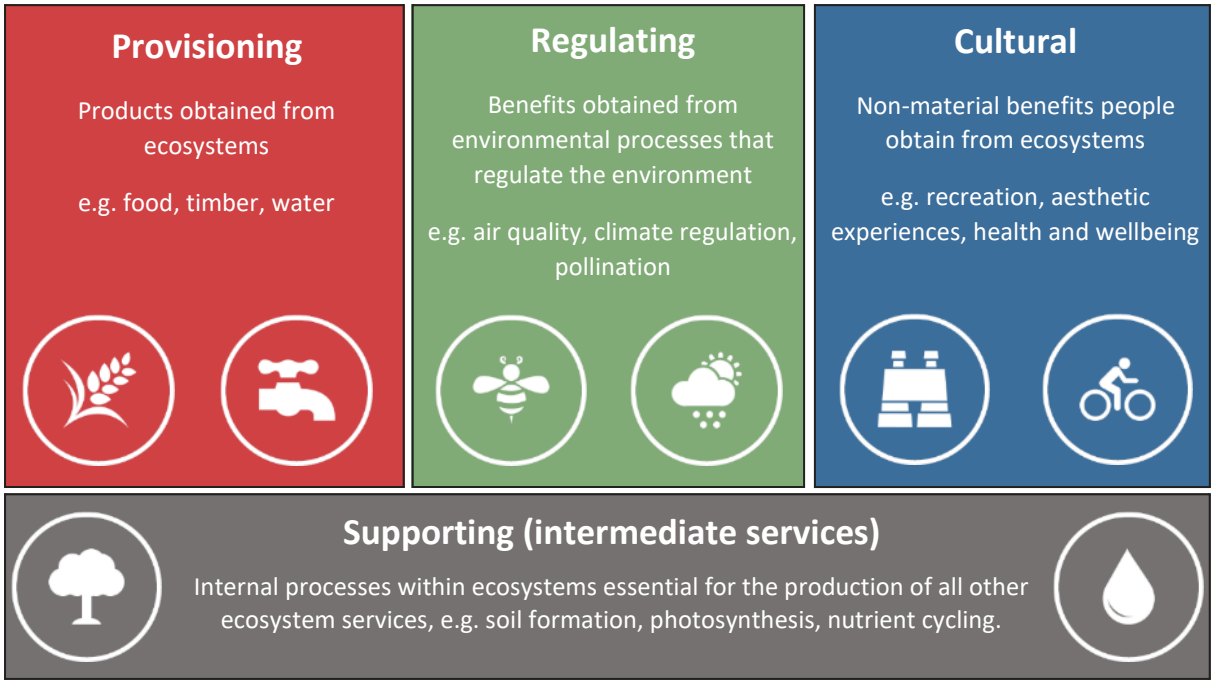

Figure 1 Key types of ecosystem services (based on MA 2005 and EEA 2016).

Natural capital supports all forms of other capital on which human systems depend, whether man-made, human or social. However, many of the outputs produced by natural capital, such as the regulation of flooding and atmospheric gases by woodlands, are not included in the decisions of individuals or organisations. This is because they often involve non-priced public goods that are not traded in the market place, and are not subject to formal property rights and entitlements (TEEB, 2010[5]). Elements of natural capital are therefore liable to be overused, degraded, depleted and eventually lost, with consequences for long-term welfare and the sustainability of economic systems. There is now much greater awareness of the role of natural capital in the design and achievement of economic and social development strategies, with strong links to business and enterprise[6].

[2] NCC (2014) Towards a Framework for Defining and Measuring Changes in Natural Capital. Working Paper 1, Natural Capital Committee.
[3] EEA (2016) Common International Classification of Ecosystem Services (CICES), European Environment Agency, Copenhagen. https://cices.eu/.
[4] Hein, L., Bagstad. K., Edens, B., Obst, C., de Jong, R., Lesschen, J.P. (2016) Defining Ecosystem Assets for Natural Capital Accounting. PLoS ONE,11(11): e0164460. doi:10.1371/journal. pone.0164460.
[5] TEEB (2010) The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations. Earthscan, London and Washington.
[6] TEEB (2012) The Economics of Ecosystems and Biodiversity in Business and Enterprise. Earthscan. London; New York.

Furthermore, the central role of natural capital in delivering quality of place is being increasingly recognised.

Natural capital is also becoming increasingly embedded across multiple policy domains, including the mandatory requirement for biodiversity net gain for all new developments, as set out in the Environment Bill, with an ambition to move towards environmental and natural capital net gain in the future, backed by changes to the National Planning Policy Framework and the new Planning White Paper. The Environment Bill also sets out the requirement for Nature Recovery Networks (NRN) and a NRN Strategy, while the new Agriculture Act paves the way for a new Environmental Land Management Scheme (ELMs), with a central tenet of farmers and land managers being paid public money for public goods, based on natural capital principles. Further policy alignment is achieved through the requirements for action on climate change and commitments to go carbon neutral, including the planting of large areas of new woodland.

2. Leicestershire's natural capital evidence review

The aim was to review any natural capital work that may already have been undertaken in the region that had, or had begun to, set a natural capital baseline. To this end we also explored data sets held by the project stakeholders that could be used in any future natural capital assessment. We found a number of studies had been completed that included the Leicester or Leicestershire county area, and were able to review biodiversity network maps that had been completed for the county. The sections below detail the findings and assess knowledge gaps.

2.1 Existing natural capital studies

Natural England Natural Capital Atlas for Leicestershire and Rutland

The Natural England Natural Capital Atlas for Leicestershire and Rutland[7] is a county scale version of the National Natural Capital Atlas (Wigley et al. 2020[8]). The best available data is used to map indicators of the quality, quantity and location of natural capital assets (habitats). Indicators for some flows of ecosystem services are also mapped, but for this region there are only three (water availability for abstraction, carbon sequestered and Greenhouse Gases fixed and actual water quality (which is not an ecosystem service)). Despite the lack of information on ecosystem service flow, there is some useful information in this atlas that can start to build a picture of the natural capital assets of Leicestershire county.

[7] Natural England (2020) Natural Capital Atlas: Mapping Indicators for Leicestershire and Rutland.
[8] Wigley, S., Paling, N., Rice, P., Lord, A., and Lusardi, J. (2020) National Natural Capital Atlas, Natural England Commissioned Report Number 285.

The atlas included a natural capital asset register (the area and percentage cover of each habitat) (see Table 1). The asset register shows that there are a broad diversity of habitats across Leicestershire, but the landscape is dominated by agricultural habitats. Arable and improved grassland combined cover and area of 207,240 ha. It also highlights that there is a significant area of woodland (15,460 ha) and active floodplain (14,680 ha).

Table 1 Area and percentage cover of broad habitat types across **Leicestershire and Rutland** (source Natural England, 2020[6]).

Broad habitat	Area (Ha)	% cover
Arable & horticulture	114,010	44.7
Improved grassland	93,230	36.6
Woodland	15,460	6.1
Broadleaved, mixed & yew woodland	10,900	4.3
Woodland priority habitats	9,560	3.8
Ancient woodland	2,720	1.1
Coniferous woodland	1,100	0.4
Woodland, scrub and hedge	480	0.2
Active flood plain	14,680	5.8
Green space: not semi-natural	8,120	3.2
Lakes & standing water	1,950	0.8
Other semi-natural grassland	1,130	0.4
Other semi-natural habitats	910	0.4
Open mosaic habitats	830	0.3
Floodplain grazing marsh	600	0.2
Dwarf shrub heath	420	0.2
Ponds	390	0.2
Modified waters (reservoirs)	310	0.1
Meadows	300	0.1
Lowland fens	160	0.1
Blue space	100	0.0
Orchards and top fruit	40	0.0
Reedbeds	10	0.0
Semi-natural habitats	10	0.0
Rivers	914.6 km	
TOTAL	**277,420**	**99.2***
*The percentages were taken from Natural England (2020) and do not add up to 100%.		

The Natural Capital Atlas presents many maps displaying natural asset quantity and quality indicators on a 5 km^2 hexagon grid as shown in Figure 2. The interval classes relate to the whole of England so a direct comparison of the performance of each indicator with the rest of England can be made. The ecosystem services associated with each indicator were also given.

Tables A1 and A2 in the Appendices were created to show the performance of each of the quality and quantity of asset indicators. Overall, the quantity of each type of natural asset across Leicestershire

and Rutland is highly variable. Despite most habitat types (apart from arable and horticultural land) being non-existent across much of the two counties, there were pockets where hexagons were outliers (larger than the 90th percentile) for most of the habitat types. The extent of permanent vegetation cover was moderate across the study area and urban green space area was unsurprisingly very high in Leicester, however, urban semi-natural habitat areas were extremely low.

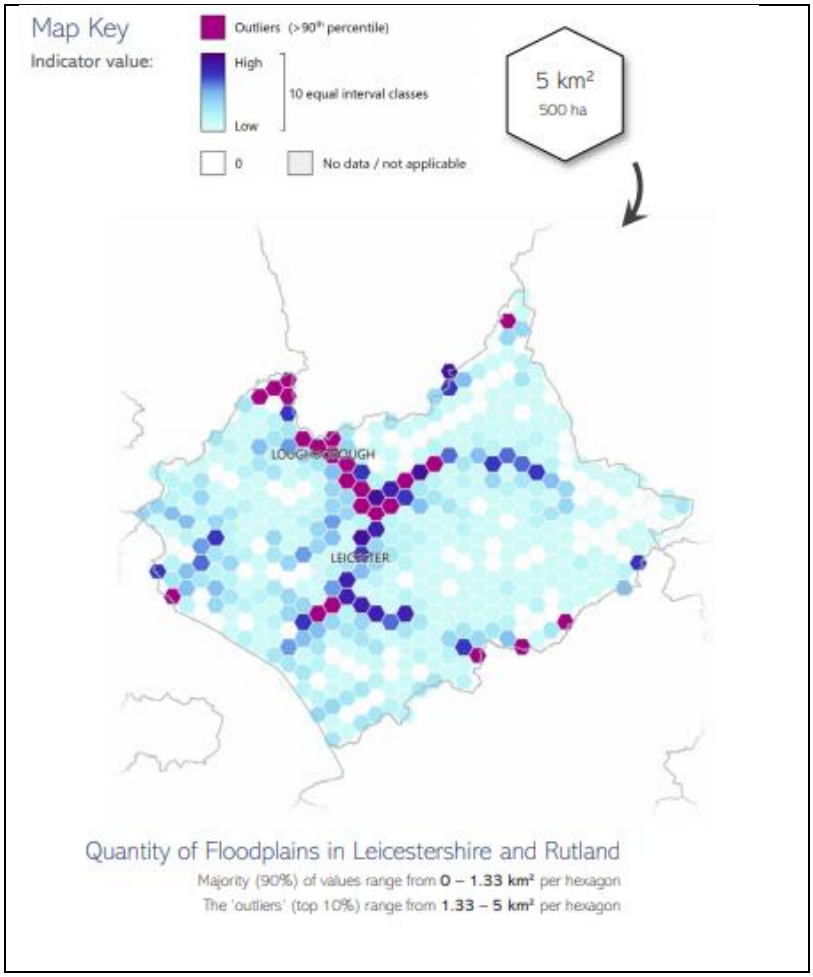

Figure 2 An example of a map from the Natural England Natural Capital Atlas for Leicestershire and Rutland.

The quantity of asset indicators that performed the best (rated as 'high' in green and 'medium' in orange) were: soil biota, the extent of permanent vegetation cover, river length, amount of water available for abstraction, arable and horticultural land area, improved grassland area, length of Public Rights of Way and presence and frequency of pollinator food plants. The quality of asset indicators that performed the best were: chemical status of waterbodies, natural aquifer function - recharge and discharge, tranquillity and lack of physical modifications of water bodies. Overall, the indicators relating to freshwater performed the best. All the other indicators were 'low' or 'very low' which suggests that there is a significant room for improving the quantity and quality of the region's natural capital assets.

We conclude that whilst the Natural England Atlas is a guide as to the extent and quality of the natural capital assets of Leicestershire, it does not provide accurate enough information for Leicestershire alone, because the asset register also covers Rutland. In addition, the data on which the extent of assets are derived is the Centre for Ecology and Hydrology's (CEH) Land Cover Map. This is a GIS land

cover layer derived from satellite data. When processing the satellite data into the broad habitat categories, there can be inaccuracies in the classification of habitats, with particular problems distinguishing between types of grasslands, which leads to inaccuracies. The resolution of the data is not fine enough to demonstrate field scale variation in habitat. Particularly the urban classifications are limited and can miss small but important greenspaces within dense urban areas (see the implications of this for mapping habitats below). This will inevitably lead to inaccuracies in the asset area calculations. There is no useful data on ecosystem service flows in the atlas for this region.

Environment Agency Natural Capital Register and Account Tool

The Environment Agency (EA) scorecard[9] is a product of the organisation's first phase of assessing and valuing natural capital. The scorecard specifically for Leicestershire county was reviewed at the beginning of the project. However, the new EA Natural Capital Register and Account Tool version 1 (NCRAT) became available towards the end of the project, which more comprehensively quantifies and values a range of additional ecosystem services. The focus of this review will be on the output of this new tool.

NCRAT records the quantity and quality of assets for a chosen study area (**natural capital register**), and uses this information to quantify the physical flow of 13 different ecosystem services from the assets. It then applies monetary values to the benefits (**natural capital account**). The natural capital register is derived from the total hectares of each habitat type using CEH Land Cover and Corine Land Cover data (a European equivalent to the CEH map), as they are open access. A more detailed habitat extent (using Natural England Habitat Priority data and other sources) and asset condition (using various data sources for peatland, woodland, surface water and others) can also be inserted. The indicators used to measure the physical and monetary flows of the ecosystem services are outlined in Table 2.

Contextual information can be added into the natural capital account by adding in local values for certain ecosystem services. Other qualitative information is gathered in a **risk register** indicating the level of risk to the quality and quantity of eight broad habitat types. A **significance assessment** is included to indicate the relative importance of each ecosystem service in the study area. A **beneficiaries assessment** indicates who benefits from the ecosystem services. The tool can be set up to assess natural capital assets for any region of interest.

The tool was set up at the Leicestershire county scale by Kane Cunliffe of the EA. The asset register for the region shows the broad habitats present, and echoes the Natural England Atlas register, with the region being dominated by agricultural habitats (Table 3). This was the first application of the tool to this region and time was short to prepare it, however, a preliminary natural capital account was created (Table 4). The total annual value of the benefits from the natural capital assets of Leicestershire is estimated to be £388.45 million, with a present value (over 100 years) of £11.84 billion (Figure 3). Food production (arable and livestock combined) is the most valuable service, followed by recreation, and water supply (Table 4 and Figure 3).

[9] Environment Agency (2019) Leicestershire and Leicester City natural capital scorecard. EA.

Table 2 Indicators used in the EA NCRAT to quantify the physical and monetary flows of 13 ecosystem services.

Ecosystem Service	Physical flow measure	Monetary flow measure
Agriculture - Arable	Yield of arable production	Gross margin
Agriculture - Livestock (dairy)	Yield of livestock (dairy) production	Gross margin
Agriculture - Livestock (meat)	Yield of livestock (meat) production	Gross margin
Fish landings	Volume of fish landings	Net profit
Water supply (public water supply)	Abstracted raw water quantity	Resource rent
Water supply (energy use)	Abstracted raw water quantity	Not valued
Water supply (other)	Abstracted raw water quantity	Marginal value
Timber	Volume of timber removals	Stumpage price
Renewable energy	Hydro-generation production	Resource rent
Climate regulation	Net CO2 sequestered	Abatement cost
Air quality - $PM_{2.5}$	PM2.5 absorbed	Avoided cost (treatment and productivity) plus welfare value
Air quality - SO_2	SO2 absorbed	Avoided cost (treatment and productivity) plus welfare value
Air quality - NO_2	NO2 absorbed	Avoided cost (treatment and productivity) plus welfare value
Air quality - O_3	O3 absorbed	Avoided cost (treatment and productivity) plus welfare value
Hazard regulation	Properties in flood zone 3	Avoided damage cost, or replacement cost of water storage depending upon option selected
Recreation (adults)	No. visits to open spaces	Welfare value
Recreation (children)	No. visits to open spaces	Not valued
Physical health	No. active visits to open spaces	Avoided treatment cost
Education	No. nature-based educational visits	Opportunity cost
Volunteering	No. nature-based volunteering days	Replacement cost
Water quality - rivers	N/A	Welfare value of good water quality
Water quality - coastal, lakes and transitional waters	N/A	Welfare value of good water quality

Table 3 Area and percentage cover of broad habitat types across Leicestershire county (source EA, 2021[10]).

Broad habitat type	Quantity (Ha)	% of total area
Enclosed Farmland	178,358	82.7
Freshwaters, Open waters, Wetlands and Floodplains	575	0.3
Marine	0	0.0
Moorlands and Heaths	99	0.0
Semi-natural Grasslands	515	0.2
Urban	32,333	15.0
Woodlands	3,835	1.8
Total	**215,715**	**100**

Table 4 Annual physical and monetary flow of the ecosystem services of Leicestershire county.

Ecosystem service	Annual physical flow	Annual monetary flow (£M)
Agricultural production	178,358 ha	180.91
Arable production	*766,940 tonnes/year*	*68.22*
Livestock (dairy) production	*784,776 kL/year*	*104.43*
Livestock (meat) production	*22,965 tonnes/year*	*8.26*
Water supply	20.71 million m^3/year	40.44
Public	*11.07 million m^3/year*	*7.17*
Energy generation	*0.075 million m^3/year*	-
All other	*9.57 million m^3/year*	*33.26*
Timber production	17,162 m^3	0.47
Carbon sequestration/climate regulation	40,134 tCO2	4.33
Air pollution regulation	10,266 tonnes/year	3.98
PM2.5 absorbed	*56 tonnes/year*	*2.73*
SO2 absorbed	*304 tonnes/year*	*0.01*
NO2 absorbed	*238 tonnes/year*	*0.77*
Water quality	-	1.77
Flood storage by woodlands	1.05 million m^3	0.46
Recreation	53 million visitors	126.22
Adults	*42 million visitors*	*126.22*
Children	*11 million visitors*	-
Physical health	18.27 million active visits	29.87

[10] Environment Agency (2021) The Environment Agency Natural Capital Register and Account Tool, Version 1. - Technical Report.

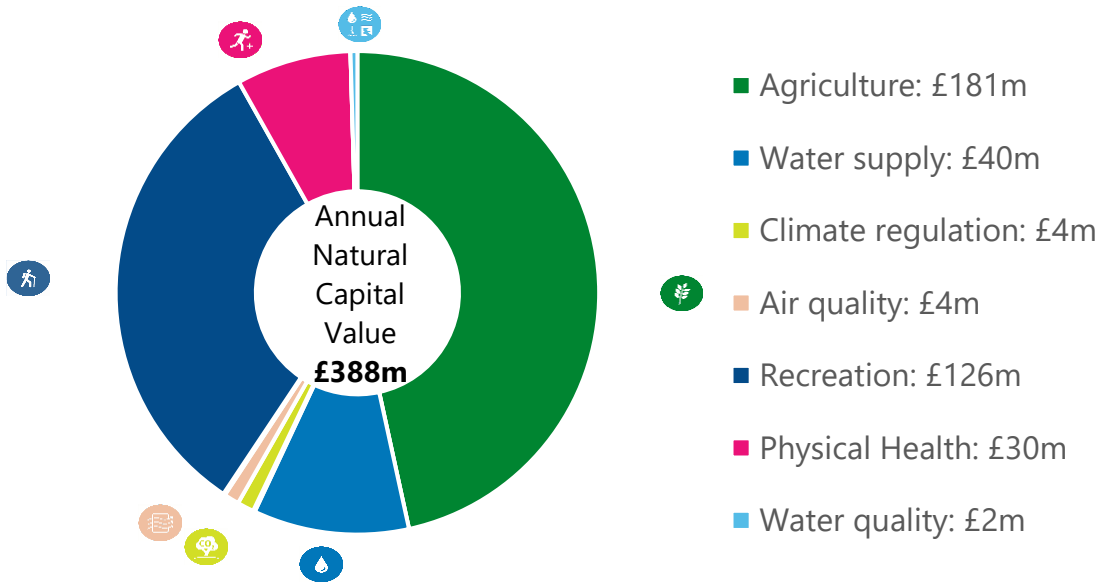

Figure 3 Breakdown of natural capital value by ecosystem service for the county of Leicestershire.

The NCRAT covers a wide range of ecosystem services, using evidence-based quantification of physical and monetary flows. It also allows tailoring to the specific context in which it is being used. It usefully indicates the relative significance of the different services and considers the beneficiaries of the benefits. Due to time constraints in this project, the tool was set as the default calculation for agriculture, and other local information was not available in the time, so the results need to be interpreted with care. For instance, the agriculture default setting makes a range of assumptions about the ratio of enclosed farmland that is arable and pasture (50% each). It assumes all arable is wheat, and it also assumes the same 50:50 split for dairy and beef related to the pasture. Clearly for Leicestershire the asset register (see asset register in Table 5 below) demonstrates that the tool assumption regarding area of arable and pasture does not apply, so the result in Table 4 should not be assumed as accurate. In addition, as with the Natural England Atlas, it is based on land cover data which may lead to inaccuracies in asset area estimations. The NCRAT has been developed for use at the regional scale – local authorities and above. This means that it is not possible to disaggregate the results at smaller scales within a local authority. Providing this is understood and no disaggregation is required, this tool will be useful for application in Leicestershire. We discuss how the tool can be used further in the pathway to delivering a natural capital investment plan for the region (Section 6).

Local Action Project: Leicester Evidence Review

This Defra pilot[11] provides an overview of the assets of the City of Leicester and maps some ecosystem services. The actual physical flow of the ecosystem services (e.g. tonnes of pollutant removed) is not measured, with the exception of one service (aesthetic value). Proxies have been used to measure aspects of the issues – e.g. the level of pollution, actual water pollution, urban temperature and flood risk – rather than the capacity of the natural capital assets to remove pollutants, reduce temperatures and soak up flood water. It is a useful overview of assets, but it does not provide any numbers for this study.

[11] Defra (2016) Local action project. Leicester evidence review.

Leicestershire county habitat and ecological permeability and connectivity mapping

The National Forest Company (NFC) and the Leicestershire and Rutland Wildlife Trust (LRWT) have put together an estimate of habitat cover across Leicestershire. This was part of a broader mapping exercise to map areas where broad habitats can be created to increase connectivity across the landscape[12] (see biodiversity network mapping section below). A number of data sets were used to map a best estimate of broad habitat cover across Leicestershire. These data included Phase 1 habitat inventory (this is available for a reasonable proportion of Leicestershire), Local Wildlife Sites, areas designated for conservation such as SSSIs, ancient woodlands, and habitat data held by the NFC. These were brought together with OS MasterMap (as it maps buildings, roads, gardens and water), and remote sensing data for the area. A tile from the series that make up the habitat basemap for Leicestershire is shown below in Figure 4.

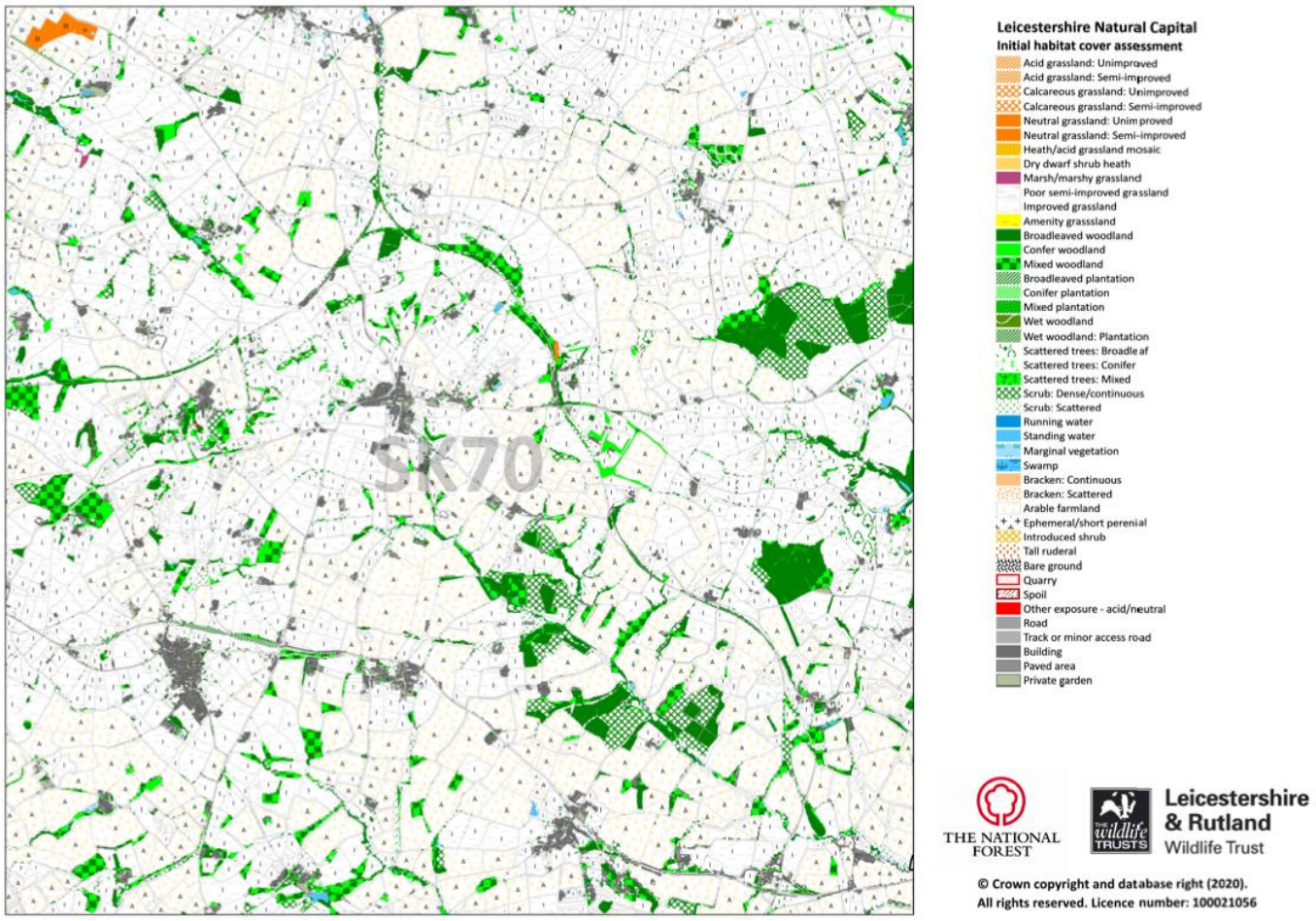

Figure 4. A 10 km tile from the habitat cover assessment of Leicestershire county.

The asset register (Table 5) created from this habitat basemap shows, as with the Natural England and EA assessments, that the agricultural habitats (arable and improved grassland) cover the greatest area of Leicestershire (65%, 140,140 ha). This is followed by grassland habitats of conservation value (8%, 17,248) and broadleaved woodland (5%, 10,780). However, the area of all of these habitats differ significantly between all three asset registers. For example, the NE Atlas shows woodland to be 15,460

[12] Lattaway, S., Clarkson, J. & Devine, B. (2020) Leicestershire county habitat and ecological permeability & connectivity mapping report. NFC and LRWT.

ha, the EA tool data estimates woodland in Leicestershire at 3,835 ha, compared to 10,780 ha in this assessment (not including coniferous woodland). This is likely a consequence of each assessment taking a different approach and using different data to derive the asset register values, as well as the NE Atlas data covering the Rutland area in addition to Leicestershire county.

Table 5 Area and percentage cover of broad habitat types (asset register) across Leicestershire county (source: Lattaway, Clarkson & Devine 2020).

Habitat	Area (ha)	Cover of total area (%)
Arable	86,240	40
Improved grassland	53,900	25
Potentially valuable grassland	17,248	8
Built	12,936	6
Garden	10,780	5
Broadleaf woodland	10,780	5
Scrub	2,156	1
All other habitats	21,560	10 (none >1% except conifer)
Total	**215,600**	**100**

This is the first assessment of Leicestershire that has included a mapping approach. The data used in the mapping provides a finer detail than the data used in the Natural England Atlas or the inputs to the EA tool. The authors of this mapping project are careful to call these habitat area estimates rough, and emphasise that some of the data used is old, and that there is a need for ground-truthing the basemap, particularly the grass road and rail verge, scrub, and woodland habitats, along with unsurfaced paths and tracks. However, the approach used here is the beginnings of a much more robust one than is used in the Natural England Atlas or the EA tool. This is because it incorporates the use of local Phase 1 data, which comes from on the ground surveys, existing data on wildlife sites and designated areas and woodland data National Forest Company. It does incorporate satellite data, but does not totally rely on this, as in the other two assessments, but uses it for cross-referencing and filling in gaps in data. It is advisable, and this is the intention, to build on this basemap by using further sources of data (for example Crop Map for England and Priority Habitat Inventory data). This will produce a more detailed basemap than those that rely entirely on satellite data of broad habitats and on national level data sets.

2.2 Biodiversity network mapping

The importance of landscape-scale conservation and ecological networks has become increasingly recognised over recent years. Many wildlife sites have become isolated in a landscape of unsuitable habitats and efforts are now being directed towards linking existing habitat patches and increasing connectivity. Species are more likely to survive in larger habitat networks, are able to move and colonise new sites, and are more resilient to climate change and other detrimental impacts.

Habitat opportunity mapping to enhance biodiversity follows this ethos by using ecological networks to identify potential areas for new habitats. Identified areas will be ecologically connected to existing habitats, thereby expanding the size of the existing network, increasing connectivity and resilience, and potentially increasing the ecological quality of the new site.

An initial assessment of biodiversity networks across Leicestershire has been completed as part of the Leicestershire county habitat and ecological permeability and connectivity mapping project[12] (reviewed above). The maps were created using the generic focal species and least-cost network methodology developed by Catchpole (2006)[13] and Watts et al. (2010)[14]. For each broad habitat, areas where it is ecologically feasible to create new habitat are identified based on the average dispersal distances for a typical focal species from each broad habitat type. These sites expand on and connect existing or core habitats.

The habitat cover maps created as part of the project (and reviewed in Section 2.1 above) were used to model possible woodland, grassland and heathland habitat networks. The woodland and grassland network maps for the whole of Leicestershire are shown in Figures 6 and 7 below. The woodland network (Figure 6) shows core habitat in dark green, and areas where woodland could be created in light green. Creation of woodland is ecologically feasible throughout Leicestershire and also within the City of Leicester itself. The largest network could be created in the north-west of the county. There are fewer possibilities for creating grassland habitat across Leicestershire, particularly in the east and the south, due to the fragmented nature of the core habitats (Figure 7). Nevertheless, there are a number of areas where it is ecologically feasible to create further semi-natural grassland (dark brown areas in Figure 7). Larger grassland networks are concentrated in Leicester and to the north-west of the city. There are only small fragments of heathland within Leicestershire in the north-west, and although there are some possibilities to create new heathland habitat, it is difficult to connect these core areas.

The fact that this network mapping exists means that progress has been made towards identifying areas where it is ecologically feasible to create new habitat to enhance biodiversity in the region. However, to make the most of these maps, it is important to be able to put them into context by comparing them to a detailed baseline natural capital asset maps that show the spatial distribution of other assets within which the biodiversity networks sit. It is also possible to combine this biodiversity network mapping with network mapping for enhancing ecosystem service provision across the region. Resultant maps would indicate where it is ecologically feasible to create new habitat to increase biodiversity and a range of other benefits at the same time. This will be key to prioritising investment in natural capital and biodiversity. We will discuss this further in the recommendations section below (Section 6).

[13] Catchpole, R.D.J. (2006). Planning for Biodiversity – opportunity mapping and habitat networks in practice: a technical guide. *English Nature Research Reports*, No 687

[14] Watts, K., Eycott, A.E., Handley, P., Ray, D., Humphrey, J.W. & Quine, C.P (2010). Targeting and evaluating biodiversity conservation action within fragmented landscapes: an approach based on generic focal species and least-cost networks. *Landscape Ecology,* 25: 1305–1318.

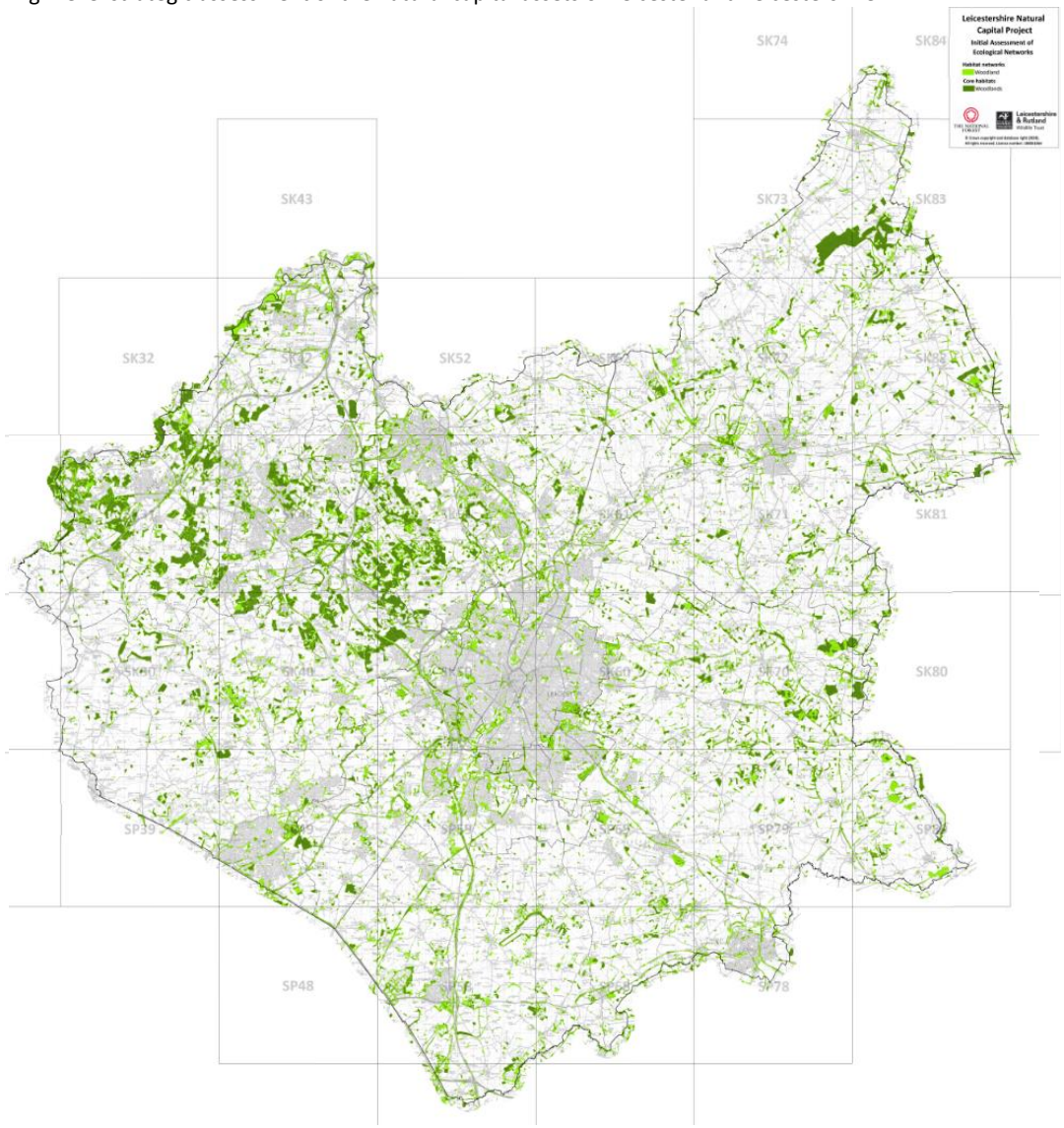

Figure 6 Woodland existing or core habitat (shown in dark green) and woodland biodiversity habitat network (shown in light green), areas where there is the ecological suitability to create new woodland.

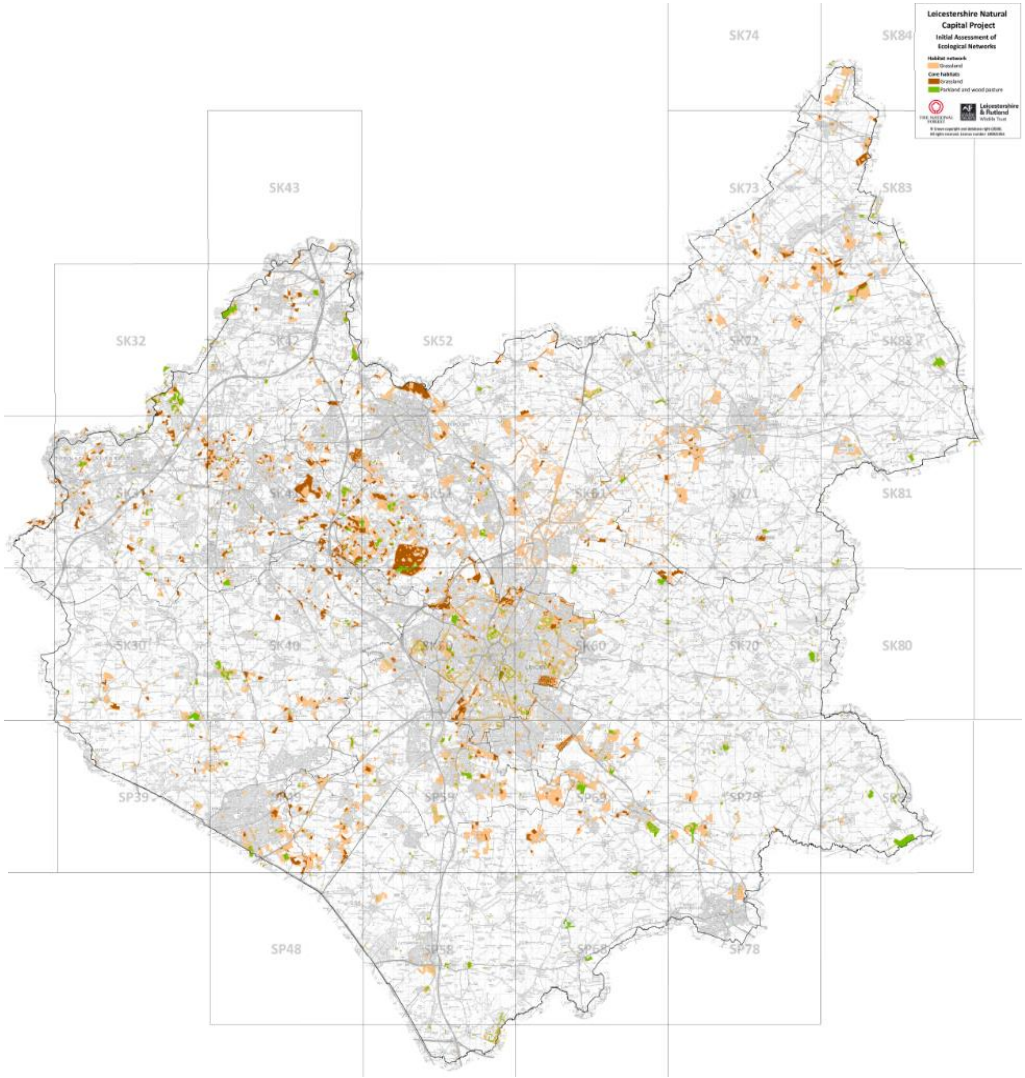

Figure 7 Grassland (shown in brown) and parkland and wood pasture (shown in green) and the grassland biodiversity habitat network (shown in pale orange), areas where there is the ecological suitability to create new grassland.

2.3 GIS data available for further analysis

The following table presents the GIS data held by the project partners, whether it has been used in this study, and whether it could be used in a future natural capital assessment. Much of the data listed in the table is open access.

Table 6 GIS data held by the project partners, whether it was used in this study and whether it could be used in a future natural capital assessment.

Data	Used in this study	Would be used in a future natural capital assessment
Leicestershire County Council (LCC) ecological data	Yes	Yes
Leicester City Council ecological data	No	Yes
Charnwood Borough Council ecological data	No	Yes
CORINE Land Cover 2018	Yes	Yes
Natural England Nature Networks	Yes	Yes
CEH Land Cover Map 2015	No	No
National Forest Company Permeability Data	Not directly but it is a part of deriving the network maps showing where new habitat could be created (Section 2.2)	Yes
Priority Habitat Inventory (England)	No	Yes
Wood pasture and parkland (England)	No	Yes
Sites of scientific interest (SSSI) (England)	No	Yes
Special Area of Conservation (SAC)	No	Yes
Index of multiple deprivation	No	Yes
Cultural Activity	No	No
District council PPG17s / Accessible Natural Greenspace Standard (ANGSt) Data	No	Yes
Ancient/Veteran Tree Inventories	No	No
Ancient Woodland (England)	No	Yes
National Forest Company Phase 1 and forest creation data	No	Yes
Charnwood Forest Landscape Partnership Scheme	No	No
Forest Research (commissioned by the Environment Agency) woodland creation opportunity maps to reduce diffuse pollution and flood risk	No	Yes
National forest inventory (NFI)	No	Yes
DEFRA / Local Authorities (Air Quality Management Areas 2019)	No	No
Local air quality status – Leicestershire https://public.tableau.com/app/profile/r.i.team.leicestershire.county.council/vi	No	Yes

z/AirQuality-NO2MonitoringinLeicestershire/AQMonitoringsites		
Drinking Water Safeguard Zones (Groundwater) (SgZs)	No	Yes (priority opportunity mapping)
Drinking Water Safeguard Zones (Surface Water)	No	Yes (priority opportunity mapping)
Drinking Water Protected Areas (Surface Water)	No	Yes (priority opportunity mapping)
Ecological / Chemical Quality of Surface Water	No	Yes (priority opportunity mapping)
CEH Soil Carbon	No	No (spatial resolution is too coarse)
CEH Soil Nitrogen	No	No (spatial resolution is too coarse)
CEH Soil Bacteria	No	No (spatial resolution is too coarse)
CEH Soil Invertebrates	No	No (spatial resolution is too coarse)
Provisional Agricultural Land Classification (ALC)	No	Yes
CPRE report (September 2015)	No	No
Areas of separation	No	No
Flood Zone Mapping – Environment Agency	No	Yes (priority opportunity mapping)
Local Climate Regulation	No	No
Terrain 5 data	No	Yes

3. Key gaps in the natural capital and biodiversity baseline

This review of existing natural capital assessments has highlighted the differences in the approaches and data used. Two of the main natural capital assessments (NE Atlas and the City of Leicester assessment) have not been focused on Leicestershire county, which is the area of interest here. The studies have differed in their approaches. The NE Atlas focuses on quantifying the extent of the different natural capital assets, the EA study takes a natural capital accounting approach, and the Lattaway et al. (2020) study has made a first attempt at mapping the habitat coverage of Leicestershire and used this to explore how habitat networks could be established. A mapping approach to natural capital assessment has advantages over an accounting approach, in that it allows an understanding of the spatial extent and location of assets, and the spatial variability of ecosystem service provision and demand. This is extremely useful for decision-making, especially when incorporating in other socio-economic and environmental data. Natural capital accounting complements a mapped assessment very well.

Whatever approach is used, spatial data is required to estimate the extent of the natural capital assets. The different data sets used in these assessments has led to discrepancies in the resulting habitat area estimates. The NE Atlas and the EA natural capital tool largely rely upon land cover maps (CEH Land Cover Map and Corine Land Cover map), which while they are good products in themselves, for this purpose they have reasonably low resolution, use relatively broad habitat categories and can be prone to error in identifying grassland habitats when processing the satellite data. Consequently, they are also unable to pick out small green spaces in urban areas. Other data used in these projects is from national data sets. This means asset areas estimated from the atlas and the natural capital tool are less reliable, than if more detailed (Phase 1 or equivalent local data) habitat information is included. The Lattaway et al. study[12] uses a combination of local data sets, OS MasterMap and satellite data to derive a first best but rough estimate of the extent of the natural capital assets. This is a more detailed and robust approach than simply using satellite data alone, and layering up further national data sets and providing ground truthing where there are gaps in data, or for ground truthing areas where uncertainty in data is high (perhaps due to it being old), will provide a good basis for the assessment of ecosystem service provision and a thorough exploration of where semi-natural habitat can be created to connect existing core habitats.

Understanding the spatial distribution of ecosystem service provision and demand would be highly desirable. Maps that show the areas that provide the highest and lowest levels of key services and how this matches up with high demand is key. For example, air quality regulation demand may be high in urban centres, especially in the City of Leicester, but this may not match up with the spatial distribution of the woodland and hedgerow habitats that have the capacity to purify the air. Furthermore, the capacity of the natural capital assets to purify water and alleviate flooding are two important services that have at present not been well captured for the region. Although the hazard regulation service from the EA tool does demonstrate the ability of woodland to soak up flood water, it values the service using the operating costs of flood reservoir storage in the absence of the woodland, using replacement cost rather than damage costs avoided. For the water quality service the actual km of river that is in good or high ecological status is measured, and is valued as the welfare benefit of maintaining the waterbody in good status or above. This does not reflect the ability of the different assets in the region to purify water. Another gap is the quantification of how accessible (in terms of distance) green spaces are to the people of Leicestershire.

Whilst there are maps of broad habitat networks for 3 broad habitats (woodland, grassland, heathland) across Leicestershire, that show how the existing core area of these habitats could be connected up, these do not as yet constitute opportunities for creating habitat for increasing biodiversity. Removing the constraints to habitat creation (e.g. historic sites, designated sites for

conservation, land ownership, agricultural land class) and prioritising these and other opportunities would create a useful map that could constitute a Nature Recovery Network for the county. This mapping could also be combined with opportunities for delivering ecosystem service benefits. A detailed habitat basemap for the region would help to put these network maps in context. We elaborate on this in the recommendations section (Section 6).

4. Policy analyses

4.1 Overview of the approach

The policy review specifically aims to produce a high-level strategic assessment that identifies the key challenges faced in Leicester and Leicestershire, how these challenges are currently being tackled (policy goals and targets), whether these goals present opportunities or threats to natural capital and what the gaps are that investment in natural capital could help to address.

Our method includes a policy analysis framework that considers the key issues grouped into five themes (following the structure of the draft Plan for Growth):

- Places (quality of place and housing)
- Ideas
- People
- Infrastructure
- Business environment

For each theme, a summary is provided of underlying policies and their anticipated approaches, targets, gaps and proposed actions to fill the gaps. This information will be used to identify the opportunities and barriers to enhancing natural capital within the economic growth ambitions.

The focus of the policy analysis is on identifying targets that can be supported through investment in natural capital. Targets that are met more through behaviour change are identified but not explored further as these cannot be easily directly impacted by investment in natural capital. However, consideration is given to potential synergies, e.g. investing in high-quality environments that enhance sense of place could help attract and retain high-skilled individuals this helping to indirectly assist with delivery of targets related to skills.

Table A3 in the Appendices provides a summary of the analysis of key policies, drawing together the approaches, targets and gaps from a variety of policies including:

- Leicester and Leicestershire Local Industrial Strategy Prospectus (2018), now replaced with the Plan for Growth;
- Leicester and Leicestershire Local Industrial Strategy (Draft 2.2), now replaced with the Plan for Growth;
- Leicester and Leicestershire 2050: Our vision for growth;
- LLEP Strategic Economic Plan 2014 to 2020;
- LLEP Covid-19 Economic Recovery Action Plan;
- LLEP Delivery Plan 2019/20;
- Energy Infrastructure Strategy for Leicester and Leicestershire (2018);
- LLEP Interim Covid-19 economic impact assessment for Leicester and Leicestershire: people, employment and skills (2020);
- LLEP Skills evidence base summary (2020);
- LLEP Skills for the future 2018-2030;

- Leicester Local Action Project: ecosystem benefits in urban water environments;
- Leicestershire County Council environmental performance summary 2019/20;
- Leicestershire County Council environment strategy 2018-2030: delivering a better future;
- Leicestershire County Council Strategic Plan 2018-22 (revised 2020); and
- Leicestershire County Council Waste Disposal Authority Plan 2018.

Rather than providing an analysis of each individual strategy or plan, the analysis identifies the key information linked to approaches, targets and gaps that could affect or influence, or be affected or influenced by natural capital. The analysis is also organised by places, ideas, people, infrastructure, and business environment, to mirror the structure of the draft Plan for Growth. In addition to the strategies and plans listed above, a brief review was also undertaken of plans across district councils. This was limited to just verifying that there were not significant additional targets that could affect the wider LLEP targets and goals.

4.2 SWOT based on the policy analysis

The key strengths and weaknesses of existing policies are summarised in the top row of the SWOT analysis diagram in Figure 8. The opportunities and threats for natural capital arising from the policy analysis are then presented in the bottom row in Figure 8. This analysis is intended to be a high-level overview, rather than a comprehensive assessment. It is also intended to be built on through the workshop discussions.

Strengths	**Weaknesses**
• Recognised need to enhance the environment to create a great place to live, work, study and visit • Recognised need to protect and enhanced natural capital • Commitment to reduce carbon emissions • Recognised need for resilient, clean growth • Build on existing low carbon strengths of manufacturing sector (e.g. hydrogen) • Good road and rail links • Plans to introduce infrastructure for sustainable transport, including for low emission vehicles	• Focus on development (but there is no consideration of natural capital as part of it) • Lack of integration across policies to support natural capital assets • Gap in coverage of land-based activities in terms of carbon emissions • High levels of car dependency • Business inertia in moving towards carbon neutrality
Opportunities	**Threats**
• Creation, protection and enhancement of green infrastructure • Restoration/regeneration of urban environments and planned refurbishments • Working with partners and communities to enable them to better understand environmental issues and their implications, including co-design • Use of existing education sector to promote upskilling in sustainable sectors	• Lack of awareness of area as desirable destination • Pockets of deprivation, limited affordable housing • Existing environmental risks including air pollution, flood risk, ecological decline • Limited career opportunities in sustainability sector (perceived and actual) • Need for change in focus to sustainable travel rather than development of new roads (active travel not perceived as convenient mode of travel)

Figure 8 SWOT analysis based on the policy analysis.

5. Key messages from the workshop

The workshop took place on 22nd March 2021 at 13.00-16.30 as a Microsoft Teams meeting. The purpose of the workshop was to allow stakeholders from a broad range of sectors (planning, City Council ecologists, renewables experts, the LLEP, Wildlife Trust, Defra family organisations) to discuss what they saw as the links between natural capital, the local economy and present and future initiatives. The aim was to discuss strengths, weaknesses, opportunities and threats (SWOT) presented by natural capital in four main categories places, infrastructure, business and people as illustrated in Figure 9 (taken from the structure of the LLEP Strategic Economic Plan 2014 to 2020). The workshop agenda and workshop attendee list are shown in Tables A4 and A5 in the Appendices.

Figure 9 Categories of the SWOT analysis.

The participants were divided into three groups to discuss places, infrastructure or business and their strengths, weaknesses, opportunities and threats in Leicestershire (see Figure 10). Each group wrote their ideas in MURAL (a digital workspace that allows the collaborative posting of ideas) as shown in Figures 13-15. Each group presented their findings to the other groups between each break-out session.

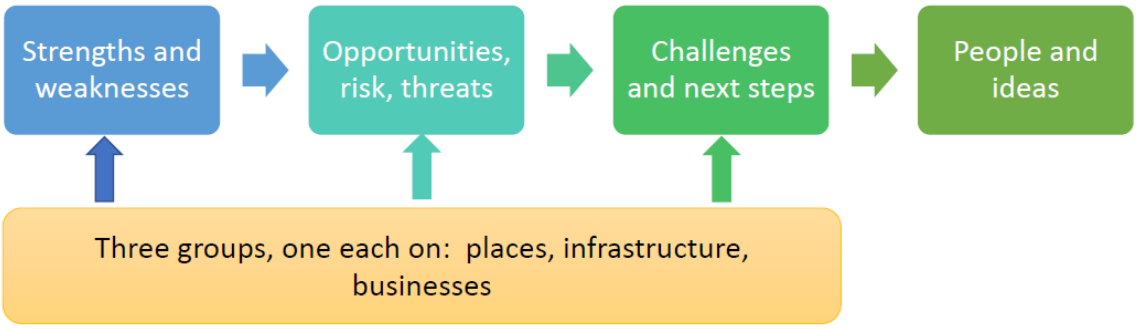

Figure 10 Workshop structure diagram.

5.1 Places

The Places group recognised as strengths the importance of key natural capital assets across Leicestershire that provide environmental, wildlife and cultural value to the region (for example the National Forest, country parks, Grand Union Canal, see the MURAL output in Figure 11 for more). It was thought that Leicestershire has a distinct landscape character. The group identified many opportunities that could be used as vehicles to invest more in natural capital. One opportunity is to build on the realisation of the value of publicly accessible greenspaces as a result of the Covid pandemic. Others were green social prescribing, the growing of finance opportunities for investing in biodiversity and markets for carbon sequestration. There was discussion about linking the better design of places, growth plan opportunities, species recovery networks and strategies, tree planting schemes to connect people with wildlife and increase benefits. The HS2 green corridor was seen as an opportunity, although the line itself was considered to be more of a threat. Others were lack of on-going financing for green infrastructure, fragmented land ownerships (many different private owners) in the development and agriculture sector. These were thought to be particular barriers to improving natural capital benefits at the strategic scale.

Key challenges identified were around land ownership and how to achieve any strategic co-ordination of investing in natural capital across these different ownerships and interests. Land values are also key, when more money can be gained from developing land this threatens natural capital and biodiversity. There are cultural challenges in the institutions that make investment decisions where the value of natural capital is not necessarily recognised. Valuation of the natural capital benefits was thought to be very important in changing mind sets and busines as usual. New governance structures may be needed for strategic investment in natural capital and working across local authorities is likely to be necessary. Finally, the discussion focused on the people that would need to be brought together to take forward initiatives that enhance natural capital, biodiversity and investment in it. For example, working with agricultural colleges, schools and universities to educate people about the importance of natural capital. Working with organisations like the NHS and Universities to connect the green infrastructure of their grounds with the wider environment and use it to increase ecosystem service benefits. Links to the CLA, water companies, developers and planners were seen as important, the latter particularly in relation to biodiversity net gain. In addition, working with land owners, farmers and tenants would be important for making the most of the new Environmental Land Management Scheme. Common threads throughout this discussion was the need to understand the spatial distribution of assets and benefits across Leicestershire to address inequities. Also the need to know who owns what assets, and where, to be able to target strategies where they can make the most gains. The MURAL in Figure 11 shows the other concepts that were discussed in this breakout session.

Figure 11 The Mural ideas board from the Places breakout sessions.

5.2 Infrastructure

Some of the key assets of significance were thought to include the food distribution networks, the East Midlands Airport and the improving broadband connections. Numerous weaknesses were found including: the poor city-country public transport links and low east-west connectivity, gaps in the road and rail networks, significant traffic congestion with the high levels of commuting and many heavy goods vehicles that go through the area and the low number of hydroelectric power facilities. There are also opportunities in the mandatory household food waste collection for use in energy recovery by 2023, the development of wind and solar renewable industries, the development of the on-demand transport industry and opportunities for rural start-ups arising from increased homeworking and increased digital connectivity. Threats were found to include the dependency on agriculture as the main form of land use, the loss of natural capital through the construction of infrastructure such as HS2, being slow to develop low carbon infrastructure such as electric vehicle charging points, pollution from the transport sector and plant pests and diseases such as ash dieback.

There is a need for basic definitions to inform understanding of natural capital and how infrastructure (and wider networks) both influence and are influenced by natural capital. There are activities and programmes in place that could work to bring infrastructure and natural capital together and to build on opportunities that are already in development, such as farming for net zero and the development

of low carbon vehicles. The LLEP area also already has existing networks that provide a baseline for moving forwards, such as the mosaic of small habitats and dense network of rivers and floodplains. This could provide an opportunity in terms of joining up to deliver added value. Overall, there needs to be a move to a whole systems approach building on the ambitions to build back better following the pandemic.

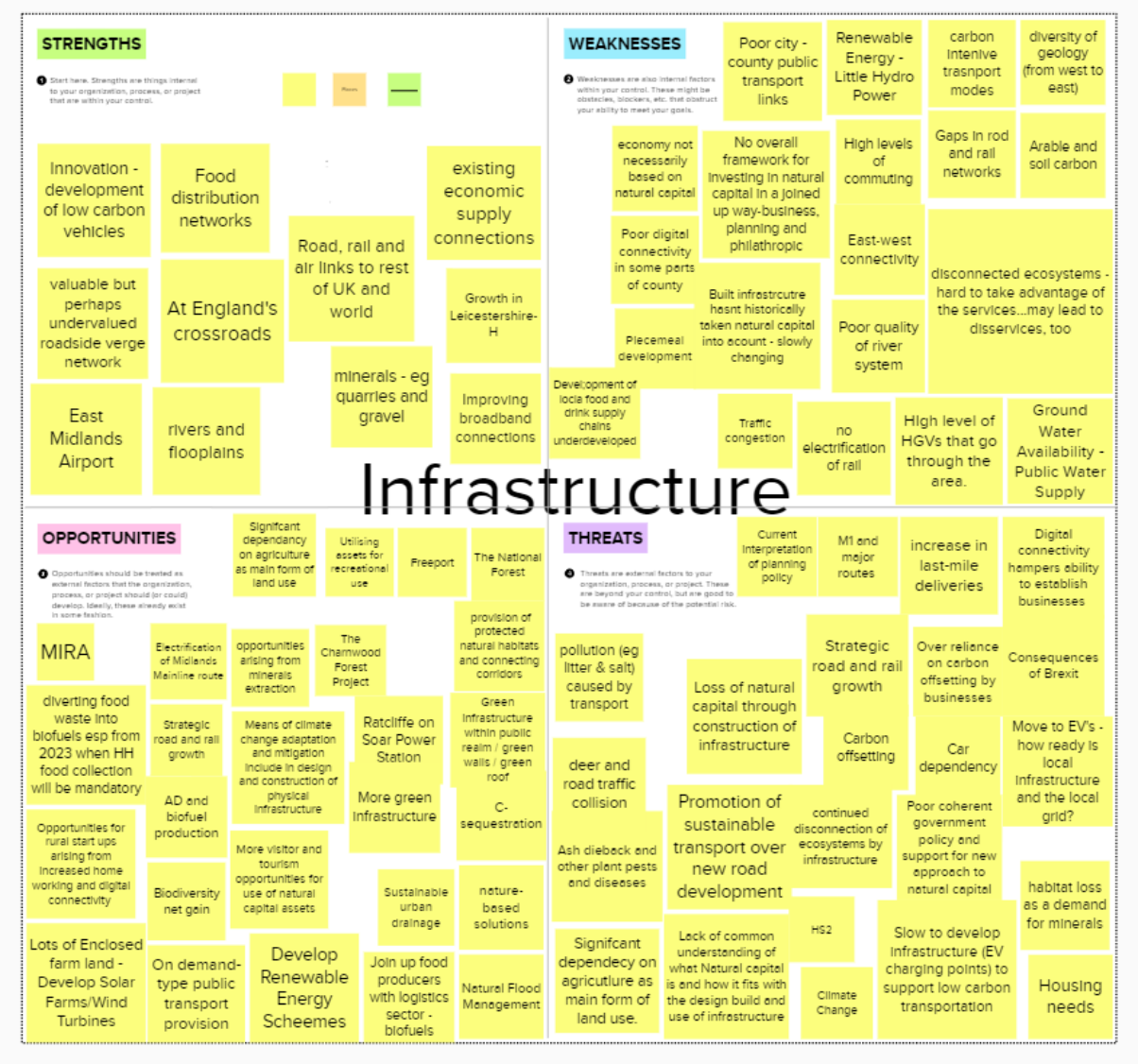

Figure 12 Mural from the Infrastructure breakout sessions.

5.3 Businesses

The Businesses breakout sessions explored the important economic sectors in Leicestershire. The main ones explored were the food and drinks industry, the growing low carbon sector, environmental goods and services sector, including the forestry industry in New Forest and the logistics sector. It is clear from the discussion that Leicestershire has numerous high profile innovative businesses and a diverse economy.

However, Leicestershire businesses appear to face numerous significant challenges. Firstly, there is poor economic productivity per head of population in Leicestershire. This is perhaps caused by the ageing population, the low adoption of digital technologies by smaller businesses and low graduate

and highly skilled employee retention. There is also a disconnect between food production and its manufacture which may impact the local economy.

The need for land for employment and high-quality office space was discussed but it was decided that post-Covid-19, the demand could be lower. It was highlighted that there is significant pollution and poor-quality space in the city centre which is repellent for businesses and trade.

Opportunities for businesses to tackle some of these weaknesses included: clusters of low carbon businesses, the new opportunities following Covid-19, moving businesses back onto the Grand Union Canal, farm cluster groups which will be supported through ELMS, building natural capital into business models and regulatory obligations to promote sustainability and offset environmental losses through the Green Agenda.

Looking into the future, low graduate retention appears to be a key threat to the local economy as well as soil carbon loss for the agricultural sector. The group were also concerned about how natural capital will be protected and enhanced in Leicestershire. They discussed whether the Biodiversity Net Gain strategy will deliver its aims and stressed the need to overcome the idea that natural capital is a rural issue. They also explored the ethics regarding land use with competing priorities such as renewables, food and biodiversity and the lack of awareness of the importance of natural capital to local businesses.

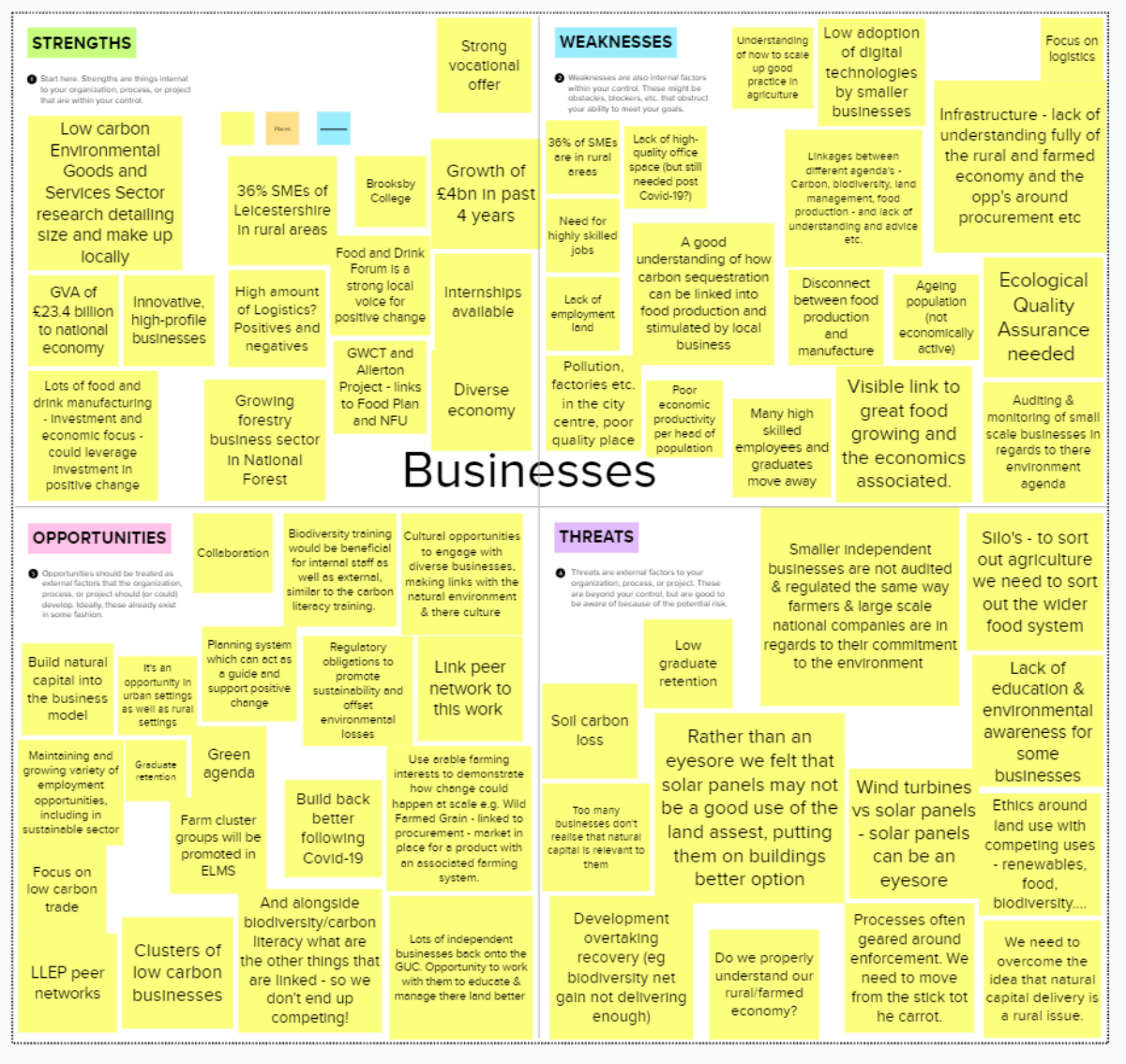

Figure 13 Mural from the Businesses breakout sessions.

6. Conclusions and recommendations

It has been possible to start building an understanding of the extent and condition of the natural capital assets in Leicester and Leicestershire, and the breadth and magnitude of the benefits that they deliver to the region, using existing studies and data. However, as we have highlighted, there are gaps in this baseline and areas where more detailed and reliable data sources can be used to build a more detailed and spatial evidence base. This is key for the production of a targeted investment plan for the region which will enhance the capacity of the natural capital assets to deliver ecosystem services, meeting the demand for them in an equitable way.

If an investment plan is to deliver a more desirable region to live, work and visit, meet targets and goals for sustainable travel, green infrastructure, inclusivity, affordable and sustainable housing, while addressing some of the pressing environmental issues (e.g. air pollution and flooding), there needs to be a fine scale understanding both of the current supply of natural capital benefits and the opportunities for enhancing biodiversity and ecosystem services. This will allow aspirations and targets for increasing biodiversity and ecosystem services through a Nature Recovery Network (NRN) and become the foundation on which a Local Nature Recovery Strategy can be built. It will provide a baseline for measuring progress towards biodiversity net gain at the regional scale, as well as for individual developments, and will allow the allocation of biodiversity off-sets (where developers are unable to meet 10% biodiversity net gain on site) to be offered and targeted to areas within the NRN. It will allow the development of policy on both biodiversity and environmental net gain in SPDs and Local Plans. It will demonstrate the contribution that the natural environment can play in attaining the net zero carbon target through carbon sequestration. It will also inform planning for the roll out of the Environmental Land Management Scheme, highlighting opportunities for farmers and landowners to deliver public benefits whilst transitioning into a more sustainable farming. Using this information it will be possible to explore whether such benefits can be easily delivered on publicly owned land, and where private land owners might be able to contribute.

6.1 Road map to a natural capital investment plan

The following steps outline what is required in terms of evidence and stakeholder engagement to deliver a Natural Capital Investment Plan for Leicester and Leicestershire.

1. *Spatial natural capital asset register*

A GIS basemap should be created that accurately maps natural capital assets across Leicester and Leicestershire. A high resolution map means that it can be viewed at the regional scale all the way down to field scale (5m), so will be applicable across all policy areas. We suggest a mapping process that involves using OS MasterMap polygons as the underlying mapping unit, and then uses a series of additional data sets (including some that we know to be held in the region, e.g. Phase 1 habitat survey, Local Wildlife Site and woodland data from the NFC) to classify each polygon to a land-use / habitat type and to associate a range of additional data with each polygon. The basemap can then be interrogated to produce land cover statistics, showing the amount and percentage of different types of land cover across the study area (an asset register). The advantage of this approach is that it will result in more accurate statistics for each habitat, as the basemap will have captured detail such as small greenspaces within the urban fabric, as well as small variations in habitats at a field scale. The use of the Phase 1 data for Leicestershire means that there can be more confidence in the ability of the resulting basemap to reflect reality (because it is derived from field survey rather than satellite imagery). The Lattaway et al. study[12] has made a good start at creating a basemap. Further data and targeted ground truthing are necessary to build a reasonably accurate picture of what is on the ground. Attention needs to be paid to the resolution of the mapping, to enable changes in habitat to be picked up within MasterMap polygons. This is important to ensure that field scale changes in

ecosystem service provision and opportunities for habitat creation can be mapped, and those fields can then be visited to explore potential opportunities.

2. Habitat quality and biodiversity assessment

An estimate of habitat quality can be included in the natural capital basemap based on existing data (rather than collecting data in the field). It is then possible to create a baseline biodiversity assessment using the most up to date version of the Natural England Biodiversity Metric tool (that assigns the number of biodiversity units to each habitat parcel based on the condition and distinctiveness of the habitat). This approach enables an assessment of whether net gain in biodiversity is being achieved across Leicestershire as a whole, as well as providing the baseline biodiversity units for any required development. It will also allow the identification of habitats (perhaps within an identified NRN see stage 6 below) that can be managed as a biodiversity off-set as part of a local authority/regional biodiversity banking scheme.

3. Mapping the physical flows of ecosystem services

Indicative maps can be created using a series of GIS based models to show the range of benefits (ecosystem services) that arise from the natural capital assets mapped in stage 1 above. The following ecosystem services can be quantified and mapped:

- Carbon sequestration
- Carbon storage
- Air quality regulation
- Noise regulation
- Local climate (urban heat) regulation
- Pollination
- Water flow (surface run-off) regulation
- Water quality (soil erosion) regulation
- Agricultural production
- Timber production
- Accessible nature
- Recreation

In all cases the models can be applied to provide extremely fine scale mapping across the area. For each ecosystem service listed, the capacity of the natural environment to deliver that service - or the current supply – can be mapped. Importantly, and wherever possible and relevant, the local demand (beneficiaries) for each ecosystem service can also be mapped. These maps will highlight the spatial variability in the capacity of the natural capital assets to provide ecosystem service benefits across Leicestershire. They will highlight areas that have low provision and those that have high provision, and these can be analysed in relation to social factors like deprivation, as well as to find out whether they match the demand for the service. Please note that it is possible to map other additional services, but these can only be captured in a more qualitative way.

4. Accessible natural greenspace assessment

The assessment of accessible nature in step 3 would provide indicative maps showing the current supply of publicly accessible greenspaces and their perceived naturalness, and the relative demand based on distance, population density and health. The valuation of ecosystem service benefits in step 5 will provide an indication of the number of visitors to each major area of greenspace within the region, and the monetary value of the recreation provided to those visitors. However, whist these provide useful information, it is not a formal assessment of the amount of access in relation to different distance bands. Natural England have published Accessible Natural Greenspace Standards (ANGSt), which set out guidelines on the size and proximity of greenspace in relation to where people

live[15]. We can use these to determine locations where ANGSt standards are met across Leicestershire, and where they are not, for each size and distance band. This can be used to prioritise where new greenspaces should be located.

5. Calculating the monetary flows of ecosystem services

The Environment Agency Natural Capital Register and Account Tool version 1 (NCRAT) could be used to quantify a set of ecosystem services for which a monetary value can be estimated, in an natural capital account (this is non-spatial). The tool provides a reasonably comprehensive set of services. It would seem logical to continue using this tool in the region, however, it would be vital to use the habitat extent data from the comprehensive natural capital asset map (stage 1) in the input asset register tab of the tool, information on which the physical flow and monetary valuations of the services are based. This should be possible using the detailed habitat extent option, but this would need to be explored in more detail. As outlined in section 2.1 the tool uses very broad habitat categories from the Corine Land Cover data, which is coarse resolution, and will give a less accurate estimate of habitat extent across the region.

The agricultural production service methodology used to calculate the results in Table 3 of Section 2.1 was calculated using the default settings within the EA tool. We would advise using the locally tailored EA tool option for the Leicestershire case, based on county wide agricultural statistics.

We would also advise calculating the carbon sequestration across habitats more comprehensively than has been attempted in the EA tool – using Woodland Carbon Code for Woodlands and more recent data for other habitats (e.g. Natural England's Carbon storage and sequestration by habitat: a review of the evidence (2021)[16], revised 2021 figures from Evans et al. (2017)[17]). This would allow the production of a carbon balance for Leicestershire to show whether the region is a net emitter or in net sequestration, and the overall costs or savings associated with this. This would entail calculating the emissions from each habitat, including the emissions associated with the way that agricultural land is managed (e.g. fertilizer, machinery and livestock emissions) in the area, which will be significant. Emissions from peat habitats is covered by the EA tool, but not from agriculture. We can also estimate the monetary value of aggregates from quarrying and recreational freshwater angling.

We would support using the EA tool for the recreation service (which uses the University of Exeter's ORVal tool, and the physical health service). There are 13 services that the EA tool calculates and values, and it would be worth carefully considering whether some of these will be of use to decision-making in the area, and what the valuation of these services actually means (e.g. water quality, water supply, renewable energy). See Section 4 for a discussion.

6. Habitat opportunity mapping

Habitat opportunity mapping is a GIS based network mapping approach used to identify potential areas for the expansion of key habitats. It aims to identify possible locations where new habitat can be created that will be able to deliver particular benefits, whilst taking certain constraints into account. NFC and the LRWT have already begun network mapping of broad habitats (woodland, grassland, heathland) across the county (see Section 2.2). If it does not exist it would be worth looking at wetland habitats in this region. These maps show where habitat could be created to create a bigger, better and more joined up network for each broad habitat. However, they are not opportunities until a constraints map is assembled and used to remove areas of the network that are not opportunities for

[15] Natural England (2010) *'Nature Nearby' Accessible Natural Greenspace Guidance*. Natural England.

[16] R Gregg, J. L. Elias, I Alonso, I.E. Crosher and P Muto and M.D. Morecroft (2021) Carbon storage and sequestration by habitat: a review of the evidence (second edition) Natural England Research Report NERR094. Natural England, York.

[17] Evans, C., Artz, R., Moxley, J., Smyth, M-A., Taylor, E., Archer, N., Burden, A., Williamson, J., Donnelly, D., Thomson, A., Buys, G., Malcolm, H., Wilson, D., Renou-Wilson, F. (2017). Implementation of an emission inventory for UK peatlands. Report to the Department for Business, Energy and Industrial Strategy, Centre for Ecology and Hydrology, Bangor.88pp.

such creation, as they are in protected areas, or sites of historical importance, or are on high grade agricultural land etc (the constraints can be set as desired). The resulting network is an opportunity map for that habitat.

Once this is done opportunity mapping for enhancing ecosystem services can also be completed. Opportunity maps for reducing surface runoff, for reducing soil erosion and increasing water quality, to reduce air pollution, noise reduction, regulate local climate (reduce urban heat) increasing access to natural greenspace, and increasing carbon sequestration can then be created.

A map can then be produced by overlaying all the individual opportunity maps, to show areas where new habitats could deliver biodiversity and multiple benefits.

7. A process for developing an investment plan

The habitat opportunity (stage 6) and accessible greenspace maps (stage 4) provide a series of maps highlighting where habitat could be created focussing on different priorities, but it does not integrate them fully, prioritise, or identify the best areas to take forward. In addition, there already exist lots of information from existing plans, strategies and assessments, housing allocations and infrastructure schemes that identify ambition, pressures and opportunities in different parts of the area. The aim of this stage would be to collate and consolidate all the existing sources of information and use to it produce a coherent set of sites / projects where natural capital investment should be prioritised.

The first step would be to collate other existing plans and strategies of relevance, such as Green Infrastructure Plans, the newly updated Landscape Character Assessments, Historic Environment Assessments and character areas, access route assessments, areas identified as Sustainable Urban Extensions, other site allocations and infrastructure schemes identified in Local Plans. Additional sources of information catchment management plans, information on agri-environment schemes (especially locations that will be up for renewal in the near future), target areas for catchment sensitive farming and water company schemes, and any other relevant information held by stakeholders working in the area. In essence, this will aim to consolidate all the information that exists across the area on catalysts of change, pressures and ambitions.

All these maps will be used to analyse the full array of information described above, to produce a consolidated map or series of maps showing potential sites or projects for investment action across Leicestershire. This could include projects that deliver benefits for biodiversity, surface water runoff reduction, water quality enhancement, air quality improvements, and access to nature (including those that take pressure off existing site of high biodiversity value), and especially projects that are able to deliver multiple benefits. The main output would be maps for each area highlighting the key locations and possibilities identified. Accompanying notes would annotate how these areas have been identified and how they fit with local plans and strategies.

This process is necessarily collaborative and should include interested stakeholders from across the region. Ideally it would take place over a series (three or four) workshops. The outcomes of this would form the basis of a formal or detailed investment strategy / plan.

6.2 Recommendations from the policy analysis

The policy analysis shows that there are many existing initiatives, policies, plans and strategies that could help deliver an improvement to natural capital and so help deliver quality of place. Existing plans, strategies and commitments are a strength that themselves open up opportunities for the explicit consideration of natural capital during their implementation. The existing quality of the environment combined with good transport links and a central location are important strengths of the

area. Key opportunities include the need to consider the natural environment during regeneration of urban areas, including the potential role of green infrastructure. There is also a recognition that communities and businesses may need help in understanding how and why the natural environment provides benefits to encourage them to consider natural capital within their own priorities and decision-making. This then highlights a need for upskilling of the workforce to enable further growth, especially to change perceptions of the sustainability sector as a legitimate career choice. Threats including existing environmental issues and decline, deprivation and inequalities, and a dependence on the car as the main means of travel. Enabling a change in mindset to one where active travel is seen as effective and convenient is an opportunity, especially on the back of the Covid-19 pandemic.

The key recommendations from the policy analysis are to:

- Recognise the strengths of the area and the strategies and plans already in place and look to ensure these are delivered;
- Consider developments (housing, commercial and transport) in an integrated fashion with the wider strategies and plans to ensure that the targets and goals for sustainable travel, green infrastructure, greater inclusivity, and affordable housing in attractive locations can be implemented and that these can help address some of the existing environmental issues (;
- Identify areas where there are opportunities to improve the condition of habitats or change habitat types so that natural capital can assist with addressing existing environmental issues (such as air pollution or flood risk);
- Maintain and improve knowledge and understanding of the importance of the natural environment to underpin future strategies so there is buy-in and subsequently pressure at the community, business and wider LLEP-level to help ensure that environmental benefits are delivered; and
- Promote the sustainability sector as providing high-quality careers to ensure that the skills are available to enable growth in key industries that can help promote the LLEP area as a stronghold for low-carbon innovations.

Many of these key recommendations can be achieved by integrating with the investment plan process in step 7 above.

7. Appendices

Table A1 The quantity of natural assets in Leicestershire and Rutland and the associated ecosystem services taken from the Natural England Natural Capital Atlas. The Leicestershire and Rutland assets areas were mapped on a 5 km^2 hexagon grid with data in percentiles. The following descriptions were assigned: Very low – hexagons were zero; Low – hexagons were in the 10-30th percentiles; Medium – hexagons were in the 30-60th percentiles; High – hexagons were in the 60-90th percentiles; Very high – hexagons were above the 90th percentile.

Indicator	Overall description	Range		Associated ecosystem services
Lowland fen area	Very low	Very low	Very high	Carbon sequestration
Reedbed area	Very low	Very low	Medium	
Coniferous woodland area	Very low	Very low	Very high	
Broadleaved, mixed and yew woodland area	Low	Very low	Very high	
Woodland, scrub and hedge area	Very low	Very low	Very high	
Meadow area	Very low	Very low	Very high	
Other semi-natural grassland area	Very low	Very low	Medium	
Dwarf shrub heath area	Very low	Very low	High	
Urban semi-natural habitat area	Very low	Very low	High	
Carbon density in topsoil	Low	Low	Very high	
Deep peat area	Very low	Very low	Low	Carbon storage
Carbon density in topsoil	Low	Low	Very high	
Soil biota quantity	Medium	Low	High	
Extent of permanent vegetation cover	Medium	Low	High	
Broadleaved, mixed and yew woodland area	Low	Very low	Very high	Air purification
Coniferous woodland area	Very low	Very low	Very high	
Woodland, scrub and hedge area	Very low	Very low	Very high	
Urban semi-natural habitat area	Very low	Very low	High	
Green space area – not semi-natural	Low	Very low	Very high	Noise regulation
Woodland, scrub and hedge area	Very low	Very low	Very high	
Urban semi-natural habitat area	Very low	Very low	High	
Active flood plain area	Low	Very low	Very high	Water flow regulation
Extent of permanent vegetation cover	Medium	Low	High	
Floodplain grazing marsh area	Very low	Very low	Medium	
Woodland area	Low	Low	Very high	
Other semi-natural habitat area	Very low	Very low	High	
Dwarf shrub heath area	Very low	Very low	High	
Woodland area	Low	Low	Very high	Water quality regulation
Other semi-natural habitat area	Very low	Very low	High	
Deep peat area	Very low	Very low	Low	
Carbon density in topsoil	Low	Low	Very high	
Extent of permanent vegetation cover	Medium	Low	High	
Lakes and standing water area	Very low	Very low	Very high	Water supply
Modified waters (reservoirs) area	Very low	Very low	High	
River length	Medium	Very low	Very high	
Woodland area	Low	Low	Very high	
Other semi-natural habitat area	Very low	Very low	High	
Amount of water available for abstraction	High	Very low	High	
Arable and horticultural land area	High	Very low	Very high	Agricultural production
Improved grassland area	High	Low	Very high	
Orchards and top fruit area	Very low	Very low	High	
Meadow area	Very low	Very low	Very high	
Other semi-natural grassland area	Very low	Very low	Medium	
Dwarf shrub heath area	Very low	Very low	High	
Meadow area	Very low	Very low	Very high	Timber, hay and other materials
Broadleaved, mixed and yew woodland area	Low	Very low	Very high	
Coniferous woodland area	Very low	Very low	Very high	
Lowland fen area	Very low	Very low	Very high	Climate regulation
Reedbed area	Very low	Very low	Medium	
Meadow area	Very low	Very low	Very high	

Other semi-natural grassland area	Very low	Very low	Medium	
Dwarf shrub heath area	Very low	Very low	High	
Broadleaved, mixed and yew woodland area	Low	Very low	Very high	
Coniferous woodland area	Very low	Very low	Very high	
Blue space area	Very low	Very low	Very high	
Green space area – not semi-natural	Low	Very low	Very high	
Woodland, scrub and hedge area	Very low	Very low	Very high	
Urban semi-natural habitat area	Very low	Very low	High	
Extent of permanent vegetation cover	Medium	Low	High	
Floodplain grazing marsh area	Very low	Very low	Medium	Accessible nature
Lakes and standing water area	Very low	Very low	Very high	
Modified waters (reservoirs) area	Very low	Very low	High	
Lowland fen area	Very low	Very low	Very high	
Reedbed area	Very low	Very low	Medium	
Pond area	Low	Very low	Very high	
River length	Medium	Very low	Very high	
Arable and horticultural land area	High	Very low	Very high	
Improved grassland area	High	Low	Very high	
Orchards and top fruit area	Very low	Very low	High	
Dwarf shrub heath area	Very low	Very low	High	
Broadleaved, mixed and yew woodland area	Low	Very low	Very high	
Coniferous woodland area	Very low	Very low	Very high	
Ancient woodland area	Very low	Very low	Very high	
Woodland priority habitat area	Low	Low	Very high	
Blue space area	Very low	Very low	Very high	
Green space area – not semi-natural	Low	Very low	Very high	
Woodland, scrub and hedge area	Very low	Very low	Very high	
Urban semi-natural habitat area	Very low	Very low	High	
Designated historic environment assets	Very low	Very low	Very high	
Public Rights of Way	High	Low	Very high	
Floodplain grazing marsh area	Very low	Very low	Medium	Biodiversity
Lakes and standing water area	Very low	Very low	Very high	
Lowland fen area	Very low	Very low	Very high	
Reedbed area	Very low	Very low	Medium	
Pond area	Low	Very low	Very high	
River length	Medium	Very low	Very high	
Meadow area	Very low	Very low	Very high	
Other semi-natural grassland area	Very low	Very low	Medium	
Dwarf shrub heath area	Very low	Very low	High	
Broadleaved, mixed and yew woodland area	Low	Very low	Very high	
Ancient woodland area	Very low	Very low	Very high	
Woodland priority habitat area	Low	Low	Very high	
Blue space area	Very low	Very low	Very high	
Green space area – not semi-natural	Low	Very low	Very high	
Open mosaic habitat area	Very low	Very low	Very high	
Woodland, scrub and hedge area	Very low	Very low	Very high	
Urban semi-natural habitat area	Very low	Very low	High	
Carbon density in topsoil	Low	Low	Very high	
Soil biota quantity	Medium	Low	High	
Priority habitat area	Low	Low	Very high	
Average priority habitat patch size	Low	Low	Very high	
Dwarf shrub heath area	Very low	Very low	High	Erosion control
Carbon density in topsoil	Low	Low	Very high	
Extent of permanent vegetation cover	Medium	Low	High	
Presence & frequency of pollinator food plants	High	Medium	High	Pollination
Priority habitat area	Low	Low	Very high	
Average priority habitat patch size	Low	Low	Very high	
Source: Natural England, 2020. Natural Capital Atlas: Mapping Indicators for Leicestershire and Rutland **Cultural services were not included in this table.**				

Table A2 The quality of natural assets in Leicestershire and Rutland and the associated ecosystem services taken from the Natural England Natural Capital Atlas. The Leicestershire and Rutland asset quality was mapped on a 5 km^2 hexagon grid with data in percentiles. The following descriptions were

assigned: Very low – hexagons were zero; Low – hexagons were in the 10-30th percentiles; Medium – hexagons were in the 30-60th percentiles; High – hexagons were in the 60-90th percentiles; Very high – hexagons were above the 90th percentile.

Indicator	Overall description	Range		Associated ecosystem services
Nutrient status of soil	Low	Low	High	Carbon storage
Naturalness of flow regime	Low	Low	High	Water flow regulation
Chemical status of waterbodies	High	High		Water quality regulation
Nutrient status of waterbodies	Very low - medium	Very low	High	
Nutrient status of soil	Low	Low	High	
Naturalness of biological assemblage	Low	Low	Medium	
Natural aquifer function - recharge and discharge	High	Very low	High	Water supply
Naturalness of flow regime	Very low - medium	Very low	High	
Nutrient status of soil	Low	Low	High	Agricultural production
Naturalness of watercourses	Very low - medium	Very low	High	Accessible nature
Condition of SSSIs	Very low	Very low	High	
Tranquillity	High	Low	High	
Naturalness of flow regime	Very low - medium	Very low	High	Biodiversity
Lack of physical modifications of water bodies	Medium	Low	High	
River continuity – lack of obstructions	Low	Low	High	
Nutrient status of soil	Low	Low	High	
Naturalness of biological assemblage	Low	Low	Medium	
Condition of SSSIs	Very low	Very low	High	Geodiversity services

Source: Natural England, 2020. Natural Capital Atlas: Mapping Indicators for Leicestershire and Rutland
Cultural services were not included in this table.

Table A3 Policy analysis framework.

Sectors/focus area	Anticipated approach	Target	Gap	Proposed actions
e.g. agriculture, education, environment with focus on economic growth	*What are the policies' overall goals/incentives?* *Including risks to NC*	*How could the policy promote enhancement of NC?*	*Where/how can NC be promoted within existing policies?* *Including opportunities for NC/risks to economy*	*What measures can be implemented to realise opportunities?*
Places (quality of place)	• Enhance Leicester city centre and create a great place to live, work, study and visit • Support the regeneration and development of towns to create attractive and productive places that people want to live, work and invest in • Support the development of the cultural, leisure and tourism offer • Develop the sports and physical activity economy **Risks**: focus on development with increasing emissions and lack of biodiversity and green spaces	• Biodiversity • Pollination • Water quality and flow • Air quality • Local climate regulation • Access to nature (recreation) • Phys./psych. experiences • Learning and inspiration • Identity and quality of place	• Green Infrastructure and spaces such as parks to promote quality of place, mental and physical wellbeing and tourism • Outdoor exercise and leisure facilities • Focus on ecotourism • Woodland development • Poverty is linked to deprivation of natural capital and vice versa	• Green Infrastructures prioritising pedestrians and cyclists • Green Improvement Districts, Green Benefit Districts and Community Infrastructure Levy • SuDS • Renewable energy/ smart grids **Addressing challenges**: prosperous town centres that are a desirable destination for tourists and living; protecting natural capital
Places	• Protect and enhance natural capital and encourage sustainable economic development **Risks**: requires a more holistic integration into overarching policies	This approach needs to be integrated in all policies to support natural capital assets		**Addressing challenges**: Future proofing town centres (retail, high streets, events), Pockets of deprivation, Limited housing supply and decreasing affordability, Lack of awareness of area as desirable destination, Protecting natural capital
	• Create 45,000 jobs • Lever £2.5 billion of private investment • Increase GVA by £4 billion (21%)	Consideration of natural capital as part of development (e.g. biodiversity/environmental net gain) but also to create high quality spaces		
	• Leicester Launchpad • MIRA Technology Park Enterprise Zone	•	•	•

Sectors/focus area	Anticipated approach	Target	Gap	Proposed actions
e.g. agriculture, education, environment with focus on economic growth	*What are the policies' overall goals/incentives?* *Including risks to NC*	*How could the policy promote enhancement of NC?*	*Where/how can NC be promoted within existing policies?* *Including opportunities for NC/risks to economy*	*What measures can be implemented to realise opportunities?*
	• Loughborough University Science & Enterprise Park • East Midlands Gateway Strategic Rail Freight Interchange			
	• Leicestershire County Council Greenhouse Gas emissions report	• Commitment to reduce carbon emissions from Council's own estate and operations by 38% by 2030 against 2016/17 baseline year	• Land-based activities (not identified in report)	• Renewable energy exports • Carbon offsets (not used to date)
	• LCC Strategic Plan 2018-22	• Economic prosperity benefits everyone and supports resilient, clean growth • People live in a health environment and have the opportunities they need to take control of their health and wellbeing • Thriving integrated places where people help and support each other and take pride in their local area	• Air pollution • Access to open green space • Planning to support and encourage active lives • Ecological decline • Flood risk	•
	• Local Action Project Leicester	•	Benefits assessment: • Access to greenspace • Flooding from surface water	• Identification of opportunity areas • Target area identification (by ward) • Restoration/regeneration of urban environments • GI or SuDS in new development • Retrofit or greening actions • Increased functionality, e.g. increased amenity or access • River restoration • Green roofs

Sectors/focus area	Anticipated approach	Target	Gap	Proposed actions
e.g. agriculture, education, environment with focus on economic growth	*What are the policies' overall goals/incentives?* *Including risks to NC*	*How could the policy promote enhancement of NC?*	*Where/how can NC be promoted within existing policies?* *Including opportunities for NC/risks to economy*	*What measures can be implemented to realise opportunities?*
				• Street trees • Water storage • Hydrological connectivity
	• LCC Environment Strategy 2018-2030	• Carbon and climate change impacts: 64% reduction by 2025 • Resource use and low/zero carbon energy: net carbon neutral by 2050; 100% clean energy by 2050 • Travel and transport • Biodiversity, habitats and local environment • Community and wellbeing • Local economy	•	• Work with partners to support wider use of low/zero carbon energy • Work with partners to reduce GHG and other pollutant emissions from the local transport network • Work with partners to support wider biodiversity and natural capital feature improvements • Support creation, protection and enhancement of sustainable green infrastructure • Respect, conserve and enhance the character, heritage and accessibility of landscape and towns • Work with communities to ensure that environmental impacts are understood and considered and that community capacity is harnessed • Work with partners to understand and address the impacts of poor air quality and its relationship with climate change
Places (housing)	• Deliver planned and sustainable housing growth **Risks**: housing development on priority natural capital assets and green spaces; lack of access	• Renewable energy • Air quality regulation • Carbon avoided • Local climate regulation • Access to nature (recreation) • Phys./psych. experiences • Learning and inspiration • Identity and quality of place	• Focus on refurbishment and new housing development with high efficiency standards • Development on existing brown sites • Development of green spaces	• Greener buildings • Prosumerism • Passive houses/high building standard • Large scale refurbishments • Development of green spaces and other natural capital assets to increase the quality of place

Sectors/focus area	Anticipated approach	Target	Gap	Proposed actions
e.g. agriculture, education, environment with focus on economic growth	*What are the policies' overall goals/incentives?* *Including risks to NC*	*How could the policy promote enhancement of NC?*	*Where/how can NC be promoted within existing policies?* *Including opportunities for NC/risks to economy*	*What measures can be implemented to realise opportunities?*
				Addressing challenges: Limited housing supply and decreasing affordability, Lack of awareness of area as desirable destination, Protecting natural capital
	• LCC Strategic Plan 2018-22	• Choice of quality, sustainable homes that people can afford	• Need for vibrant spaces • Sustainable housing (energy, water efficient, mitigating impacts of climate change)	• Move to low carbon circular economy • Co-design of innovative, green integrated service solutions
Ideas	• Develop Space Park Leicester as the centre of excellence for Earth Observation and satellite technology • Develop Leicester and Leicestershire's autonomous and electric vehicle R&D assets • Develop SportPark Loughborough as a national centre of excellence in sports and science technology • Create a Shared Diagnostics and NHS Data Centre • Develop a life sciences cluster at the Life Sciences Opportunities Zone • Embed innovation in food and drink production and agri-tech • Commercialise new ideas through collaboration between universities and business • Support all businesses to adopt new technologies and processes	• Agricultural outputs • Timber/wood fuel production • Water supply • Renewable energy • Air quality regulation • Carbon avoided and sequestration • Local climate regulation • Water flow regulation • Water quality regulation • Pollination • Access to nature (recreation) • Phys./psych. experiences • Learning and inspiration • Identity and quality of place	• Integrating natural capital in the development plans (biodiversity/environment neg gain)	• Focus on R&D and technologies that facilitate a low carbon economy/green innovation • Environment net gain on or off site • Offsetting industrial development and emissions through habitat banking • Support ELMs objectives via the agri-tech industry and emissions reduction in the agriculture sector • Utilise manufacturing sector to promote low carbon transition (e.g. hydrogen) **Addressing challenges**: Increasing R&D expenditure, Improving the commercialisation of ideas, Improving knowledge transfer
	• MIRA Technology Park Enterprise Zone	•	•	•

Sectors/focus area	Anticipated approach	Target	Gap	Proposed actions
e.g. agriculture, education, environment with focus on economic growth	*What are the policies' overall goals/incentives?* *Including risks to NC*	*How could the policy promote enhancement of NC?*	*Where/how can NC be promoted within existing policies?* *Including opportunities for NC/risks to economy*	*What measures can be implemented to realise opportunities?*
	• Loughborough University Science & Enterprise Park			
People	• Support the development of an integrated Further Education and Higher Education employer-led skills system to upskill the workforce • Develop an integrated Further Education and Higher Education employer-led skills infrastructure for the low carbon, health, life sciences and logistics sectors • Apply health, sport and life science assets to promote healthy living and a more productive workforce • Enhance the Leicester and Leicestershire Enterprise Adviser Network and Careers Hub to inspire young people and prepare them for the world of work • Improve graduate retention and attract new talent • Improve leadership and management skills in entrepreneurs and SMEs	• Agricultural outputs • Timber/wood fuel production • Water supply • Renewable energy • Air quality regulation • Carbon avoided and sequestration • Local climate regulation • Water flow regulation • Water quality regulation • Pollination • Access to nature (recreation) • Phys./psych. experiences • Learning and inspiration • Identity and quality of place	• Providing a larger variety of employment opportunities, also in the sustainability sector so that (young) people feel they can make better/more ethical and sustainable career choices	• Create jobs that promote natural capital (including management of habitat banks, woodland renewable energy technology, innovative farming practices, hydrogen, etc) and wellbeing (physical activities) • Facilitate insights into low carbon/natural capital project projects for pupils early on (internships, apprenticeships, etc) • Providing access to multi-disciplinary skills to support nature-based activities through collaboration with Higher Education **Addressing challenges**: Support the development of an integrated Further Education and Higher Education employer-led skills system to upskill the workforce, Develop an integrated Further Education and Higher Education employer-led skills infrastructure for the low carbon, health, life sciences and logistics sectors, Apply health, sport and life science assets to promote healthy living and a more productive workforce, Enhance the Leicester and Leicestershire Enterprise Adviser Network and Careers Hub to inspire young people and prepare them for the world of work, Improve graduate retention and attract new talent, Improve leadership and management skills in entrepreneurs and SMEs
	• Skills Metro • Investment in skills infrastructure • Information advice and guidance	•	•	•

Sectors/focus area	Anticipated approach	Target	Gap	Proposed actions
e.g. agriculture, education, environment with focus on economic growth	*What are the policies' overall goals/incentives?* *Including risks to NC*	*How could the policy promote enhancement of NC?*	*Where/how can NC be promoted within existing policies?* *Including opportunities for NC/risks to economy*	*What measures can be implemented to realise opportunities?*
	• Leicester and Leicestershire to work programme • Growth area and priority skill plans			
Infrastructure	• Deliver the strategically important road and rail projects included in the Midlands Connect Strategy and prioritised by Transport for the East Midlands • Deliver other important transport projects as set out in Leicestershire County Council's Prospectus for Growth (PfG) • Deliver public and sustainable transport provision as set out in the Transforming Cities 'Connected Leicester Hub and Spoke Plan' • Encourage the introduction of electric and other low emission vehicles and supporting infrastructure • Implement the recommendations of the Energy Infrastructure Strategy for Leicester and Leicestershire • Improve digital connectivity across urban and rural areas	• Water supply • Renewable energy • Air quality regulation • Carbon avoided and sequestration • Local climate regulation • Water flow regulation • Water quality regulation • Pollination • Access to nature (recreation) • Phys./psych. experiences • Learning and inspiration • Identity and quality of place	• Biodiversity/ environment net gain to offset environmental losses and enhance natural capital • Prioritising sustainable transport over new road development	• Focus on Green Infrastructure and sustainable modes of travel rather than the development of a new road network • Ensure public transport (e.g. rail), cycling and walking are the most cost-effective and convenient modes of travel • Offset new infrastructure development • Distinguish between energy • SuDS • Renewable energy generation to support physical and non-physical energy infrastructures • Utilise energy waste (heat) from data storage **Addressed challenges**: Car dependency and increasing congestion impact on productivity and the environment; Improving rail connectivity; Passenger and Sustainable Transport; Improving digital connectivity; Delivering clean, smart and flexible power
	• East Midlands Gateway Strategic Rail Freight Interchange	•	•	•
Business Environment	• Create a low carbon and circular economy business cluster at Loughborough University Science and Enterprise Park	• Agricultural outputs • Timber/wood fuel production • Water supply • Renewable energy • Air quality regulation	• Streamlining low carbon business and investment practices • Onsite mitigation and off-site compensation by	• Streamline TCFD (Task Force on Climate-Related Financial Disclosures) among businesses • Regulatory obligations for businesses to promote sustainability and offset environmental losses

Sectors/focus area	Anticipated approach	Target	Gap	Proposed actions
e.g. agriculture, education, environment with focus on economic growth	*What are the policies' overall goals/incentives?* *Including risks to NC*	*How could the policy promote enhancement of NC?*	*Where/how can NC be promoted within existing policies?* *Including opportunities for NC/risks to economy*	*What measures can be implemented to realise opportunities?*
	• Increase targeted foreign direct investment in the low carbon and life sciences sectors • Support businesses to move towards carbon neutrality • Create an ecosystem that supports businesses to start-up and then scale-up • Improve the supply of employment land and commercial premises for businesses • Maximise our trade and export potential by utilising our international links • Develop a freeport centred on East Midlands Airport	• Carbon avoided and sequestration • Local climate regulation • Water flow regulation • Water quality regulation • Pollination • Access to nature (recreation) • Phys./psych. experiences • Learning and inspiration • Identity and quality of place	valuing natural capital (e.g. airport) • Focus on low carbon trade	• Support with setting up low carbon businesses and forming of clusters utilising energy-efficient digital technologies • Providing training and re/upskilling within SMEs to promote nature-based businesses (e.g. for seasonal labour) • Promote natural capital investment opportunities and business cases • Highlight career progression within nature-based sectors to attract a diverse workforce • Identify suitable natural capital investors • Opportunity for office share and WFH after the Covid-19 pandemic • Utilising brown field sites for commercial premises • Opportunity to reduce emissions in the aviation sector • Reducing waste by incentivising reducing, reusing and recycling materials **Addressed challenges**: Low value-added sectors; A lack of high-quality office space in the city centre and commercial space across Leicester and Leicestershire; Weak investment finance infrastructure; Low adoption of digital technologies by smaller businesses; A lack of employment land and suitable premises exacerbated by permitted development and viability issues
	• Business Support Programme • Economic intelligence	•	•	•

Table A4 Stakeholder SWOT analysis workshop agenda.

Agenda Item	Item Lead	Timings
Introduction • Project overview / scope • Project status update • Purpose of workshop	Alison Holt / Teresa Fenn	30 minutes
Workshop 1 – strengths and weaknesses • Key assets of significance	All	30 minutes
Break	All	15 minutes
Workshop 2 – opportunities and threats • Current demand for services • Environmental issues	All	30 minutes
Workshop 3 – challenges and next steps • Sectoral priorities • Future demands for services	All	30 minutes
Break	All	15 minutes
Workshop 4 – People / Ideas • Skills challenges facing the sector	All	30 minutes
Conclusions and wrap-up	All	30 minutes

Table A5 Workshop attendees.

Name	Organisation / Role
Helen Harris	Leicestershire County Council
Lucie Hoelmer	Leicestershire County Council - Environment Policy and Strategy
Caroline Boucher	Leicestershire County Council
John Clarkson	Leicestershire & Rutland Wildlife Trust
Sam Lattaway	National Forest
Ben Devine	Leicester City Council - Planning
Simon Fisher	NFU
Harriet Ranson / Saya Harvey	NFU (Saya is Branch Chair of Melton Mowbray)
Rupert Simms	Charnwood Borough Council
Sue Timms	Leicestershire County Council
Louisa Aspden	Natural England
Greg Broughton	Environment Agency
Kane Cunliffe	Environment Agency
Fiona Baker	LLEP
Irshad Mulla	LLEP
Robert Thornhill	Strategic Planning Manager - across all districts/City/County - SGP
Roseanna Burton	Leicestershire County Council - Environment Policy and Strategy

James O'Brien	Leicestershire County Council - Environment Policy and Strategy
Gavin Fletcher	Sustainable Food Partnerships Coordinator / Energy
Ben Taylor	Nottinghamshire County Council - Development Corporation
Paul Wilkinson	Chief Executive of Nottinghamshire Wildlife Trust
Sharon Wiggins / Tim Smith	Leicestershire County Council
Rupert Harrison	Andrew Granger & Co - Owner
Mrs Louise Richardson	Leicestershire Rural Partnership - Chair
Alison Holt	Consultant (NCS)
Teresa Fenn	Consultant (RPA)
Imogen Shapland	Consultant (NCS)