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## Irwell Management Catchment: Natural Capital Account and Ecosystem Services Opportunities Mapping



River Irwell



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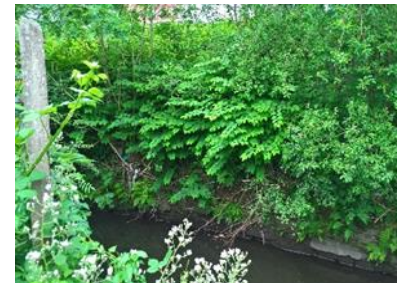


## THE STUDY

This report identifies the natural capital value of the Irwell Management Catchment's (IMC) waterbodies, and the opportunities for investment in ecosystem services (ESS) provided by the IMC's waterbodies.

This project (LIFE IP Ref: LIFE17IPE/UK/027) is part of "Natural Course" which is an EU LIFE Integrated Project aimed at integrated water management through accelerating the objectives of the Water Framework Directive and improved flood risk management.

The project has been led by Greater Manchester Combined Authority (GMCA) whose 10 Councils work together to tackle issues which affect the entire city region. The project also covers some Lancashire districts.



All: River Irwell, various locations near Ramsbottom

## THE STUDY



### Natural Course:

A focus of the Natural Course project is Greater Manchester and the IMC. This reflects the large number of urban challenges including:

- 77% of the waterbodies in the IMC are classified under the Water Framework Directive (WFD) as “Heavily Modified” and have poor or moderate ecological status;
- The water quality within the IMC is poor because of numerous and widespread sources of diffuse urban pollution; and
- Significant numbers of properties are at risk of flooding.

### Urban Pioneer:

The “Urban Pioneer” project is designed to support and inform the development of the UK Government’s 25 Year Environment Plan. The Urban Pioneer focuses on improving the natural environment through improved decision making to support the health, wellbeing and prosperity of Greater Manchester’s residents.



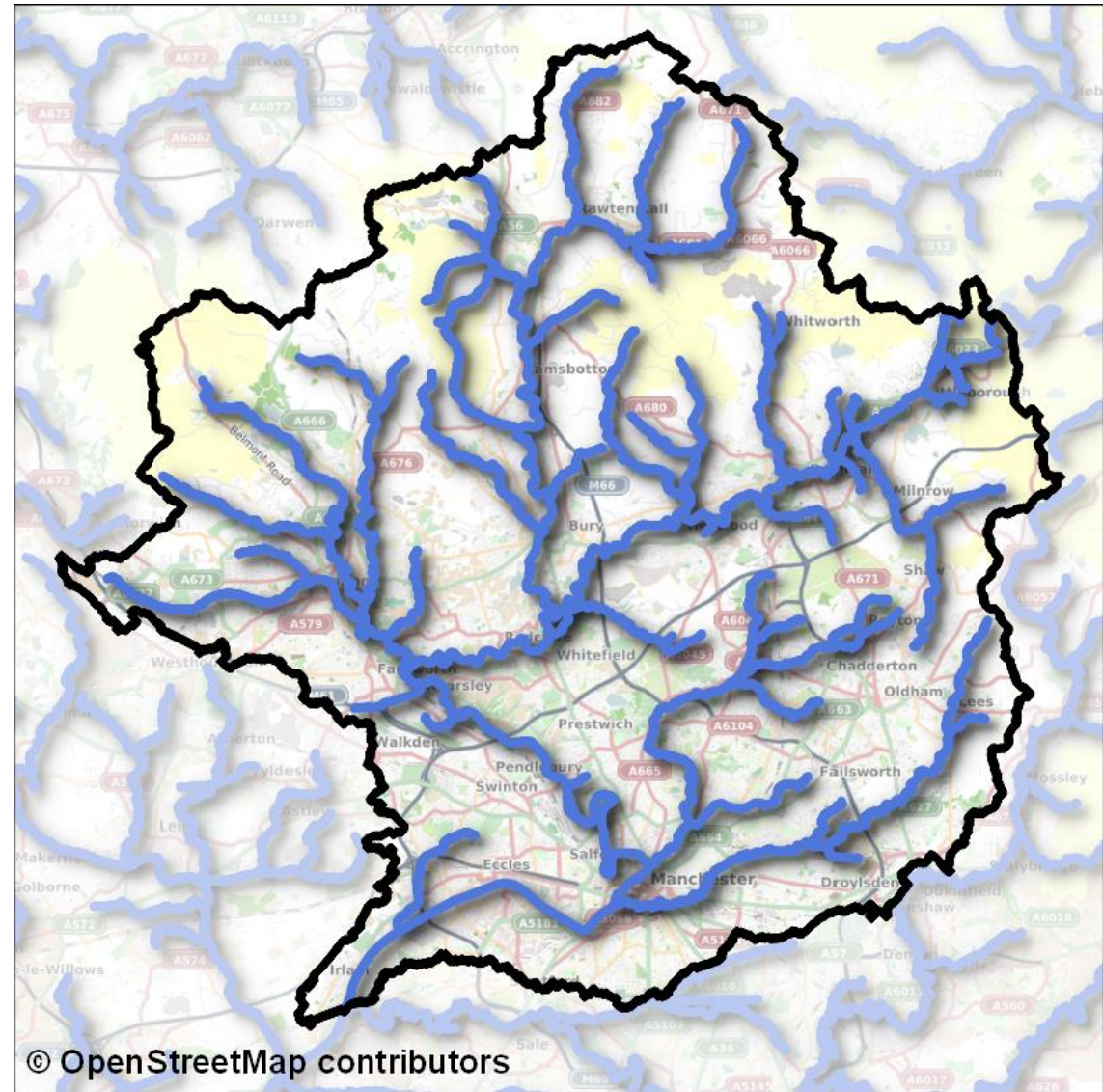
Top: Sinderland Brook, Left: Brookside, Right: River Irwell

## STUDY AREA

The WFD Surface Water Operational Catchment Cycle 2 was used as the overall project boundary for the IMC.

The principal waterbodies are the Irwell, Roch, Croal, Irk and Medlock along with their tributaries.

Our study focussed on the waterbodies and their floodplains. This formed the “study area” for the natural capital account and the ESS opportunity assessment.



## STUDY AREA

The focus of this project is on Heavily Modified Water Bodies (HMWB) and the identification of potential opportunities to improve ESS throughout the IMC.

A study boundary of a 100m buffer was applied to the 1 in 100 year flood zone, alongside each river allowing the study to focus on the key river corridors and opportunities for improvement. This formed the “study area”.

The Natural Capital Account included in this report covers all land within the 100m buffer, but also considers the value of these corridors to those communities living beyond the study area boundary. Therefore the Natural Capital Account values presented in this report are defined by the extent of any Middle Super Output Area (MSOA) that intersects the 100m buffer around the main rivers and flood zones.

ESS opportunity assessment maps also consider influences beyond the 100m buffer, particularly in relation to land that is hydrologically connected to the river.





## PARTNERSHIPS AND COLLABORATIONS

This project builds on the following studies carried out for Natural Course:

1. River Irwell Evidence & Measures Study (APEM);
2. Natural Flood Risk Management Modelling in the IMC (Rivers Trust /JBA);
3. Green Infrastructure for Water Mapping for the Irwell and Upper & Lower Mersey Catchments (City of Trees); and
4. Irwell Catchment Ecology Project (GM Ecology Unit).

A special thanks to those who have provided valued support and input:

*Manchester City of Trees, Environment Agency, Forestry Commission, Natural England, GM Local Authorities, Greater Manchester Ecology Unit, Groundwork, Department for Environment, Food and Rural Affairs, United Utilities, The Rivers Trust, Rural Payments Agency, Lancashire Environment Record Network, Transport for Greater Manchester, Sustrans, Lancashire County Council, Rossendale Borough Council, JBA Consulting and all those who attended the consultation events in September 2017 and February 2018.*

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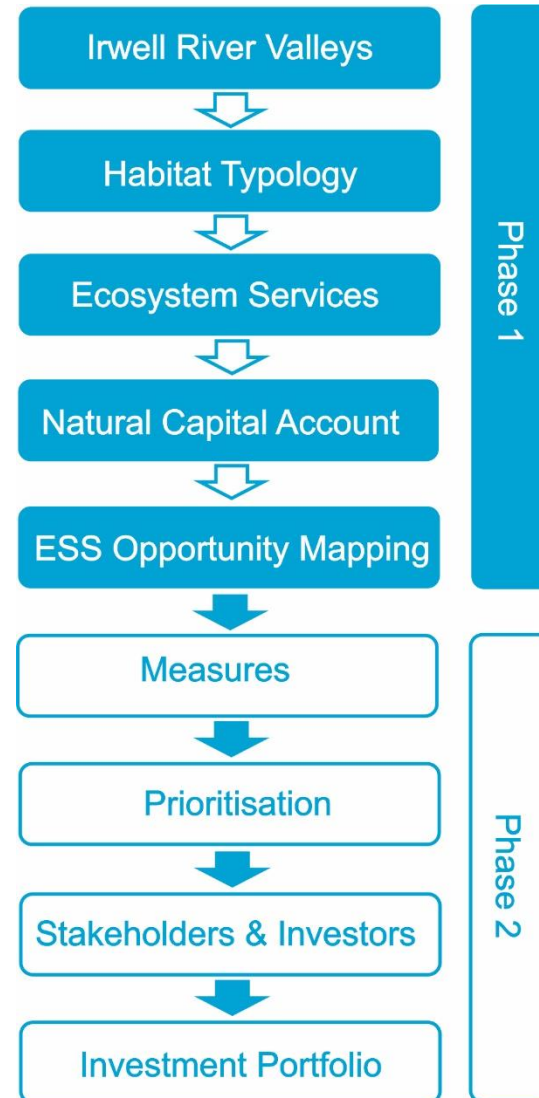
## OBJECTIVES

The intended outcomes of the IMC Natural Capital Account and ESS Opportunities Mapping Study are:

- An improved level of understanding of the scale and value of ESS in the IMC.
  - Identification of opportunities to develop or improve ESS for each of the waterbodies in the study area including the Irk, Roch, Medlock, Croal, Irwell.
  - Creation of capacity within the IMC Partnership and more widely, to support the development and prioritisation of projects to enhance ESS benefits.
  - Identification of investment opportunities which will maximise the value of ESS in the IMC.
  - Training and capacity building through the development of an interactive GIS Mapping Tool.
-



## THE METHOD



This study goes through a number of steps which will eventually lead to a portfolio of projects that enhance the natural capital of the IMC.

We focussed on Phase 1, and provided a thorough valuation of natural capital, alongside detailed maps of ESS opportunity.

We also provided a commentary on the measures, priorities and partnerships needed to develop the investment portfolio.

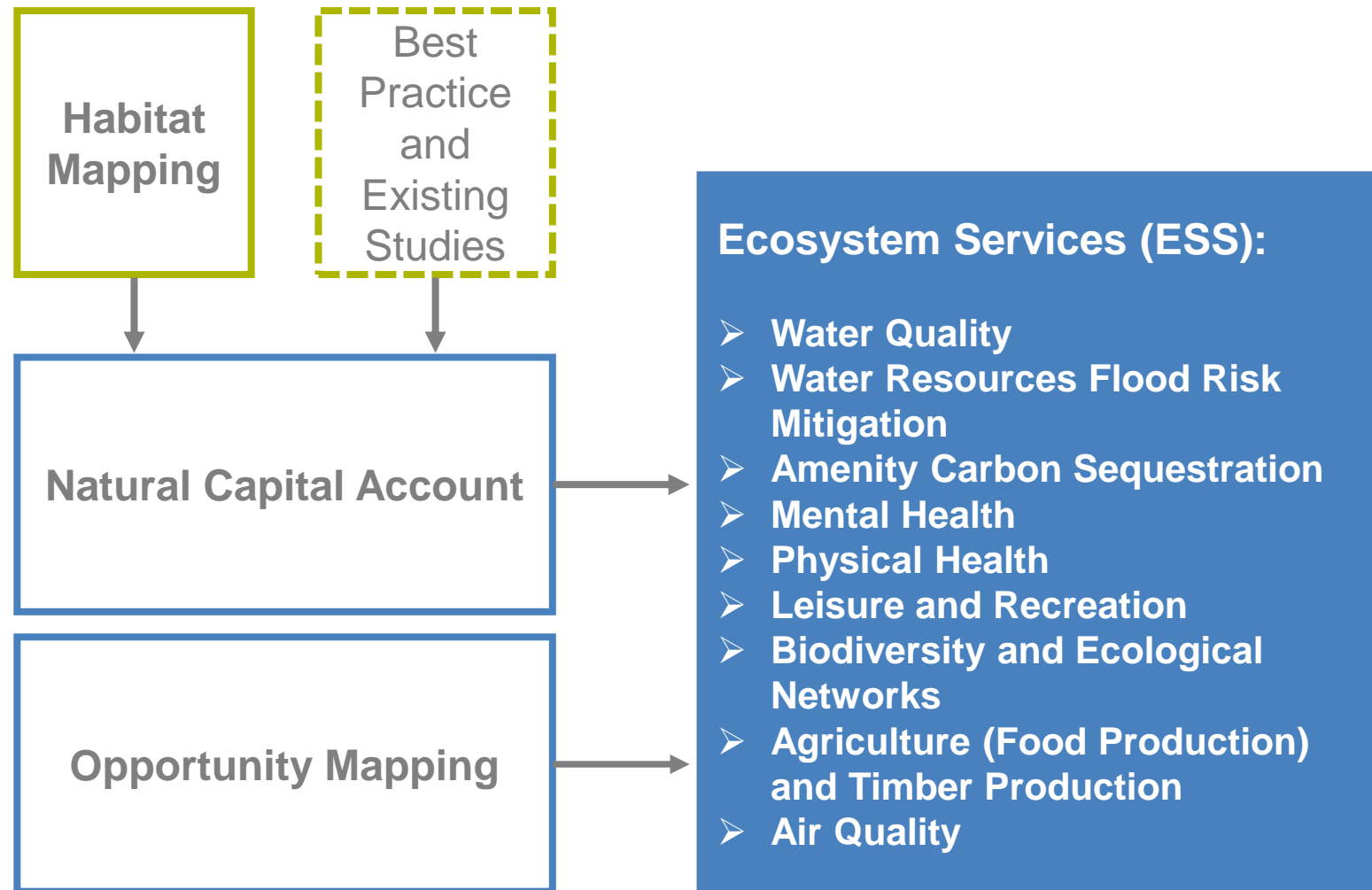
The method developed within this study has used open data, and national datasets, as far as possible, to enable this process to be repeated across similar urban catchments.

## HABITAT MAPPING AND SCOPING OF ECOSYSTEM SERVICES

This diagram shows how we have completed Phase 1 of the project.

The habitat mapping, best practice and existing studies, all feed into the Natural Capital Account and opportunity mapping.

The ESS included in the scope of the project are shown on the right hand side.





## WHY A NATURAL CAPITAL APPROACH?

A natural capital approach shows how habitats in the study area contribute to the economy of Greater Manchester, Lancashire and the IMC.

The natural capital approach offers an effective means of illustrating the level of ESS provided by natural assets to different groups of people or places.

Equity in the availability and provision of ESS is frequently cited as a key objective for stakeholders who manage these assets, owing to the important role natural capital has for a range of economic and social indicators, such as public health.

Measurement and valuation of ESS can provide information about beneficiaries. This can be used to provide evidence about best locations to invest in maintaining and enhancing natural capital to deliver greatest public benefit.

A natural capital approach is promoted in “A Green future; our 25 year plan to improve the environment” (UK Government, 2018)

## NATURAL CAPITAL ACCOUNT

Service	Annual Value (£m)	Capital Value* (£bn)	Share (%)
<b>Assets</b>			
Recreation	190	3.5	41%
Physical Health	98	1.8	21%
Amenity	80	1.4	17%
Mental Health	59	1.0	13%
Water Resources (Abstraction)	23	0.4	5%
Water Quality	14	0.3	3%
Carbon Sequestration	1	<0.1	<1%
Agriculture (Food Production)	<1	<0.1	<1%
Timber Production	<1	<0.1	<1%
<b>Gross Value</b>	<b>465</b>	<b>8.5</b>	<b>100%</b>
<b>Liabilities</b>			
Flood Risk	(48)	(0.9)	
<b>Net Value</b>	<b>418</b>	<b>7.7</b>	

The Natural Capital Account for the IMC shows the net asset value is at least **£7.7bn**.

The ESS provided by the IMC have a net value per annum of **£418m/yr**.

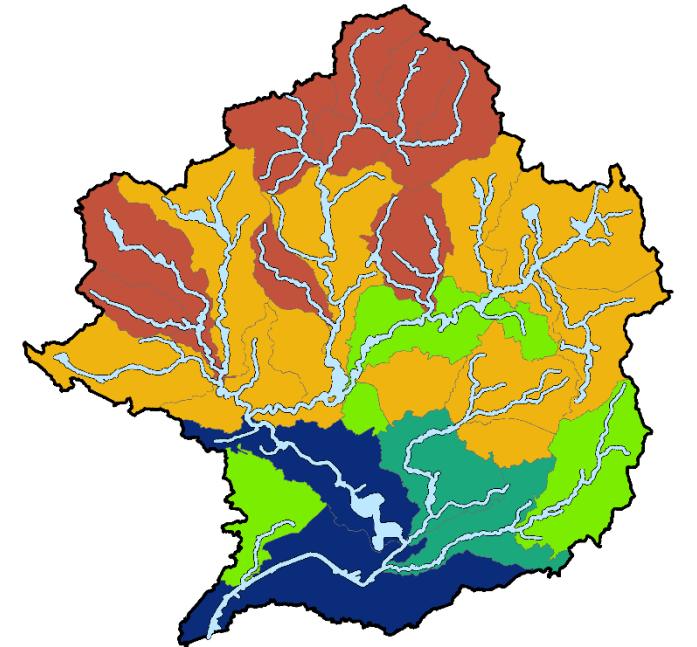
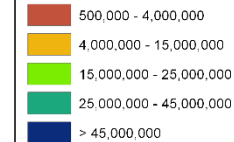
The gross asset value is **£8.5** billion, tempered by liability costs associated with flood risk (**£0.9bn**).

NB: Some ESS are not monetised, due to difficulty in modelling physical services or valuing their contribution to the economy.

## NATURAL CAPITAL ACCOUNT

- The benefits to people who use greenspace are particularly large; with recreation values totalling **£190 million/year**
- The existence of greenspaces in the catchment avoids **£157 million/year** of costs associated with poor physical and mental health. These “avoided costs” benefit residents, the public sector and businesses.
- The amenity value of living close to greenspaces is revealed through differences in property prices and is valued at **£80 million/year**.
- Natural capital accounts are estimated at the MSOA level to accurately assess ESS value. The total natural capital values are displayed for each waterbody catchment (right) to provide a strategic overview.
- The values are highest in the lower catchment, primarily due to the higher population density relying on waterbodies and associated greenspaces.

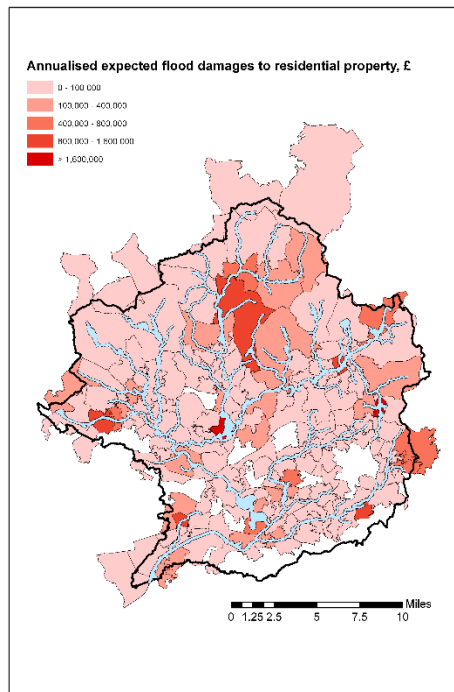
Total value of ecosystem services, £



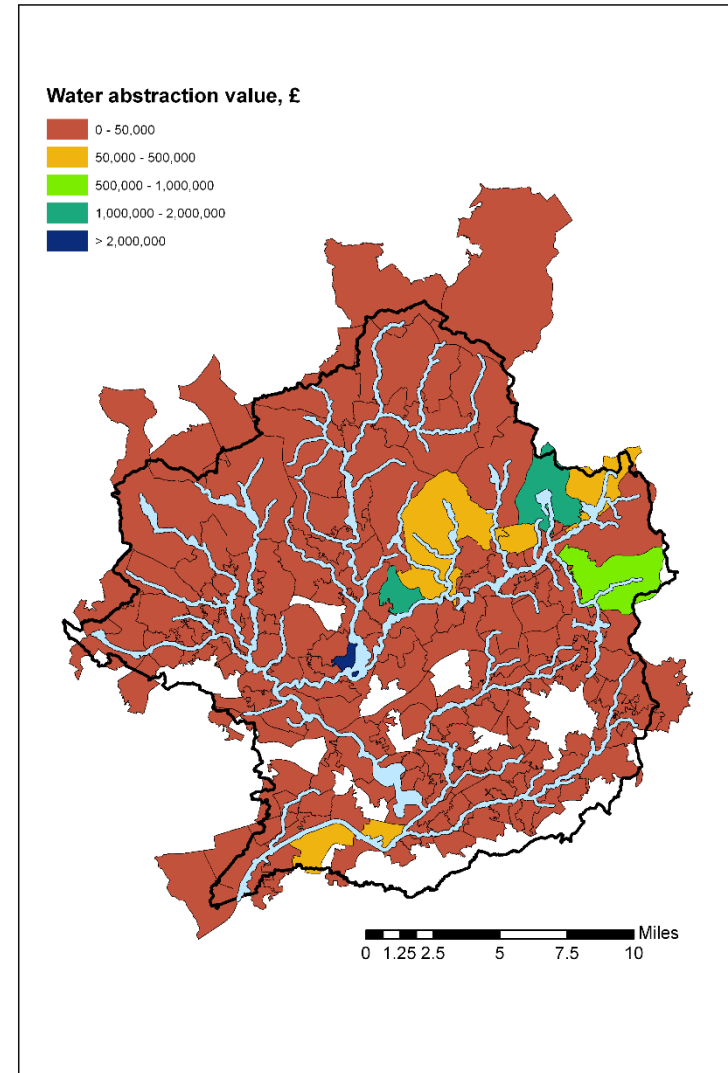
0 1.25 2.5 5 7.5 10 Miles

## NATURAL CAPITAL ACCOUNT

- Natural capital values are estimated at the Middle Super Output Area level where possible to accurately map beneficiaries across the IMC.
- Waterbodies play a pivotal role in the local economy, currently providing **£23 million/year** natural capital value through abstraction for use in public water supply, energy, industry and amenity.



- People place a value of **£14 million/year** on water in the IMC being classed as 'Good' according to the WFD Ecological Potential
- The costs of effectively managing flood risks are illustrated by the large costs to residential property from surface water flooding, with expected annual costs of **£48 million**. Reduction in these risk costs would improve the overall natural capital account.

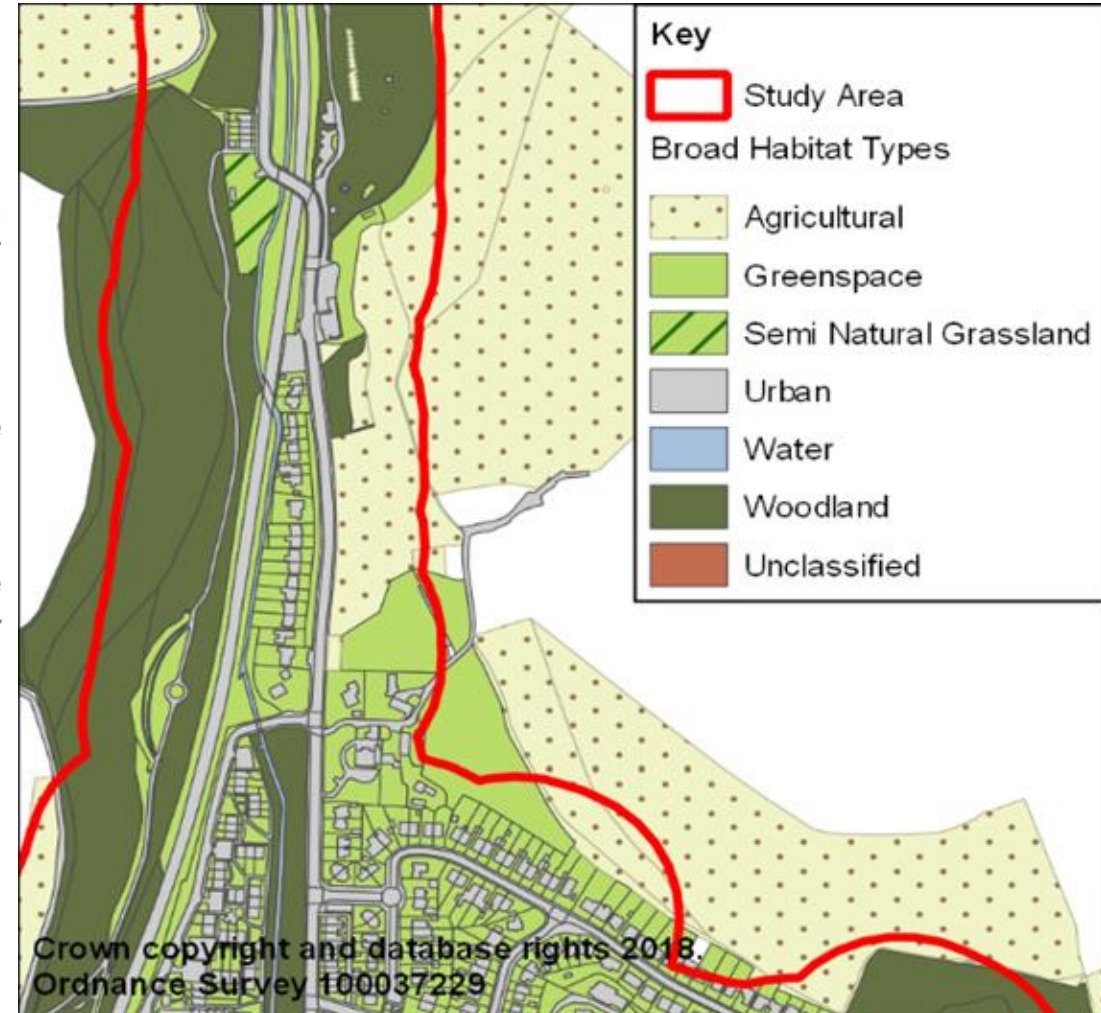


## NATURAL CAPITAL ACCOUNT

- The Natural Capital Account also recognises the asset values of woodland and agricultural land within the 100m river corridors, in terms of benefits from carbon sequestration, generation of timber and food production (in this case, primarily livestock rearing).
  - These asset values are calculated by reference to land within the study area and will be greater for the IMC as a whole.
  - This study does not generate a monetary value for ESS associated with regulation of urban temperature, noise problems and air quality pollution. This is due to lack of granular data for the study areas and lack of a reliable physical model applicable to this study area.
  - This study does not monetise biodiversity, due to lack of a widely-agreed approach to valuation of use and non-use benefits of biodiversity.
-

## HABITAT TYPES

- Habitat maps were created for >200,000 individual land parcels. These can be viewed on MappingGM  
[https://mappinggm.org.uk/gmodin/?lyrs=tep\\_ecosystem\\_services#os\\_maps\\_night/10/53.5069/-2.3201](https://mappinggm.org.uk/gmodin/?lyrs=tep_ecosystem_services#os_maps_night/10/53.5069/-2.3201)
- The image to the right provides a snapshot of the broad habitat mapping.
- The habitat mapping is derived directly from the Ordnance Survey MasterMap, available under Public Sector licence.





## HABITAT TYPES

- The largest open habitat type in the river corridors is agriculture (5,127 ha) followed by Greenspace (4,142ha) and woodland (2,508ha).
- Total urban cover is 2,933ha.
- Total area of land mapped in the study area is 16,676ha – NB this is within the 100m river corridors!
- There are 124 ha of unclassified land parcels which represents 0.74% of the study area. “Unclassified” is an OS categorisation, usually indicative of land use change.
- Automated attempts are made to classify parcels based on other intersecting and spatially adjacent datasets. Where the attempt falls below a confidence level, the parcel remains unclassified. The OS MasterMap product is updated on 6 week rolling program, so we expect “unclassified” parcels to change over time.

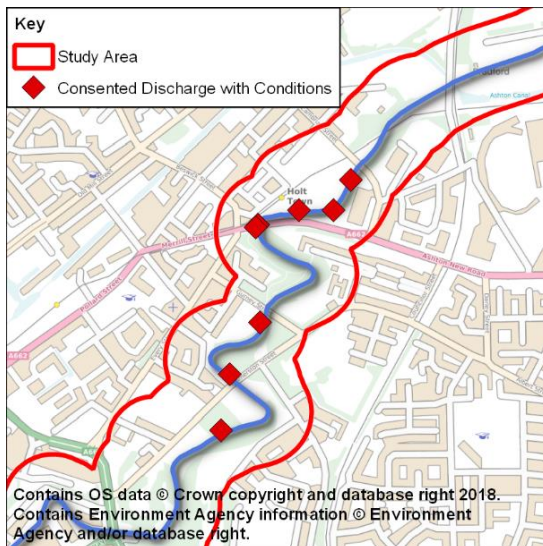
Broad Habitat Type	Area (ha)	Habitat Sub-Type	Area (ha)
<b>Agricultural</b>	<b>5,127</b>	-	-
<b>Greenspace</b>	<b>4,142</b>	<i>Amenity</i>	1447
		<i>Private Garden</i>	608
		<i>Unknown</i>	606
		<i>Transport</i>	535
		<i>Sports Facilities</i>	481
		<i>Park</i>	299
		<i>Institutional/Educational Grounds</i>	87
		<i>Religious Grounds</i>	58
		<i>Allotments</i>	21
		<b>Urban</b>	<b>2,933</b>
<i>Road</i>	685		
<i>Roadside/Footpaths</i>	408		
<i>Residential</i>	283		
<i>Buildings</i>	260		
<i>Industrial/Commercial</i>	225		
<i>Unknown</i>	168		
<i>Railway</i>	87		
<b>Woodland</b>	<b>2,508</b>		
		<i>Non-coniferous Ancient</i>	134
		<i>Coniferous</i>	109
<b>Water</b>	<b>1,025</b>	<i>River</i>	902
		<i>Pond/Lake/Reservoir</i>	57
		<i>Canal</i>	32
		<i>Unknown</i>	20
		<i>Marsh or Saltmarsh</i>	13
<b>Semi-natural Grassland</b>	<b>818</b>	-	-
<b>Unclassified</b>	<b>124</b>	-	-
<b>Total Area</b>	<b>16,676</b>		

## ECOSYSTEM SERVICES OPPORTUNITY ASSESSMENT

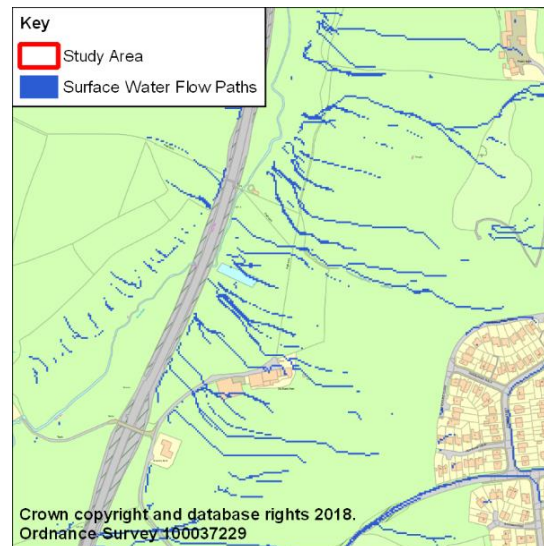
- An ESS opportunity arises on land which, given its physical, social, economic, geographical and cultural characteristics, offers potential to intervene and improve ESS functioning and thus uplift natural capital.
  - ESS opportunity arises where there is a combination of feasibility and need.
  - Feasibility: some land uses are unlikely to be capable of significant change to improve ecological functioning e.g. road surfaces, cemeteries, private residences. These are ruled out of opportunity assessment.
  - Need: some land uses are already in optimal ecological condition for the ESS in question e.g. woodlands cannot be bettered in respect of ESS such as carbon sequestration.
  - Over **30 individual aspects** of the environment have been assessed using spatial analysis to identify ESS opportunities within the study area.
  - Geo spatial analysis, informed by current best practice has identified multiple **opportunities across every district and waterbody** within the study area.
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## ECOSYSTEM SERVICES OPPORTUNITY ASSESSMENT

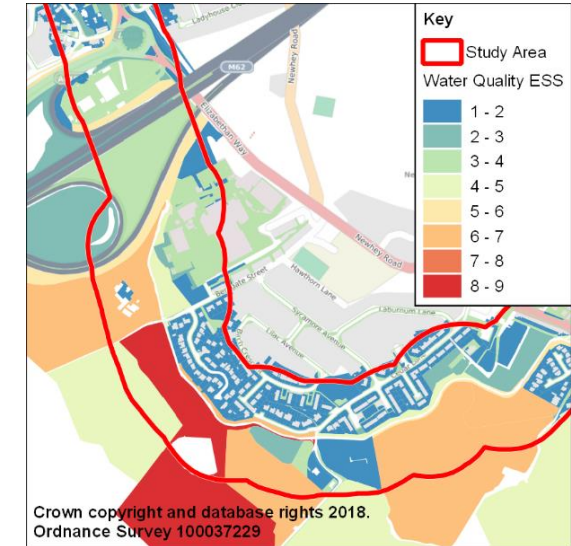
The opportunity assessment for each ESS is based on 'Attributes' which analyse different aspects of each service. For example, water quality ESS is made up of an assessment of attributes including: land connectivity, hydrological connectivity, slope, soil characteristics, land use and consented discharge locations. The combination of the scores from the ESS attributes provides the overall score for the service.



Map showing Consented Discharge Locations. Land parcels with a consented discharge point receive a score of 1 and there may be opportunity to intervene to remodel the discharge point or install filter beds of natural vegetation.



Map showing Flowpaths. Land parcels with surface water flowpaths receive a score of 1. Flowpaths and areas where water might 'pool' offer opportunities for wetland creation and establishment of wet woodland and reedbeds to capture and filter sediment and pollution.



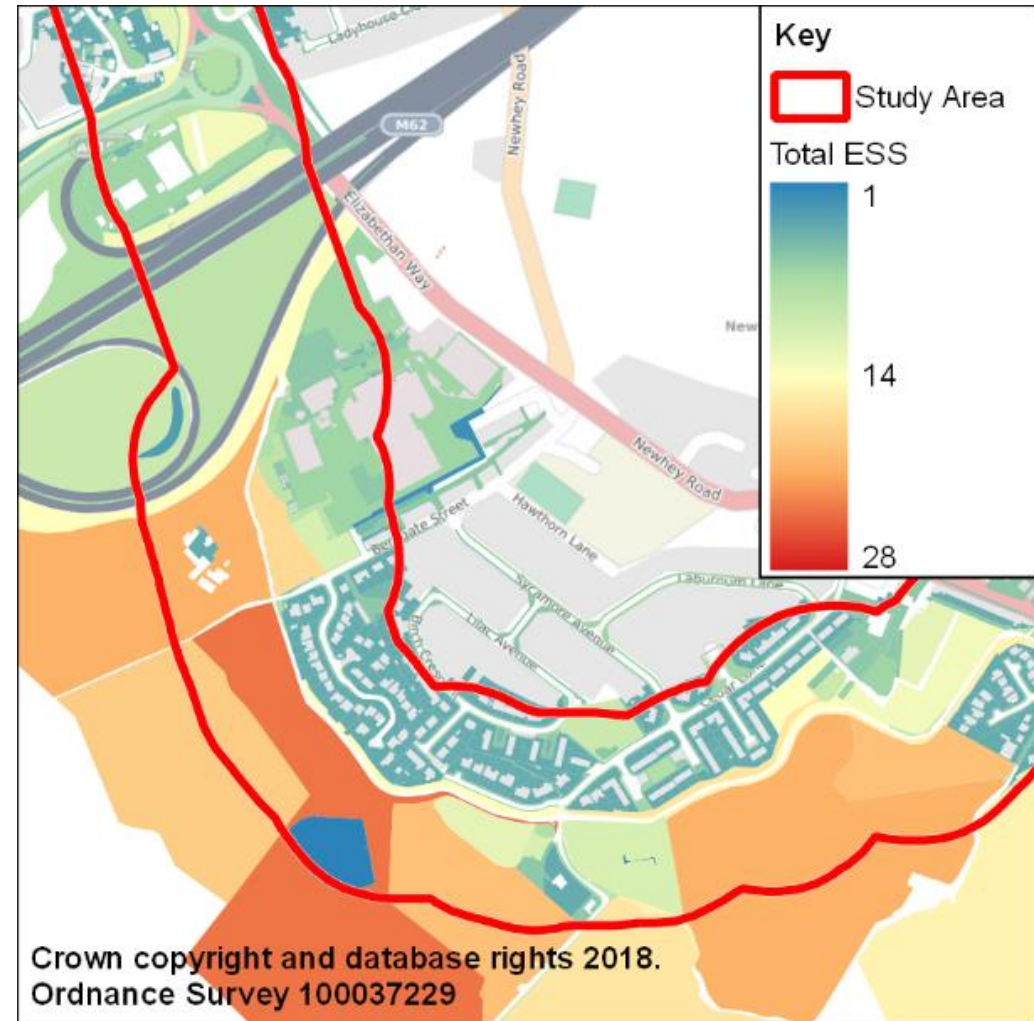
The Water Quality Opportunity Heat Map combines all the attribute scores for Water Quality, which includes consented discharge locations and flowpaths. Land parcels with the highest opportunities for water quality are shown in red and those with less opportunities are shown in blue.

## ECOSYSTEM SERVICES OPPORTUNITY ASSESSMENT

A composite heat map for all ESS in the study area is generated, including:

- Water Quality
- Flood Risk Mitigation
- Recreation and Leisure (including Physical and Mental Health)
- Amenity
- Carbon Sequestration
- Biodiversity and Ecological Networks
- Air Quality

NB: ESS opportunities associated with water resources, timber and food production, noise reduction and temperature regulation are present within the catchment, but are not displayed at the granular level shown in these heat maps

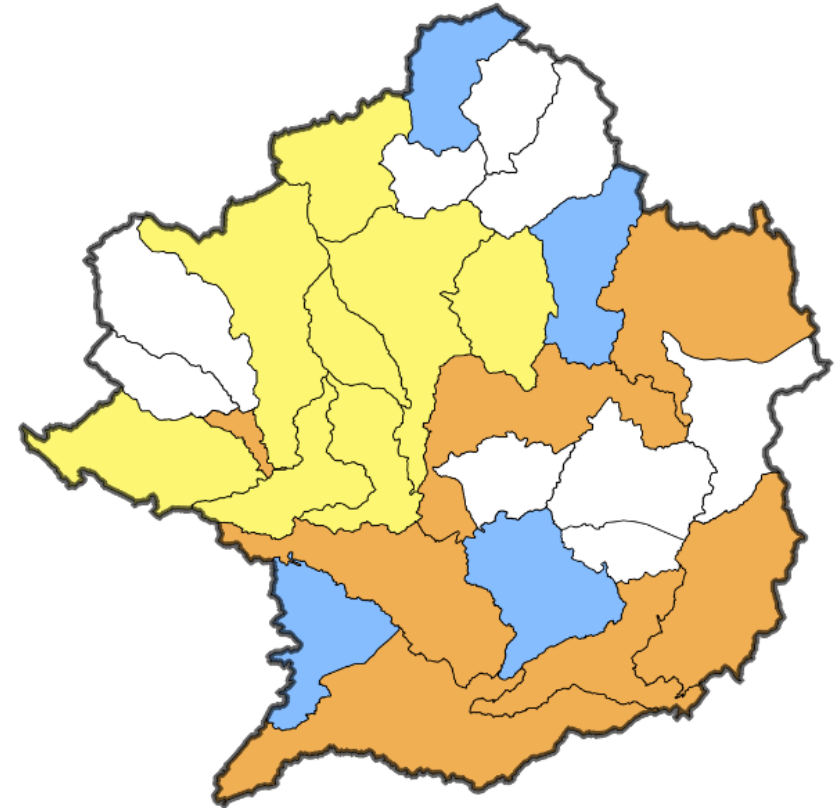


Composite Heat Map for all ESS

## TOWARDS AN INVESTMENT PORTFOLIO

The natural capital valuation and the ESS opportunity mapping can be brought together to help the Natural Course project identify investment priorities.

Waterbodies are assessed in terms of both the current provision of natural capital and the total opportunity score for each ESS.



### Key

- ESS Opportunity Ranking and Valuation are Above Average
- ESS Opportunity Ranking is Above Average and Valuation is Below Average
- ESS Opportunity Ranking is Below Average and Valuation is Above Average
- ESS Opportunity Ranking and Valuation are Below Average

## ESS Opportunity Ranking and Valuation are Both Above Average

These are typically urban waterbodies and represent **critical natural infrastructure** that must be maintained owing to the high demand for natural capital in a densely populated area.

The priority of future investment is to **maintain** existing natural capital value and **develop new projects** which address specific environmental problems or meet the specific health needs of local communities. These waterbodies are:

- Irwell (Croal to Irk);
- Irwell/ Manchester Ship Canal (Irk to confluence with Upper Mersey);
- Medlock (Lumb Brook to Irwell);
- Medlock (Source to Lumb Brook);
- Roch (Source to Spodden);
- Roch (Spodden to Irwell); and
- Tonge.



## ESS Opportunity Ranking is Above Average and Valuation is Below Average (Shown in Yellow)

These are typically urban waterbodies or urban/rural fringe waterbodies upstream of communities which experience flood risk and/or deprivation concerns. These waterbodies can be considered as critical environmental infrastructure with gaps and weaknesses that can be tackled (at least in part) by investment in the natural environment. The policy priority is to create and enhance green infrastructure. These waterbodies are:

- Bradshaw Brook;
- Croal (including Blackshaw Brook);
- Irwell (including Roch to Croal)
- Irwell (Rossendale STW to Roch)
- Kirklees Brook;
- Middle Brook;
- Naden Brook; and
- Ogden.



## ESS Opportunity Ranking is Below Average and Valuation is Above Average

These tend to be urban or fringe waterbodies and some sustain large populations. They are also critical natural infrastructure. Whilst these waterbodies have fewer opportunities for widespread new naturalistic projects, they require continuing investment to maintain their natural capital value and also implement specific ESS opportunities that can tackle local deficiencies in natural capital. Interventions in these areas may have to be carefully selected in order to maintain current environmental quality.

These waterbodies are:

- Folly Brook and Salteye Brook;
- Irk (Wince to Irwell);
- Limy Water; and
- Spodden.





## MEASURES AND PROJECTS

- Best practice guidance, case studies and relevant reports have been assessed to develop a series of **improvement measures** which have the ability to improve the social, economic, environmental and ecological aspects of the study area.
- A measures matrix identifies appropriate interventions which have the potential to deliver opportunities for natural capital uplifts across a range of ESS.
- For each opportunity area, several appropriate measures and interventions have been identified to improve each ecosystem service. Measures to increase ESS include: channel re-naturalisation, flood plain re-naturalisation, diffuse pollution attenuation schemes, pollution source control schemes, new waterfront access, community stewardship, health and community cohesion schemes, urban greening, habitat creation and natural flood management.
- To ensure this study provides a legacy and solid evidence base for decision makers, the opportunity mapping data analysis has been made publically available on MappingGM [https://mappinggm.org.uk/gmodin/?lyrs=tep\\_ecosystem\\_services#os\\_maps\\_night/10/53.5069/-2.3201](https://mappinggm.org.uk/gmodin/?lyrs=tep_ecosystem_services#os_maps_night/10/53.5069/-2.3201) alongside a companion user guide.



## MORE INFORMATION

For further information relating to the study please contact:

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<http://gmlch.ontheplatform.org.uk/>

<https://www.greatermanchester-ca.gov.uk/>

<https://naturegreatermanchester.co.uk/>

Twitter: @GMLowCarbonHub



## NATURAL COURSE

78% of our rivers in North West England are not considered healthy and many solutions are found to be too expensive to implement.

Organisations from across North West England are working together to seek cost-effective solutions to improving water quality across urban and rural landscapes, sharing best practice across the UK and Europe.

Natural Course will:

- Test and inform best practice in achieving UK and EU legislation in water quality.
- Use the North West River Basin as a flagship project and share best practice with the UK and Europe.
- Make better use of resources, share ownership of complex issues, reduce barriers and maximise outcomes, through a collaborative approach of organisations from public, private and third sector.

Join the conversation #NaturalCourse

Visit <http://naturalcourse.co.uk/> for more information.

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