# Gwent Levels. Mapping Resilient Ecological Network core zones and nature recovery zones.

Report No: 855

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# Crynodeb Gweithredol

Nod Datganiadau Ardal y De-ddwyrain a Chanol y De yw gweithredu'r Polisi Adnoddau Naturiol ar lefel leol. Mae cwmpas yr adroddiad tystiolaeth hwn wedi cael ei gyfyngu i gynhyrchion haen System Gwybodaeth Ddaearyddol (GIS) ar gyfer Rhwydweithiau Ecolegol Cadarn Gwastadeddau Gwent (RENs), gan ddilyn Canllaw Ymarferwyr i Rwydweithiau Ecolegol Cadarn Cyfoeth Naturiol Cymru (CNC).

Mae'r dirwedd sy'n ffurfio'r ardal chwilio ar gyfer y REN yn cynnwys ardal fawr o lifwaddod aberol wedi'i adennill rhwng afonydd Rhymni a Gwy yn Ne-ddwyrain a Chanol De Cymru, a elwir gyda'i gilydd yn Wastadeddau Gwent. Gyda'i gilydd, maent yn ffurfio gwastadedd arfordirol hyd at 6 km o led, sy'n ymylu ar ochr ogleddol Aber Hafren. Mae gan Wastadeddau Gwent bartneriaeth dirwedd effeithiol ers 2014, sef Partneriaeth Lefelau Byw, gyda chapasiti'r bartneriaeth yn cael ei gynnal gan y Gymdeithas Frenhinol er Gwarchod Adar (RSPB). Mae'r RENs o fewn Gwastadeddau Gwent wedi cael eu diffinio gan ddefnyddio'r dystiolaeth orau sydd ar gael gan CNC a phartneriaid.

Ochr yn ochr ag ysgogwyr y Datganiadau Ardal, roedd yr angen i fwrw ymlaen â chynllun REN Gwastadeddau Gwent yn amcan hefyd gan Lywodraeth Cymru yn ei gwaith ar Bolisi 9 prosiect peilot Gwastadeddau Gwent Dyfodol Cymru ar gyfer prif ffrydio bioamrywiaeth, cydnerthedd ecosystemol a seilwaith gwyrdd o fewn polisïau cynllunio yng Nghymru.Mae Gwastadeddau Gwent yn un o naw ardal ledled Cymru sydd wedi'u nodi'n Ardal Adnoddau Naturiol Cenedlaethol.

Mae'r dull a ddefnyddiwyd i ddatblygu RENs yn dilyn Canllaw Ymarferwyr i Rwydweithiau Ecolegol Cadarn Cyfoeth Naturiol Cymru (CNC). Defnyddiodd y prosiect Gam 1 a 2 y Canllaw Ymarferwyr i ddylunio RENs sy'n adlewyrchu cymeriad y dirwedd. Cynhaliwyd astudiaethau desg a thri gweithdy gydag aelodau'r Bartneriaeth Lefelau Byw a rhanddeiliaid ehangach. Nid yw'r adroddiad yn dogfennu creu'r weledigaeth ar gyfer y REN/s, cynllunio'r camau gweithredu, na chynllun manwl ar gyfer cyflawni.

Mae allbwn y prosiect wedi nodi 42 o barthau craidd sy'n cwmpasu 18,979 hectar (ha) ac 86 parth adfer natur sy'n cwmpasu 2,214 ha fel dwy haen GIS. Yn fras mae'r rhain yn cynnwys ecosystemau dŵr croyw, ffen, cors, glaswelltir lled-naturiol, ac ecosystemau coetir brodorol.
Mae allbynnau'r prosiectau'n cynnwys data GIS mewn fformatau Shapefile ESRI a Raster, mapiau digidol ar ffurf jpeg ac Adroddiad Tystiolaeth CNC Rhif 855 (h.y. yr adroddiad tystiolaeth hwn). Bydd y data GIS ar gael drwy Borth Gwybodaeth Amgylcheddol Cymru a DataMapCymru i'w defnyddio gan y Bartneriaeth Tirwedd Fyw, Partneriaethau Natur Leol, partneriaethau eraill, Awdurdodau Cynllunio Lleol yn y De-ddwyrain a Chanol y De, partïon â diddordeb ac unrhyw aelodau o'r cyhoedd.

Fel cynnyrch y Datganiad Ardal mae mapio REN yn cyfrannu at ein dealltwriaeth o'r blaenoriaethau, y risgiau a chyfleoedd ar gyfer rheoli adnoddau naturiol (SMNR) yn gynaliadwy ar dirwedd Gwastadeddau Gwent. Y canfyddiadau allweddol eraill yw datblygiad  dealltwriaeth genedlaethol o ddyluniad REN, ac adborth i'r Canllaw i Ymarferwyr. Trafodir y gwersi a ddysgwyd ynghylch data a thystiolaeth, a'r adnoddau sydd eu hangen ar gyfer y broses.

Dylai Cyrff Cyhoeddus roi sylw i gynhyrchion Datganiad Ardal, o dan Adran 11 Deddf yr Amgylchedd, a'u strategaethau a'u cynlluniau. Dylai'r RENs o fewn Gwastadeddau Gwent nawr gael eu hymgorffori yn y canlynol:

- Cynllun Lle Gweithrediadau De-ddwyrain CNC a rhaglenni gwaith tîm
- Cynllun Lle Gweithrediadau Canol De Cymru CNC a rhaglenni gwaith tîm
- Cynlluniau Adnoddau Coedwig CNC
- Rhaglenni ecosystemau cenedlaethol CNC
- Cynlluniau Datblygu Lleol a Strategol, yn enwedig:
    - Sut mae'r RENs yn cael eu defnyddio ac yn dylanwadu ar wneud penderfyniadau yn y polisi cynllunio cyfredol
    - Sut y defnyddir y RENs i gyfarwyddo Asesiadau Seilwaith Gwyrdd a dylanwadu ar y broses o wneud penderfyniadau wrth lunio strategaethau a pholisïau cynlluniau datblygu.
- Cynlluniau dyletswydd Adran 6 Corff Cyhoeddus

Gellid ymgorffori REN Gwastadeddau Gwent yn y canlynol:

- Cynlluniau Gweithredu Adfer Natur lleol y Bartneriaeth Natur Leol (Caerdydd, Sir Fynwy a Chasnewydd, yn y drefn honno)
- Ceisiadau am gyllid i raglenni grantiau
- Fel sail tystiolaeth yng ngwaith datblygu Partneriaeth Lefelau Byw ar gyfer eu cam nesaf a'u cais am gyllid
- Helpu i gyfarwyddo datblygiad canllawiau cynllunio Polisi 9 gan brosiect peilot a arweinir gan Lywodraeth Cymru ar gyfer Gwastadeddau Gwent

Y gobaith yw y bydd y profiad o gymhwyso'r dull RENs a'r cynhyrchion yn cyfarwyddo gweithgarwch ar gyfer gweithredu ar Wastadeddau Gwent ac mewn mannau eraill yn y rhanbarth gan feithrin cydnerthedd ecosystemau a thrwy hynny wella'r buddion hirdymor a gyflenwir gan natur. Bydd y Datganiadau Ardal yn parhau i ddysgu, addasu a gweithredu'r SMNR yn seiliedig ar dystiolaeth newydd.

# Executive summary

The South East and South Central Area Statements aim to implement the Natural Resources Policy at the local level. This evidence report scope is limited to Geographic Information System (GIS) layer products for the Gwent Levels Resilient Ecological Networks (RENs), following the Natural Resources Wales (NRW) Practitioners' Guide to Resilient Ecological Networks

The landscape forming the area of search for the REN comprises a large area of reclaimed estuarine alluvium between the Rivers Rhymney and Wye in south east and south central Wales, collectively known as the Gwent Levels. Together, they form a coastal plain up to 6 km wide, fringing the northern side of the Severn Estuary. The Gwent Levels, Lefelau Gwent, have had an effective landscape partnership since 2014, the Living Levels Partnership (LLP), with partnership capacity hosted by Royal Society for the Protection for Birds (RSPB). The RENs within the Gwent Levels have been defined using the best available evidence from NRW and partners.

Alongside the Area Statement drivers, the need to progress the Gwent Levels REN design was also sought by the work being undertaken by Welsh Government on the Policy 9 of Future Wales Gwent Levels pilot project for mainstreaming biodiversity, ecosystem resilience and green infrastructure into planning policies in Wales. The Gwent Levels is one of nine areas across Wales identified as a National Natural Resource Area.

The approach taken to develop RENs follows the Natural Resources Wales (NRW) Practitioners' Guide to Resilient Ecological Networks. The project made use of Step 1 and 2 of the Practitioners' Guide to design RENs that reflect the landscape character. Desk studies and three workshops were conducted with members of the Living Levels Partnership and wider stakeholders. The report does not document the creating the vision for the REN/s, action planning, or a detailed plan for delivery.

The output of the project has identified 42 core zones covering 18,979 hectares (ha) and 86 nature recovery zones covering 2,214 ha as two GIS layers. These broadly comprise freshwater, fen, bog, semi-natural grassland, and native woodland ecosystems.
The outputs of the projects include the GIS data in ESRI Shapefile and Raster formats, digital maps in jpeg format and NRW Evidence Report No.855 (i.e. this evidence report). The GIS data will be available via the Wales Environmental Information Portal and DataMapWales for use by the Living Landscape Partnership, Local Nature Partnerships, other partnerships, Local Planning Authorities in South East and South Central, interested parties and any members of the public.

As Area Statement products the REN mapping contributes to our understanding of the priorities, risks and opportunities for the Sustainable Management of Natural Resources (SMNR) in the Gwent Levels landscape. The other key findings are the advancement of the national understanding of REN design, and feedback to the Practitioners' Guide. Lessons learnt are discussed regarding data and evidence, and resources required for the process.

Area Statement products, under Section 11 of the Environment Act, should be given regard to by Public Bodies and their strategies and plans. The RENs within the Gwent Levels should now be incorporated into the following:

- NRW South East Operations Place Plan and team work programmes
- NRW South Central Operations Place Plan and team work programmes
- NRW Forest Resource Plans
- NRW national ecosystem programmes
- Local and Strategic Development Plans, particularly:
    - How the RENs are used and influence decision making in current planning policy
    - How the RENs are used to inform Green Infrastructure Assessments and influence decision making in formulating development plan strategies and policies.
- Public Body Section 6 duty plans

The Gwent Levels RENs could be incorporated into the following:

- LNP local Nature Recovery Action Plans (Cardiff, Monmouthshire, and Newport, respectively)
- Funding applications to grant programmes
- As an evidence base in the Living Landscape Partnership development work for their next phase and funding application
- Help inform the development of Policy 9 planning guidance by a Welsh Government led pilot project for the Gwent Levels

It is hoped that the experience of applying the RENs approach and the products will inform activity for action in the Gwent Levels and elsewhere in the region building the resilience of ecosystems and thereby improving the long-term benefits supplied by nature. The Area Statements will continue to learn, adapt and implement SMNR based on new evidence.

# 1. Introduction

## 1.1 Resilient Ecological Networks, Area Statements and the Sustainable Management of Natural Resources

The Environment (Wales) Act 2016 provides an iterative framework that ensures that managing natural resources sustainably, SMNR, will be a core consideration in decision-making. There are many policy drivers to identify and deliver Resilient Ecological Networks (RENs) in Wales to maintain and enhance the wider resilience of Wales' ecosystems, see Appendix 2 for further details. RENs are recognised in the NRW Corporate Plan outcome WB01 Nature Recovery, which states NRW should 'identify opportunities to enlarge and better connect the series of Sites of Special Scientific Interest (SSSI); Scaling up connectivity between habitats; landscape scale nature recovery through developing collaborative partnerships (NRW 2024).

The Natural Resources Policy (Welsh Government 2017) defines RENs as ‘networks of habitat in good ecological condition linking protected sites and other biodiversity hotspots across the wider landscape, providing maximum benefit for biodiversity and well-being. Such nature networks have existing or potential for healthy resilient ecosystems which provide a range of important ecosystem services, as well as allowing the movement of species across landscapes in response to climate change.’

Currently, in Wales, RENs, are recognised as vital for nature recovery. RENs put protected sites at their core, taking into account the four key attributes required for ecosystem resilience (diversity, extent, condition and connectivity) and applying these at an effective and appropriate scale (Brotherton *et al* 2021). A REN is not framed as a simple nature conservation objective but rather as a means to implement integrated environmental policy and project management (Vimal *et al*, 2012). Identifying RENs is supported by the Natural Resources Wales (NRW) Practitioners’ Guide to RENs; Terrestrial and freshwater Resilient Ecological Networks: a guide for practitioners in Wales (Garrett & Ayling, 2021). The Practitioners’ Guide is intended to do the preparatory groundwork for people intending to implement policies or sustain open-ended activities that improve ecosystem resilience using the concept of RENs as a vehicle for intervention.

RENs offer a strategic approach to safeguard and restore Wales' biodiversity. By identifying, prioritising, and connecting key habitats, RENs create a robust framework to adapt, resist and recover to pressures such as climate change and other environmental pressures whilst aligning with local needs and opportunities.

RENs are considered as a key mechanism for delivery of themes in the South East Area Statement and South Central Area Statement (NRW 2020a; 2020b). This report outlines how Step 1 and part of Step 2 of the Practitioners’ Guide was undertaken for the first time in Wales to produce mapped networks of core and nature recovery zones that reflect the landscape character. The report does not include creating the vision for the REN/s, action planning, or a detailed plan for delivery.

Area Statements have arisen from Section 11 of the Environment (Wales) Act 2016. They facilitate the implementation of the Natural Resources Policy (Welsh Government 2017) and integrate the SMNR approach. The benefit of defining RENs through an Area Statement is in Part 1, Section 13 of the Environment (Wales) Act 2016:
“In exercising its functions, a public body must have regard to any guidance given to it by the Welsh Ministers about steps that should be taken to address the matters specified in an area statement under section 11(3).”

This would be considered as having regard to Area Statement products produced by Part 1, Section 11. Welsh Ministers refer to Area Statements in policy such as Policy 9 of Future Wales (The National Plan 2040) (Welsh Government 2021) and Planning Policy Wales Edition 12 (Welsh Government 2024).

## 1.2 Gwent Levels

The Gwent Levels comprise a large area of reclaimed estuarine alluvium between the Rivers Rhymney and Wye in southeast Wales, collectively known as the Gwent Levels. Together, they form a coastal plain up to 6 km wide, fringing the northern side of the Severn Estuary (NRW 2014) (Figure 1). Further contextual information is available in the National Landscape Character Assessment (2014), Gwent Levels Landscape Profile (Natural Resources Wales, 2019) and the Historic Landscape Characterisation (GGAT 1997). There is an active landscape partnership, the Gwent Levels Living Levels Partnership, since 2014, with co-ordination hosted by the RSPB.

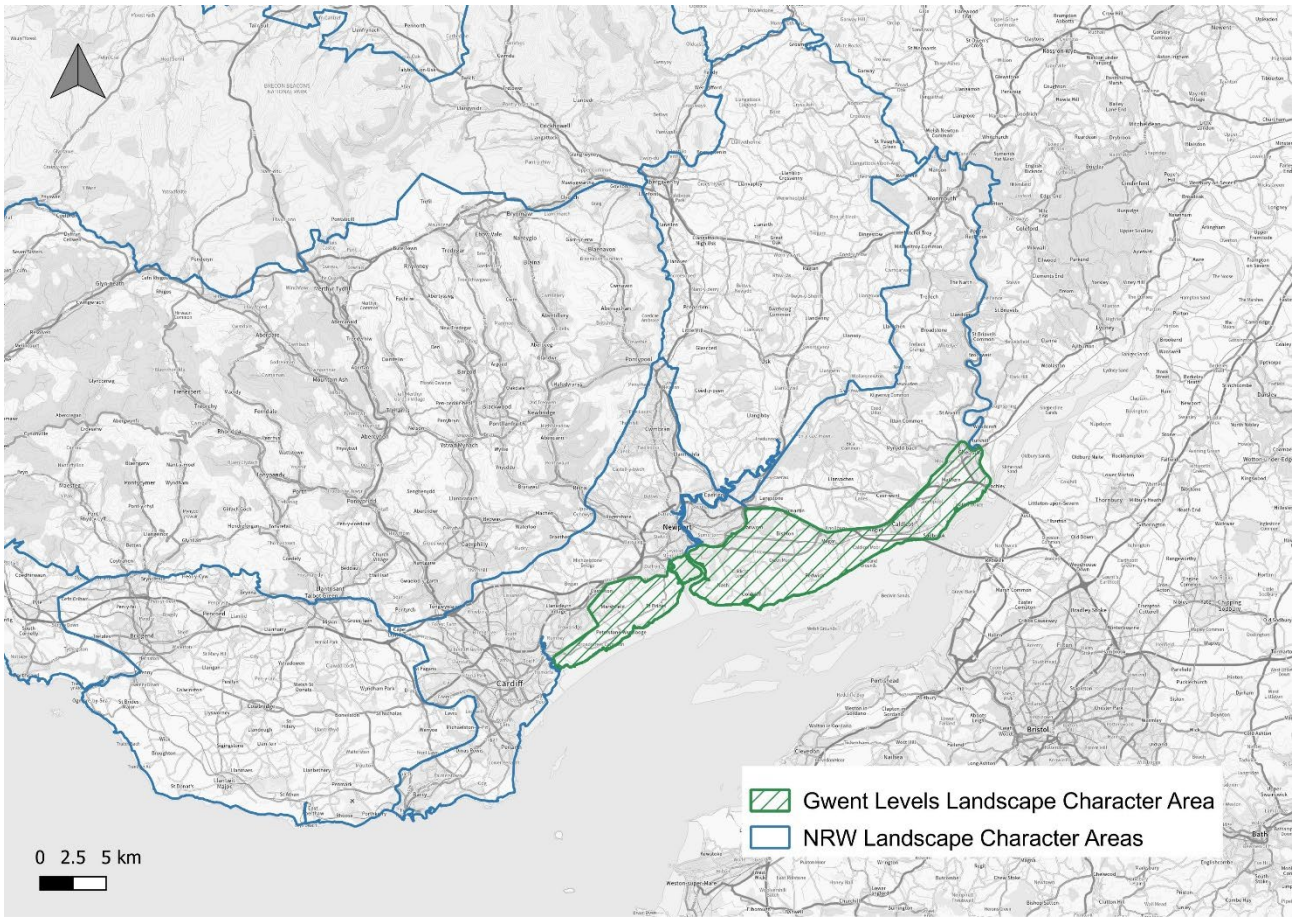


**Figure 1. Gwent Levels Landscape Character Area (LCA) situated between South Central and South East areas.**

The Gwent Levels covers two NRW Area Statement regions, South East and South Central. In the South East, the Gwent Levels cover the southern part of the region, from the River Wye to western edge of Newport City Council boundary. RENs are being developed here as the key mechanism for delivering the Linking our Landscape theme of the South East Area Statement, based on the geographical area covered by the Gwent Levels Landscape Profile (Natural Resources Wales, 2019).The western part of the Gwent Levels is in Cardiff city borough area, which falls into the South

Central region, and complements the ongoing delivery of the Building Resilient Ecosystems theme of the South Central Area Statement.

Alongside the Area Statement drivers, the need to progress the Gwent Levels REN design was also sought by the work being undertaken by Welsh Government on the Policy 9 of Future Wales (Welsh Government 2021) Gwent Levels pilot project for mainstreaming biodiversity, ecosystem resilience and green infrastructure into planning policies in Wales. The Gwent Levels is one of nine areas across Wales identified as a National Natural Resource Area by Policy 9, being important for its ancient landscape and special cultural significance as well as for biodiversity, recreation, flood alleviation, carbon storage and food production. Therefore, there are multiple users of this REN design, alongside Area Statement stakeholders.

## 1.3 Designing Resilient Ecological Networks

Developing a REN is not just a spatial approach to environmental management but also one that involves a cross-section of people and stakeholders in the planning and design process (Garrett & Ayling 2021). Future Wales (Welsh Government 2021) identifies that Welsh Government will work with partners to identify areas which should be safeguarded and created as ecological networks for their importance for adaptation to climate change, for habitat protection, restoration or creation, to protect species, or which provide key ecosystems services, to ensure they are not unduly compromised by future development. A definitive map of the core zones and nature recovery zones is required to be able to incorporate RENs into the evidence base for land use policy, planning, strategies, management and decisions.

Terrestrial and freshwater Resilient Ecological Networks: a guide for practitioners in Wales (Garrett & Ayling 2021) has a stepwise decision-support framework of three steps to design a REN in Wales:

1. understand the place,
2. create a vision and plan to build resilience through creating networks that reflect the landscape character,
3. organise the project delivery.

There are key tasks associated with each step to help identify priorities and keep the design programme on track.

The Practitioners' Guide states that RENs are comprised of core areas and the intervening land use matrix, which together guide and inform opportunities to improve ecosystem resilience attributes of the existing ecological network. This refers to the DECCA framework for ecosystem resilience which includes the attributes of ecosystem resilience, Diversity, Extent, Condition, Connectivity, and their emergent properties, or other Aspects of ecosystem resilience (adaptability, recovery, resistance) as described in the Practitioners' Guide.

Initial application of the Practitioners' Guide in South Central has developed terminology with stakeholders and end users of REN design. Hereafter in this report

the amended terms will be used, as they were used with stakeholders from the outset of the design process. The term Core Zone is used instead of ‘core area’ as in Garrett & Ayling (2021), or ‘core site’ in Crick *et al* (2020a), and the term ‘Nature Recovery Zone’ is used instead of ‘Intervening Land Use Matrix’ as in Garrett & Ayling (2021), following England’s use of ‘recovery zone’ (Crick *et al* 2020a) (Hancocks *in prep*).

In a REN, core zones are the nature-rich sites and reservoirs of biodiversity that can flow into the wider landscape if conditions allow (Garrett & Ayling 2021). Core zones should consist of existing high quality semi-natural habitats, including statutory and non-statutory sites.

In an ecological network, nature recovery zones reinforce core zones by restoring, creating and positively managing land and water adjoining its components to increase their size and so reduce extinction risk, buffering them from edge effects and human impacts. They allow the movement of species, for example for foraging or migration of individuals, through dispersal of seeds and genes, to the major shifts of species’ populations to adjust to a changing climate. Ecological networks also contain features which allowed for movement within natural processes, for example, cycling of water and nutrients between different components of the landscape. They contain a diverse array of elements providing functional connectivity between core zones and their components (Garrett & Ayling 2021). It is the interaction of these elements within, and between, ecosystems that underpin flows of ecosystem services that contribute to peoples well-being.

# 2. Step 1 - Understanding the Place

**Step 1 – Understand the place**

To understand the Gwent Levels, national, regional and local data and evidence was gathered between April and November 2024 to iteratively inform the mapping and actions aimed at building resilience in the network. The Gwent Levels has had an active landscape partnership since 2014, the Living Levels Partnership (LLP). The REN design process builds on the partnerships work to date, which has enhanced the evidence base and delivered actions to build ecosystem resilience.

**Gwent Green Grid Partnership’s Ecological Network and Opportunity Mapping**

In the South East, following the place-based approach, an environmental data consultancy was commissioned by the Gwent Green Grid Partnership (GGGP) to provide additional local spatial knowledge and information to inform map outputs. Core and nature recovery zones were informed by this ecological network and opportunity mapping (Gwent Green Grid Partnership 2025).

The ecological network and opportunity mapping project supports the development of RENs in the Gwent Levels, and South East Wales, by creating comprehensive habitat and ecological network maps and identifying opportunities for habitat restoration and

enhancement. This project utilised remote sensing and up-to-date habitat data, including recent grassland survey data carried out by NRW, to develop modelled networks for grassland, woodland, wetland, and heathland. The habitat map, created using over 50 individual datasets, provides a continuous representation of habitats at a 5-metre resolution across the Gwent region, and was expanded to cover the South Central area of the Gwent Levels.

The ecological network modelling informed development of the core zones by identifying core habitats, which are large enough to sustain viable populations, and stepping stone habitats, which provide important resources and facilitate movement between core areas. The network models highlighted areas for connecting core zones and identifying significant areas of connectivity outside the protected site network, which informed the development of the nature recovery zones. The modelling identified additional networks to Priority Ecological Networks (NRW 2023a). Additionally, ecological opportunity modelling from the GGGP map identified potential nature recovery zone areas where habitats could be enhanced through new management, restoration, or creation. The opportunity and priority habitat maps provide actionable insights for planning nature recovery projects, highlighting specific areas where conservation efforts can be targeted to maximise ecological benefits.

# 3. Step 2 - Create a vision and plan to build resilience through creating networks that reflect the landscape character

## 3.1 Create a Vision

In the Practitioners' Guide, agreeing a vision statement is a key task. The LLP already has a written vision for the Gwent Levels landscape (LLP 2022), so it wasn't necessary to do this part of the stepwise approach. However, the LLP hadn't developed a tool or map to describe the current and potential future states for nature recovery and ecosystem services.

However, during the stakeholder engagement workshops it was recognised that taking account of new evidence becoming available is important in order to achieve desired outcomes for nature's recovery and therefore a more resilient ecosystem.

## 3.2 Mapping Gwent Levels RENs

The Practitioners' Guide was not designed to provide explicit guidance for mapping and producing GIS based products. Therefore, with learning from Hancocks (*in prep*), the data and evidence base, combined with stakeholder engagement, Steps 1 and 2 of the decision-support framework was expanded to design ecological networks. Maps were drafted and iterated with stakeholder engagement to create GIS map products.

Desk based mapping was undertaken to create the first version of a map of the ecological network, comprising the initial area of search and the core zones (section 3.2.1). In the Practitioners' Guide, suggested data and evidence sources are included, and these are followed below in section 3.2.2. Nature recovery zones were not drafted as a desk based exercise but were drawn up using the stakeholder engagement workshops (section 3.2.2).

### 3.2.1 Initial Area of Search

Using Geographical Information System (GIS) software (ESRI ArcGIS) a workspace was created to represent geographic information as a collection of data in a map view, as in Figure 2. The data sources used are listed in Appendix 3.

The following layers were considered together to establish an Initial Area of search;

- the Gwent Levels national landscape character area (NRW 2008),
- the Gwent Levels Living Levels Partnership project boundary (LLP 2018) and
- the Gwent Levels landscape profile boundary (NRW, 2019).

As advised by the Practitioners' Guide, an additional area of approximately 1km around the Initial Area of Search was examined to enable understanding of connectivity outside of this project and facilitate connection with future projects in the wider area. This wider search also considered whether the Initial Area of Search extent was appropriate.

Ecological significant features were considered to check for ecological integrity of the Initial Area of Search. These layers were:

- SSSIs,
- Special Areas of Conservation (SACs),
- National Nature Reserves (NNRs),
- Important Invertebrate Areas,
- Priority Ecological Networks, and
- Rivers and their catchments.

In the Severn Estuary the Initial Area of Search aligned with Mean Low Water following technical expert opinion from NRWs national marine policy and operational teams. This is to take into account species and ecological flows, for example wading birds, terrestrial land management of the saltmarsh, the terrestrial planning system and

advice from the Living Levels Partnership. Area Statements include the area of land to Mean Low Water.

The Initial Area of Search was presented to stakeholders to generate discussion and as described in section 3.3.1.

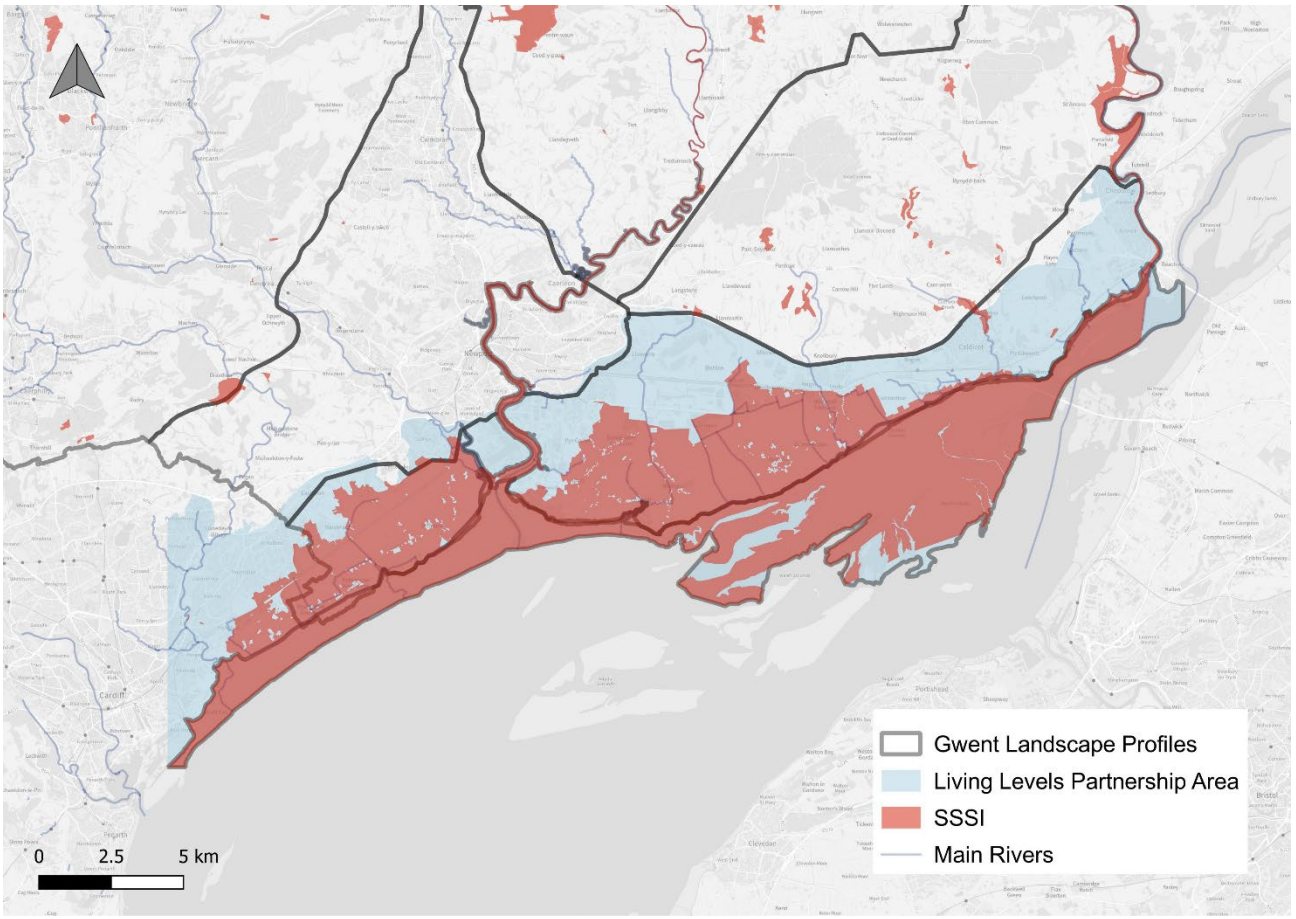


**Figure 2. Datasets used to inform Gwent Levels Initial Area of Search; Living Levels Partnership area, Landscape Profile boundary, SAC, SSSI, NNR, rivers.**

## 3.2.2 Core Zones

The land and water chosen to inform core areas is based on the confidence in what the spatial data represents. Bringing the following data sources together in the GIS workspace allowed spatial consideration.

Site based data sources:

- SSSIs, based on JNCC selection criteria (JNCC 2024) and mapped by NRW (2023c),
- Sites of Importance for Nature Conservation (SINCs), criteria by Gwent Wildlife Trust (2004) and mapped by Local Authorities,
- Section 7 habitats (Welsh Government 2016).
- Ancient Woodland Sites (NRW 2022)

Habitat network data sources:

- GGGP's Ecological Network and Opportunity Mapping (GGGP 2025)
- Priority Ecological Network (PEN) mapping (NRW 2023a)
- Habitat Network mapping (Latham, Sherry & Rothwell 2013)

The core zones were based initially on the protected sites series and were then refined further (Table 1). Relevant learning from the South Central approach (Hancocks *in prep*) was applied; that core zones do not overlap each other and where SINCs are included in the core zone, the SINC habitat type compliments the adjacent SSSI habitats. Habitat types from SSSI features or SINC designations were used to assign a zone to one or more broad ecosystems. The Broad ecosystems followed SoNaRR (NRW 2020c); coastal margins, enclosed farmland, freshwater, marine, native woodland and semi-natural grassland.

The draft REN core zones were also informed by specialist advice, from NRW Environment Team members and other NRW specialist ecologists, which provided evidence around the DECC of habitats in the Gwent Levels.

**Steps undertaken to draw a draft set of REN core zones**

| Step | Action |
|---|---|
| 1 | The SSSI shapefile was used to interrogate within the Area of Search using the 'Feature category' to assign broad ecosystems based on the NRW baseline assessment data (NRW, 2021). |
| 2 | SSSI shapefile was extracted into a new core zone shapefile with attributes as per Appendix 6.<br>For the Gwent Levels Area of Search, 14 SSSIs were transferred as polygons into the core zone shapefile forming the basis of the core zones. |
| 3 | Core zones were assigned ecosystems attributes derived from their SSSI classification and corresponding to the broad ecosystems categories in step 1 |

| Step | Action |
|---|---|
| 4 | SINCS were interrogated to consider their potential to contribute to the core zone. In the Area of Search SINCs had habitat features included in the attribute table, so could be matched to a broad ecosystem.<br>Either:<br>the adjacent SINCs to the core zone (i.e. SSSIs) were considered, and the core zone boundary expanded to include sites with complimentary habitats; or,<br>SINCs not directly adjacent to the core zone, but in an ecological network (identified in PENs or GGGP's ecological network and opportunity mapping) with a suitable habitat for the broad ecosystems, were added as new polygons in the core zone layer.<br>SINCs that didn't fit the above were excluded. |
| 5 | SINCs without enough information in GIS layers – seek designation forms from the Local Planning Authority (LPA). |
| 6 | Internal consultations checked direction of travel and prioritise section 7 habitats to be considered |
| 7 | The Coastal and floodplain grazing marsh, and Orchard Section 7 habitats were assessed to consider their potential to contribute to the core zones and considered to be integral to the functioning of the ecosystems. Resultingly these habitats were included in map 1 and put forward for discussion at workshop 1. Orchards were combined into one feature for inclusion as a core zone. |
| 8 | Ancient woodland sites adjacent to the core zones were assessed to consider their potential to contribute to the core zones and considered to be integral to the functioning of the ecosystems. Resultingly these habitats were added to the core zones. |
| 9 | The habitat network data sources were used to cross reference the draft core zone polygons layer for ecological integrity providing a quality assurance step.<br>Land and water that weren't included in steps 1-7 but showing in the habitat network data sources, were revisited or considered for inclusion in the core zones. |

**Table 1: Steps taken to draft REN layers in GIS to create version 1 of the map.**

By following the steps set out in Table 1 the first iteration of ecological networks was produced, comprising the initial area of search and the core zones. The draft REN core zones are in some cases based on assumptions of spatial evidence and ecological modelling. These areas provide the basis for stakeholder engagement, ground truthing and discussion to further develop the RENs, see section 3.3.1.

The draft REN core zones were also informed by specialist advice, from NRW Environment Team members and other NRW specialist ecologists, which provided evidence around the DECC of habitats in the Gwent Levels.

## 3.3 Stakeholder engagement

The Practitioners' Guide sets out the expectation for stakeholder engagement as part of the stepwise approach to designing a REN. Following the desk based initial mapping to produce map version 1, (Section 3.2), three stakeholder workshops were conducted (Figure 3).

Stakeholders included Welsh Government staff working on Policy 9 and Biodiversity, NRW staff, GGGP, and LLP. The workshops were designed in a Delphi method (Cardiff University, 2017) inspired format, alongside considering the nine SMNR principles and the five Well-being of Future Generations Act 2015 Ways of Working, a statutory requirement for public bodies and highlighted in the RENs Practitioners' Guide (Appendix 7).

Working in partnership in this way enabled a wider range of stakeholders to be invited from across the landscape, with experts in ecology and the landscape, and ecosystem services and benefits attending, to reach expert consensus. When considering stakeholders suitable to attend the workshops, thought was given to the users of both the REN mapping and how the work could inform the implementation of Future Wales Policy 9. The attendees for each workshop are listed in Appendix 4.

The workshops overall aim were to cover the questions in the 'review the place audit' in the Practitioners' Guide. Workshop one in July 2024 focused on reviewing version one of the map; the draft Initial Area of Search, REN core zones, and building upon these to collaboratively design the nature recovery zones (see section 3.3). A second workshop was held in September 2024 to gather more information on ecosystem services and benefits (see section 3.3.2). A third workshop was held in November 2024 to provide an explanation and overview of the process to date and show the results of mapping RENs across the Gwent Levels landscape, for stakeholder agreement, which was also available to stakeholders for comment by email (see section 3.3.3).

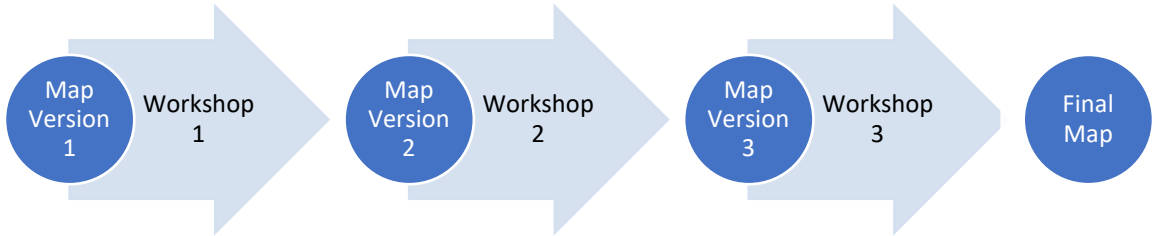


**Figure 3. A flow diagram showing the progression of mapping and workshops.**

### 3.3.1 Workshop 1 - Initial Area of Search (Partnership area), REN Core Zones, REN Nature Recovery Zones

In workshop one a range of public and third sector environmental and ecological management stakeholders were invited from the county boroughs covered by the Gwent Levels landscape; Cardiff, Monmouthshire and Newport. Welsh Government Planning Policy staff were present at this workshop as notetakers. The workshop was held in person.

The stakeholders were selected collaboratively by the Gwent Levels RENs mapping task and finish group who analysed who were the key stakeholders in this landscape and who could provide the local or specialist knowledge relevant to each workshop. The Living Levels Partnership has an extensive stakeholder network of contacts and therefore a new stakeholder analysis for the purpose of mapping RENs wasn't required. For workshop 1 county ecologists, Local Nature Partnership Co-ordinators, NRW Environment Team members, and other representatives of the key stakeholders and partners were also present.

This workshop covered the first two questions in the 'review the place audit' in the Practitioners' Guide:

- Question 1. Which existing landscape [units] might already contribute to the REN, and how? Which landscape [units] that could contribute to an effective REN are missing or could be improved through habitat maintenance, restoration or creation?
- Question 2. Are there any significant constraints to the functioning of the [units]? Examples of [units] include key semi-natural habitats and features, important species populations including migratory ones, and the condition of designated sites.

In the first session there was an introduction to the key principles of RENs, based on the Practitioners' Guide; core zones, nature recovery zones, the ecological rules of thumb and the desk based mapping. The stakeholders were grouped into one of four spatially relevant groups; Cardiff, Newport West, Newport East or Monmouthshire, based on job role location.

**Core zones**

The workshop participants then reviewed and sense checked the initial area of search and the draft REN core zones. Suggested amendments were made to version one of the maps, on printed large scale copies, with participants adding direct annotations, post it notes (Figure 4) and written feedback These were based on the principles that had been presented earlier in the workshop, and amendments as above in Section 1.3 from Place based learning. The following questions were asked for stakeholders to input with their local knowledge:

- Are any areas missing from the draft core zones?
- Are any additional core zones that had been missed?

Notes of the discussion were captured by note takers. A summary of the feedback received is included below. Generally the stakeholders were in agreement with version one of the map being presented, and the zones were amended based on local knowledge and agreement in the break-out groups. There were no fundamental disagreements with the principles of ecological networks or desk based mapping.

In the Cardiff area of the Gwent Levels, the initial area of search had been drawn to the Gwent Levels reen hydrological extent, as the Living Levels project boundary was poorly defined on the western boundary (Figure 2). The area of search was expanded to include the Rhymney river and to the A48 as a west and north-west boundary as stakeholders did not feel that splitting the urban communities of Llanrumney and Rumney was desirable for landscape scale partnership working. This was discussed after the workshop with the Cardiff City Nature Network and the Rhymney catchment project, who were in agreement. Enlarging the area meant that the Rhymney river was included as a core zone, and assisted in the creation of coherent Nature Recovery Zones.

Core zones were expanded in some areas, for example the Caldicot Levels, to include areas of coastal and floodplain grazing marsh priority habitat, which are not notified as SSSI but constitute the same landscape, with no natural break between the notified and non-notified areas. The workshop identified several areas of ancient woodland along the northern edge of the Gwent Levels which were incorporated into core zone. Areas of high ecological value and potential for restoration in and outside of core zones were identified through discussions and to provide a basis for future action planning.

Some sites within the core zone identified through the desk study and workshop 1 have undergone building development since their designation as SSSI or SINC. The issue of whether to amend the core zone away from areas of designation which have been developed on since designation or keep the boundary of the core zone to the original designated boundaries was discussed. The workshop attendees decided that it was important to maintain the original boundaries, as moving core zones away from developments may set a precedent that the importance of core zones and designated sites could be undermined in future. However, in some cases small edits were made to boundaries of the core zones to amend discrepancies between the GIS data and real-world boundaries. This helps to maintain the integrity of the mapping process and ensure that stakeholders have confidence in our knowledge of the area. Holes in the core zone for private properties, for example in the Gwent Levels SSSI areas, were left unamended. However, orchards, which were grouped into one feature, often overlap SSSIs and private land, as such they were left as an overlapping feature in the core zone.

**Nature recovery zones**

In a second break out session, stakeholders collaboratively developed nature recovery zones. These were based on the principles that had been presented earlier in the workshop, based on the Practitioners' Guide, amendments as above, Section 1.3 and design process for the workshop above.

The nature recovery zone components are:

- Buffers adjacent to core zones, which are a functional component of species movement
- Corridors between core zones,
- Stepping-stones between core zones,
- Linear landscape features such hedges, native tree lines, ditches and the vegetated margins of fields, watercourses, hedgerows, roads and active travel routes,
- Habitat patches between core zones:
    - supporting degraded habitats with potential for restoration
    - Habitat in process of restoration from a degraded to a functional state

The criteria developed for the nature recovery zone components is included in Appendix 5.

The following questions were asked for stakeholders to input with their local knowledge:

- Which nature recovery zone components contribute to an effective REN or could be improved through habitat maintenance, restoration or creation?
- Are there any significant constraints to the functioning of the core zones and nature recovery zones? Examples of components include key semi-natural habitats and features, important species populations including migratory ones, and the condition of designated sites.

After each session, there was feedback to the whole group of workshop attendees. Potential actions and delivery mechanisms were also captured to inform future action planning and delivery.

Coastal and floodplain grazing marsh priority habitat sites which were not included in the core zone but identified as components of nature recovery zones by workshop attendees were included as nature recovery zones. In urban and peri-urban settlements along the Gwent levels, green spaces and linear features such as railway lines were identified as corridors, patches, and stepping stones increasing connectivity within and outside the Gwent Levels. In industrial areas around Newport and Cardiff, disused land and restored landfills were identified as opportunities for nature restoration and were included in the nature recovery zones.

Following workshop 1 nature recovery zone buffers of 100m were created around core zones, a distance recommended in the Practitioners' Guide. Where possible, PENs provide additional evidence to inform buffers. Where buffers from the same broad ecosystems overlapped these highlighted areas of potential connectivity, which formed suggested corridors as nature recovery zones.


**Figure 4. Photo of Newport West map version one with annotations from workshop one.**

Following the first workshop the area of search, core zones and nature recovery zones were created or modified to reflect feedback and input (Table 2). A second iteration of the core zone and an initial nature recovery zone draft were produced and presented back to stakeholders for feedback in online meetings with spatial groupings, and version two of the map was produced to inform the second workshop.

### Steps undertaken to draw a draft set of REN core zones

| Step | Action |
|---|---|
| 10 | Amendments to the core zone shapefile were made following the workshop feedback. |
| 11 | A nature recovery zone layer was created, with attributes as per section 3.3. and Appendix 5. Zones were created as polygons following the workshop feedback.<br><br>The ecosystem attributes were assigned up to three broad ecosystems. These were not assigned in any order of priority. |

| Step | Action |
|---|---|
| 12 | Relationship between core, initial nature recovery zones and modelled functional ecological networks in PENs and GGGP network maps were examined to identify landscape corridors, areas of connectivity or further nature recovery potential.<br><br>Following this, new nature recovery zones were created or existing zones were amended |
| 13 | Stakeholders were consulted by area on the draft digitised layers in an online meeting. |
| 14 | More sources of evidence layers were added to the mxd to inform nature recovery zone selection. Further spatial data (shapefiles) to inform nature recovery zone selection was added to the workspace at this step. |
| 15 | The core zone shapefile and nature recovery zone shapefile were refined to reflect the online meeting with stakeholders. |

**Table 2. Steps taken to draft REN layers in GIS for version 2 of the map**.

### 3.3.2 Workshop 2 - Ecosystem services and benefits

The Practitioners' Guide states that "A place-based assessment of ecosystem services provides understanding of the current and potential benefits provided by ecosystem services in an area and how they relate to people at different spatial scales."

Checklist 7 in Step 1, 'Understand the Place' states to:

- Describe ecosystem services: provisioning, cultural and regulating.
- Clearly define the main issues.
- Collate historic environmental and cultural features.

and to use SoNaRR, Area Statements and the UK National Ecosystem Assessment as evidence sources.

The Gwent Levels did not have an ecosystem services assessment available, so it was decided to follow the Practitioners' Guide checklist, to describe the ecosystem services, and create a qualitative place-based assessment of ecosystem services through consultation with stakeholders who hold local and national expertise.

The list of ecosystem services used was based on the 'Initial checklist of ecosystem services for consideration' (DEFRA 2007).

The Gwent Levels RENs mapping task and finish group recognised that stakeholders involved in workshop one weren't able to cover all ecosystem services and therefore conduct a complete qualitative place-based assessment. Potential additional stakeholders and their organisations were listed against ecosystem services. These were considered by the task and finish group. It was decided that grouping stakeholders into the ecosystem service categories of provisioning, cultural, supporting or regulating would be a challenging framing to run as a workshop, with stakeholders potentially not identifying with those groupings. From further discussion alternative groupings naturally emerged and are captured in Table 3. The groupings in Table 3 also paralleled the Gwent Levels landscape and the LLP knowledge, and the Policy 9 justification for The Gwent Levels as a National Natural Resource Area; "being important for its ancient landscape and special cultural significance as well as for biodiversity, recreation, flood alleviation, carbon storage and food production."

| **Ecosystem service group** | **Ecosystem service** |
|---|---|
| Farming & food, wider land management | Food |
| | Pollination |
| | Soil formation |
| | Pest regulation |
| | Fibre |
| | Fuel |
| | Erosion regulation |
| Water quality & quantity | Fresh water |
| | Water regulation |
| | Water purification and waste treatment |
| | Natural hazard regulation - pollution |
| | Natural hazard regulation - flood management |
| | Natural hazard regulation - drought |
| Climate change | Climate regulation - carbon storage |
| | Natural hazard regulation - wildfire |
| | Natural hazard regulation - coastal flooding |
| Culture | Cultural heritage |
| | Recreation & tourism |
| | Aesthetic value |
| | Education |
| Human health & well-being | All |
| | Green Infrastructure |

**Table 3. The ecosystem service groups derived from ecosystem services.**

Based on the groupings set out in Table 3, the following themes were created to group stakeholders for the workshop:

- Climate change
- Culture

- Food & farming
- Health & well-being (including Green Infrastructure)
- Water quantity and quality

In preparation for the second workshop, the following resources were used:

- Using ArcGIS a workspace was created to present data sources for ecosystem services and benefits. (Appendix 3).
- Workshop stakeholders were asked to send any relevant ecosystem services and benefits data sources, which were included in the workspace (Appendix 3).
- Version two of the Gwent Levels REN mapping
- Development of one Miro board for each ecosystem service and benefits group, five in total.

In workshop two a range of public and third sector environmental and ecological management, ecosystem services and benefit leads and neighbouring landscape stakeholders were invited from the county boroughs covered by the Gwent Levels landscape; Cardiff, Monmouthshire and Newport. Welsh Government Planning Policy staff were present at this workshop as notetakers. The workshop was held online.

To capture learning about ecosystem services and benefits stakeholders were asked two key questions:

- By considering the ecosystem services, does that change or add anything to the drafted REN maps?

- Does it affect the ecological network design?

The workshop introduced the process undertaken thus far for REN design and mapping, including key principles of ecosystem services. Break-out sessions were then held with stakeholders grouped in to one of the five ecosystem service and benefit groupings listed above. In the first session, the aim was to familiarise stakeholders with the Gwent Levels, and explore their perspectives on ecosystem service provision, beneficiaries, flows and neighbouring landscapes, to prepare for the second break-out session.

In the second break-out session, stakeholders were asked the following questions:

- What opportunities are there for new or enhanced ecosystem service provision?
- Which options and locations will potentially tackle the issues and build on opportunities? Please discuss as a group and note on map (Figure 5).

After each session, there was feedback to the whole group of workshop attendees. Potential actions and delivery mechanisms were also captured on the Miro boards.

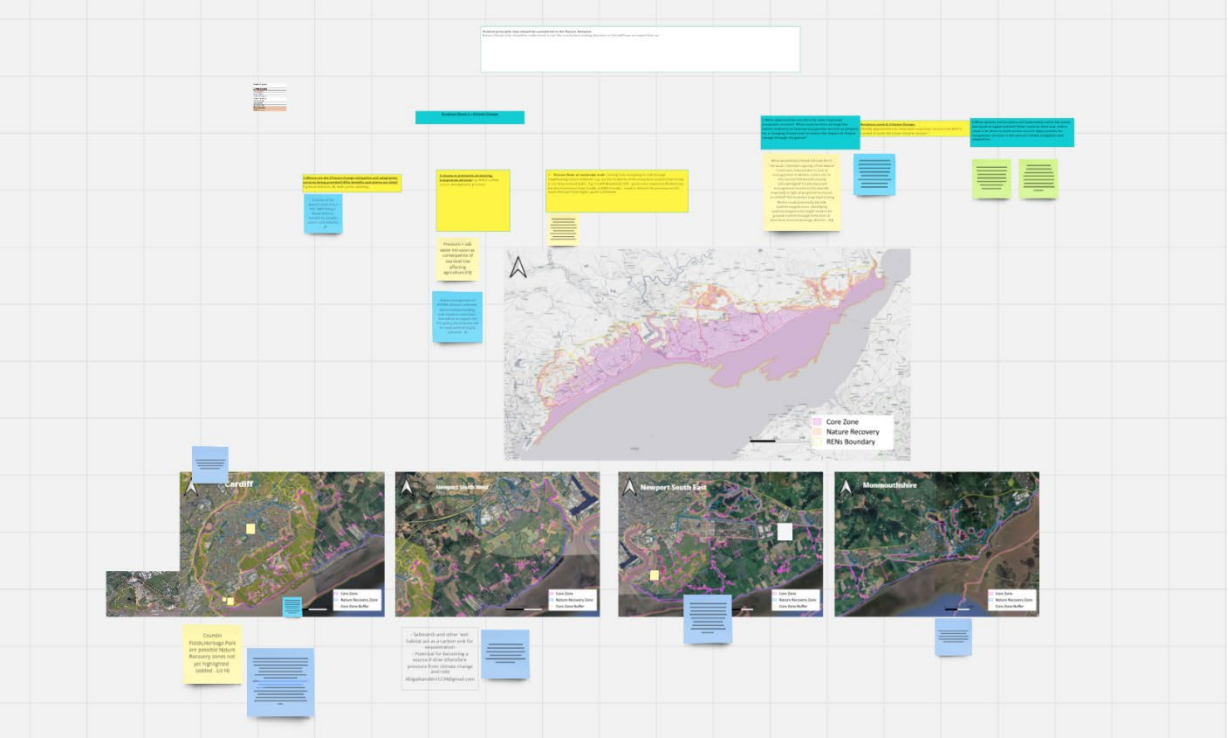


**Figure 5. Screenshot of a Miro board used during workshop 2.**

Workshop 2 resulted in limited changes to the core zones, as much of the area discussed in relation to ecosystem services were already included, however, this provided useful validation of the draft core zones and acted as a cross-checking mechanism improving the robustness of the evidence. Watercourses feeding into the Gwent Levels were emphasised during the workshop due to their importance for water quality and habitat provision, therefore main rivers which had not yet been included were added as core zones, as a Section 7 priority habitat.

The presence of peat on the Gwent Levels was highlighted through discussions about preservation of archaeological materials. This was an important ecological, climate and geological aspect of the Gwent Levels which had not been identified in previous workshops and discussions. Following the workshop, data from the Peatlands of Wales maps were incorporated into the core zone. Most of the peatland area with high confidence of peat presence were already covered by the core zone, however, peatland areas with a confidence score of 1 were created as buffers and included as nature recovery zones.

Discussions from workshop 2 focused predominantly on the development of the nature recovery zones. Accompanying the addition of main rivers into the core zones, buffers were created for waterways and added as nature recovery zones, excluding areas where the buffer would be overlapping core zone (Appendix 5).

Areas of cultural and historical significance were cross referenced against ecological data and added as nature recovery zones, this included parkland estates and registered parks and gardens. Participants in workshop 2 identified green spaces for inclusion as nature recovery zones which are important for health and well-being and

have ecological functions.The Ordnance Survey (OS) open greenspace layer was raised as a published source of mapped polygons for including green space data into nature recovery zones as areas which are important for health and well-being and have ecological functions. The Wales Coast Path, which runs along the sea wall for the majority of its length was also included as a linear nature recovery component.

Following workshop 2 the maps were updated using the additional data sources and core and nature recovery zones were amended accordingly (Table 4). These were checked with spatial based groupings from workshop 1. Version three of the REN maps were produced.

The ecosystem services and benefits learning was used to draft a briefing note to inform the third workshop.

**Steps undertaken to draw a draft set of REN core zones**

| Step | Action |
|---|---|
| 16 | More sources of evidence layers were added to the REN GIS workspace to inform nature recovery zone selection. |
| 17 | Main river shapefile was added to the core zone shapefile |
| 18 | Amendments to the core zones were made following the workshop feedback |
| 19 | Amendments to the nature recovery zones were made following the workshop feedback |

**Table 4. Steps taken to draft REN layers in GIS for version 3 of the map.**

### 3.3.3 Workshop 3 - Strategic Opportunities

In workshop three a range of public and third sector stakeholders were invited from the county boroughs covered by the Gwent Levels landscape; Cardiff, Monmouthshire and Newport. This included some local authority planning officers who hadn't previously attended and a local community group representative. Welsh Government Planning Policy staff were present at this workshop as notetakers. The workshop was held in person.

The purpose of the workshop was to provide an explanation and overview of the process to date and show the results of mapping RENs across the Gwent Levels landscape, giving stakeholders a chance to review the maps and further inform their development. A summary of the opportunities identified in Workshop 2 was shared with stakeholders in a briefing note paper 'Strategic Themes and Opportunities for

nature recovery and ecosystem resilience in the Gwent Levels'. It is intended that this will be published on the GGGP or LLP website.

In the first break-out session stakeholders had the opportunity to walk around and look at the maps and make comments. In the second break-out session, Figure 6, a facilitated discussion was held around the identified strategic themes and opportunities, to help inform partnerships and individual stakeholder actions for nature recovery and thereby building ecosystem resilience within the Gwent Levels. Stakeholders were asked to  add any missed opportunities and to prioritise the opportunities.

**Figure 6. Photo of workshop 3 held on 25/11/2024**

Following the third workshop the maps were amended as outlined in Table 5, checked with local expertise using the spatial based groupings from Workshop 1. The final version of the REN map was produced, and quality assured by NRW Environment Team Leaders for Gwent/Cardiff.

### Steps undertaken to draw a draft set of REN core zones

| Step | Action |
|---|---|
| 19 | Amendments to the core zone shapefile |
| 20 | Amendments to the nature recovery zone shapefile |
| 21 | Quality assurance by NRW Environment Team Leaders of the core zone and nature recovery zone shapefiles. |

**Table 5. Steps taken to finalise REN layers in GIS for final version of the map.**

## 3.3.4 Naming

The name used and widely agreed upon in both South Central and South East, prior to the Area Statements, for the landscape is the Gwent Levels, or Lefelau Gwent in Welsh.

The Historic Place Names Operational Guidance Note (OGN) 124 (NRW 2023b) advises any staff involved in naming activities to use a historic name from the List of Historic Place Names or devise a new name, using standardised forms that reflect modern Welsh orthography, to meet the statutory duty. Historic place names link us with the past, history and culture, and the study of the place names (toponymy) of an area can strengthen a sense of belonging and continuity with previous generations and with our heritage (NRW 2023b).

Names are also required for the cataloguing of the GIS dataset (Section 3.4).

Therefore, the GIS datasets will be named in English and catalogued with an attribute for both the English and Welsh landscape names so that they are recorded with the spatial data (Appendix 6). As part of the filing of this evidence report, NRW activity relating to the List of Historic Place Names was recorded as per OGN 124 (NRW 2023b) to meet the Historic Environment (Wales) Act 2023 duty.

## 3.4 GIS cataloguing

The REN core zones and REN nature recovery zones have been catalogued with a comprehensive set of attributes (Appendix 6). Stakeholders were asked for their feedback on the draft attributes in workshop 1, and no suggestions for amendments were made. These attributes will be reviewed as part of the REN map monitoring.

**Naming**

In accordance with NRW (2023b), core zones and nature recovery zone names are based on established SSSI or SINC names, devised by NRW or Local Authorities respectively, or/and OS toponym, or geographical feature/ names.

**Landscape**

This is the National Landscape Character Area focused on for the initial area of search.

**Ecosystems**

The core zones and nature recovery zones have been catalogued with one, two or three broad ecosystem attribute fields. Some ecosystems are complimentary, and that allows the core zone to capture these mosaics.

**GIS cataloguing requirements**

There is a requirement to include polygon shape codes in NRW datasets.

**Area**

In hectares. This can be useful for a quick view of the spatial extent of a zone. Also follows the attributes used in SSSI cataloguing.

# 4. Results – mapped products

The output of the processes described in Sections 2 and 3 is two GIS layers:

- A polygon shapefile representing 42 core zones, and
- A polygon shapefile representing 86 nature recovery zones.

Table 6 provides spatial information on which Area Statement, Local Authority the core zones and nature recovery zones are in, and the spatial extent in hectares. The result of following and building on steps 1 and 2 of the Practitioners' Guide through the methodology described in Section 2 and 3 is two GIS layers, one for 42 core zones as polygons and one for 86 nature recovery zones as polygons (Table 6; Figures 7-9).

| **Area** | **Number of polygons in LA area – Core zones** | **Spatial extent (ha) – Core zones** | **Number of polygons in LA area – Nature recovery zones** | **Spatial extent (ha) – Nature recovery zones** |
|---|---|---|---|---|
| Cardiff (South Central) | 4 | 1068.77 | 17 | 303.39 |
| Newport (South East) | 39 | 13125.21 | 33 | 998.14 |
| Monmouthshire (South East) | 20 | 4785.21 | 40 | 912.8 |
| **Total** | 42 | 18979.19 | 86 | 2214.33 |

**Table 6. Core zones and nature recovery zones by Area Statement and Local Authority. Where zone polygons cross Local Authority borders, the polygon is counted for both Local Authorities. Therefore the total of zones is lower than adding all of the Local Authority zones together, whereas the ha total is cumulative.**

Figure 7, Figure 8 and Figure 9 have been reproduced from the ArcGIS workspace for the purposes of visually describing how for the Gwent Levels Pilot Project the Practitioners Guide has interpreted steps 1 and 2 of the mapping RENs process.

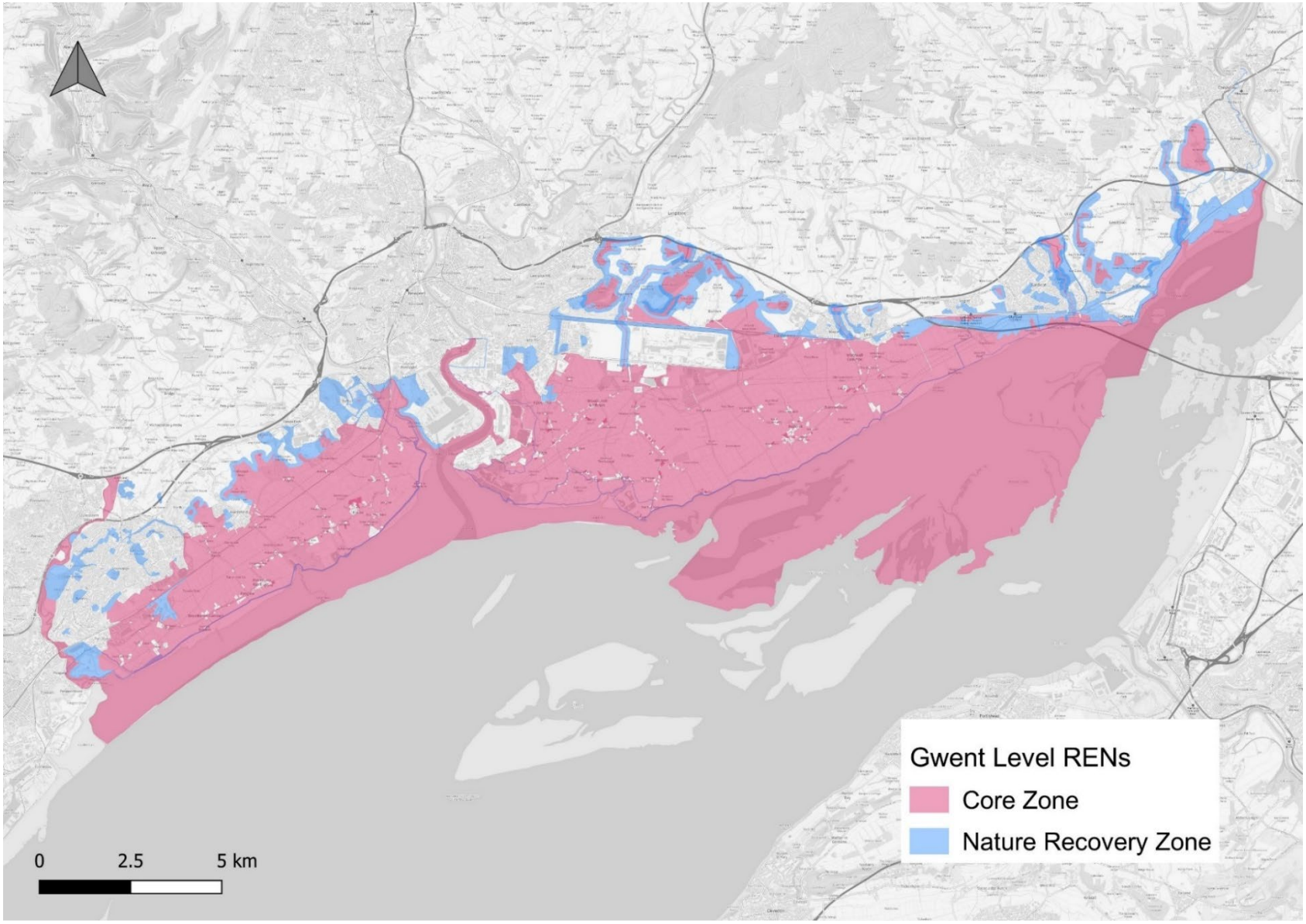


**Figure 7. Gwent Levels initial area of search showing the core zones and nature recovery zones**

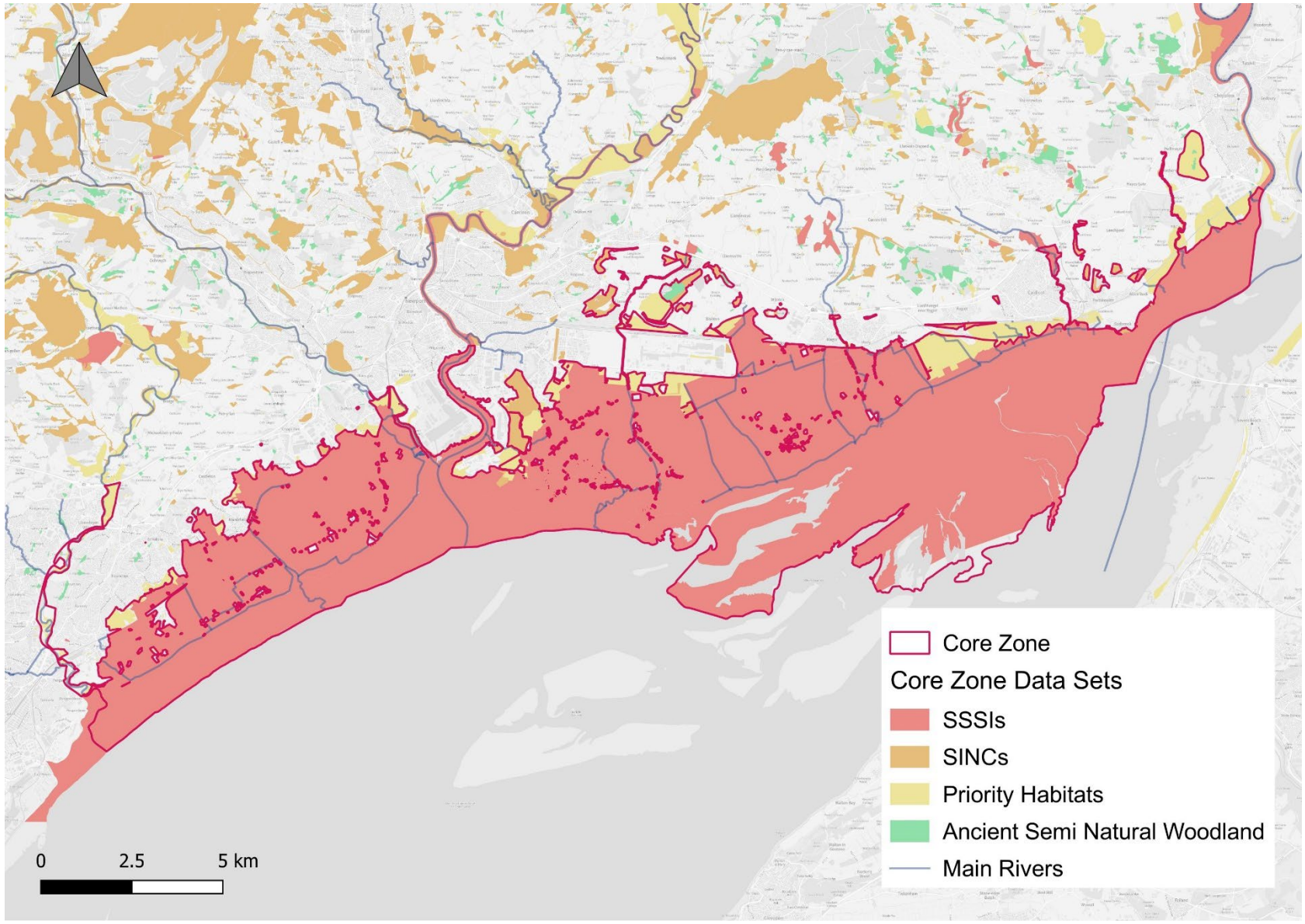


**Figure 8. Map of REN core zones in the Gwent Levels, including rivers**

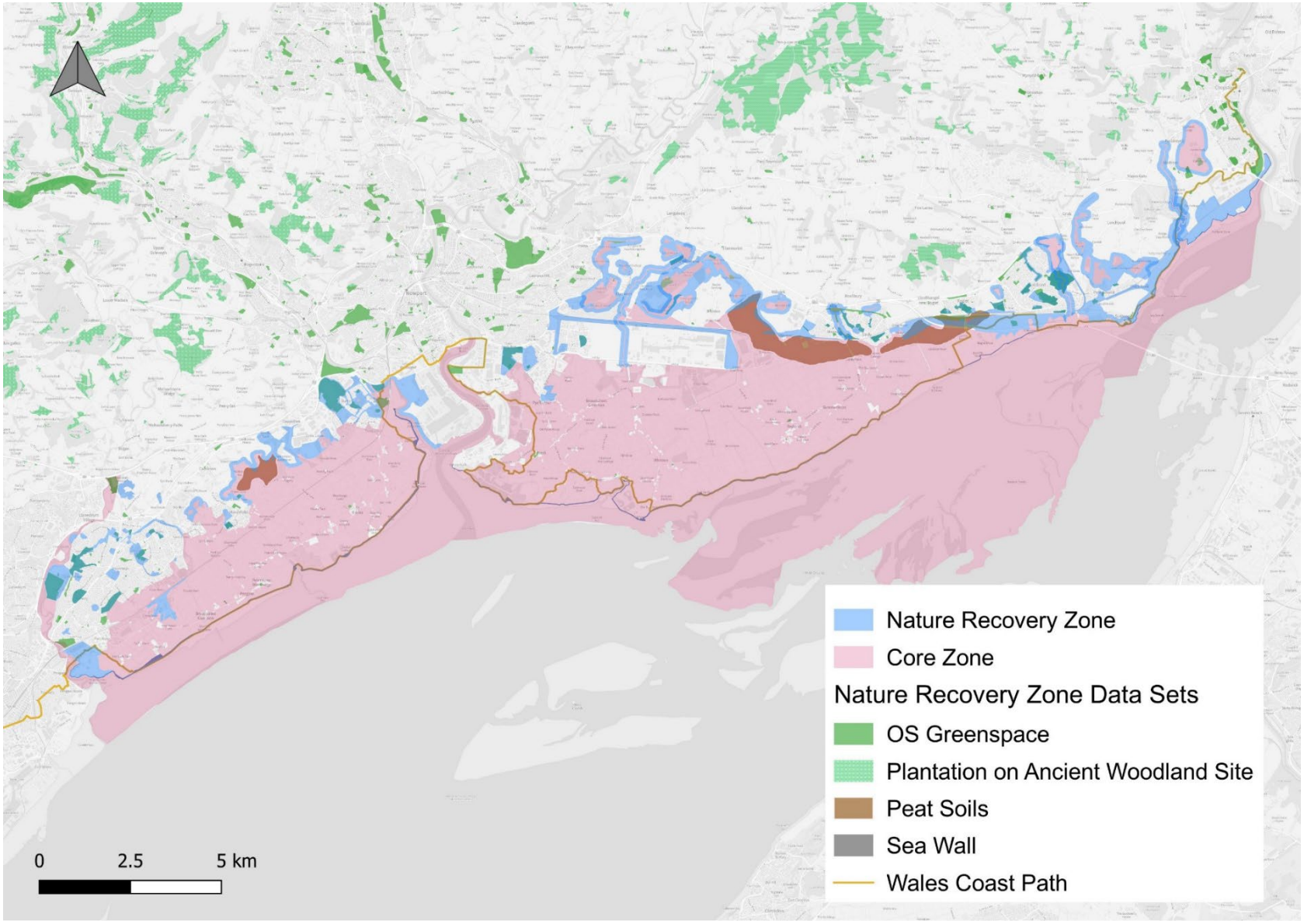


**Figure 9. Map of REN nature recovery zones in the Gwent Levels, including rivers**

# 5. Discussion

## 5.1 Key findings

There are three key findings from the process of mapping RENs in the Gwent Levels landscape; i) REN design; ii) expanding on the Practitioners' Guide and iii) lessons learnt. These findings and insights have local, regional and national implications.

The ecological network design and GIS mapping resulted in 42 core zones and 86 nature recovery zones designed in collaboration with stakeholders. The results of the mapping has shown that following the Practitioners Guide it is possible to map RENs with GIS software, and collaboratively with landscape stakeholders. As the first landscape to be taken through the REN design process in Wales, it wasn't known whether to expect this result or not. The potential applications of the mapped products are discussed in section 5.4.

Expanding on the Practitioners' Guide was necessary as it does not include a methodology for mapping, ecosystem services assessment, governance or monitoring and evaluation. These are discussed further in sections 5.2 and 5.3.

The final key finding is the lessons learnt from the process regarding evidence and resource, in section 5.5. It is hoped that this report can be used by other Area Statements and landscape partnerships.

## 5.2 Practitioners' Guide to RENs

The process has followed the Practitoners' Guide as closely as possible, whilst including learning from Area Statement delivery since 2020, and expanding the methodology where necessary, particularly mapping, ecosystem services assessment, partnership working and governance, and monitoring and evaluation. It was necessary to hold workshops with stakeholders to design the RENs to meet the SMNR principles and WBFG Ways of Working, which is not specified in the Practitioners' Guide. The guide states to "develop methods" using lessons learnt from Area Statement development place-based process, using SMNR principles. The South East and South Central Area Statements have captured these lessons learnt and continue to apply them in delivery, led by NRW Place-based staff. The Gwent Levels RENs work is one example of this. By following the Practitioners' Guide and SMNR principles, the SMNR building resilience principle has been followed and therefore DECCA attributes have been assessed.

The process of designing the Gwent Levels RENs adhered to step one of the Practitioners' Guide, and expanded on the understanding of ecosystem services to inform ecological network design. If the second workshop focused on ecosystem services and benefits hadn't been undertaken, it wouldn't have been possible to have completed checklist 7 of step one of the Practitioners' Guide. It is hoped that learning

from that workshop can inform principles for ecosystem services and benefits for the benefit of other REN design processes.

The Practitioners' Guide suggests that core [zones] would form a significant proportion of each REN. In the Gwent Levels the core zones cover approximately 68% of the initial area of search. This is due to the large extent of the SSSI and SAC features and the sensitive nature of the landscape. In other landscapes, the proportion of core zones is likely to differ, due to the extent and variation in the protected sites series in Wales.

Regarding Step 2, as stated above, the Living Levels Partnership already had a vision, so there was no need for the REN design and mapping process to undertake that. Suggested actions and delivery mechanisms were captured throughout all three workshops, and the resulting 'Strategic Themes and Opportunities' briefing note is available to partnerships and stakeholders to inform action planning.

The Practitioners' Guide was not designed as a methodology for spatial mapping of RENs in a GIS environment. This gap necessitated innovative approaches and highlighted areas for future Practitioners' Guide updates. Some aspects of the guidance, such as assessing attributes related to DECCA, could not be fully translated into GIS layers due to data unavailability.

In the Practitioners' Guide, governance isn't included as a key task until step 3; "explore what governance options exist to manage delivery" however it is recognised in the future for developments "to move from policy into practice there is a pressing need to delineate, develop and deliver RENs and fundamental to this is the establishment of related, effective, long-term governance." The Gwent Levels REN design process was initiated by Area Statement delivery and was also sought by the work being undertaken by Welsh Government on the Policy 9 of Future Wales (Welsh Government 2021) Gwent Levels pilot project. The Gwent Levels RENs mapping task and finish group, a sub-group of the Policy 9 working group, was vital to the completion of the REN mapping, and it would be suggested to agree governance at the start of the design process, with stakeholders, to enable accountability and responsibilities for the process to be allocated.

Overall, the three-step decision support framework has been tested for step one and partly Step 2 of the Practitioners' Guide. These have been clarified by this work, adding mapping and GIS data creation as a key task in step one to understand the place from a functioning network of habitats and species populations, building on the ecosystem services and benefits thinking and resources available, and bringing governance into step one. It was found that desk based mapping could only complete initial REN design for core zones, and that stakeholder engagement is necessary to ensure robust REN design. Stakeholder mapping is a key first task in step one, from this process.

A review of the Practitioners' Guide could also focus on usability, and potentially could be streamlined to enable more activity by regional and local stakeholders, who might consider the current number of key tasks and multiple checklists a barrier to designing RENs.

## 5.3 Monitoring & Evaluation

There is no agreed method or protocol for monitoring, evaluating and reviewing RENs. Garrett & Ayling (2021) suggest progress could be assessed using monitoring or surveillance data for a range of environmental, ecological, economic, cultural and social benefits, such as carbon capture, flood management, clean water, pollination and recreation. This will be developed in further work with partners. For the REN core zones and nature recovery zones, it is suggested to review at agreed intervals to adapt the zones using GIS based on best available evidence, which would be expected to be provided by academic literature, industry information, guidance and policy, and stakeholder feedback.

The attribute tables in each of the Shapefiles contains ‘date reviewed’ and ‘last edited’ fields (Appendix 6). Should the attributes be amended during a review project, the metadata should be updated following best practice. Amendments to the shapefiles should be updated on DataMapWales.

RENs are likely to be a useful source of information for wider nature recovery indicators and targets such as the Global Biodiversity Framework’s 30 by 30 Target which is being adopted by the UK (DAERA *et al*, 2025). How effective management and nature recovery is monitored for the 30 by 30 target will require ecosystems to be resilient from pressures and threats. Therefore, RENs should provide a steer for action by stakeholders, land owners and managers to contribute to the overall target for the land, water and sea under their influence.

## 5.4 Potential Applications

The Gwent Levels now has maps that will assist stakeholders in assessing where to build ecosystem resilience by referring to the spatial mapping, and briefing note which captures discussions about nature recovery actions and ecosystems services to understand the benefits provided by these services, as suggested by the Practitioners’ Guide. Further information regarding resilience building and ecosystem service provision on the Gwent Levels are presented in the ‘Strategic Themes and Opportunities‘ briefing note which captures discussions throughout the workshops.

RENs are a strategic spatial approach to influence land management objectives and actions. Defining ecological networks provides an opportunity to prioritise and integrate existing and proposed activity, as well as secure and target new resources, to maintain and build ecosystem resilience. As the project to develop the RENs progressed it was evident that their application could be used in multiple ways such as:

- Living Levels Partnership and Local Nature Partnership planning and delivery
- Local Nature Recovery Action Plans Planning and Delivery
- Town and country planning - Future Wales Policy 9 guidance and Local Development Plans, including Green Infrastructure Assessments
- Informing landowners and managers on where to prioritise Nature Based Solutions – e.g. Sustainable Farming Schemes and Payments for Ecosystem Services
- Area Statement Priority Delivery
- Projects and Programme Planning
- Prioritise grant funding
- Operational decision making and targeting resource, including sequencing of actions
- Informing Well-being Assessments, Planning & Delivery

### 5.4.1 Local Landscape Partnerships and Local Nature Partnerships

The mapping allows REN partnerships to action plan to build resilience. This will form part of the overall REN action plan (Garrett & Ayling 2021). Typical actions would be habitat improvement, restoration, or creation, located within the boundaries of a REN core zone or nature recovery zone, or situated at its margins to consolidate, extend, or link different zones. For operational delivery to build resilience, a land use decision maker can further interrogate these maps, along with locally relevant supporting data and to determine the most appropriate actions.

The remainder of Step 2 and Step 3 of the Practitioners' Guide around action planning and action delivery will be taken forward by the LLP, LNPs and GGGP. The LLP are in a planning and development stage for the second delivery phase of their project, and will use the RENs outputs as an evidence base to inform this work. The LNPs can similarly use the RENs outputs when planning projects and strategically in the development and delivery of their Local Nature Recovery Action Plans.

Workshop 3 prioritised the Strategic themes and opportunities that were the outcome of discussions in workshops 1 and 2, and these can be used in action planning alongside the spatial mapping.

There was also a strong theme emerging in all three workshops that ecosystem resilience within the core zones needs to be improved, with most of the SSSI features

being in unfavourable condition (Natural Resources Wales 2021), as well as building ecosystem resilience in the nature recovery zones.

Action planning needs to consider strategic species plans, eNGO conservation plans and taxa based landscape scale plans. There are species of conservation concern distributed across the Gwent Levels. For example, Dormouse *Muscardinus avellanarius* and Shrill Carder Bee *Bombus sylvarum*. Further work is needed to understand favourable conservation status for these and other species, and how the REN can support their population persistence.

### 5.4.2 Local Planning Authorities

The Gwent Levels REN design process was also sought by the work being undertaken by Welsh Government on the Policy 9 of Future Wales (Welsh Government 2021).The pilot project will now consider how the REN mapping could be used.

Local Planning Authorities in the Gwent Levels should give regard to the RENs spatial boundaries when making land use planning decisions and in formulating their development plans, and in time, the action plans developed by LLP and LNPs (section 5.4.1). The Practitioners' Guide states that "when implementing a plan for a REN, the planning system is a major statutory instrument that can be used to help implement appropriate land-use within and adjacent to a network", therefore this work shows how REN design and mapping core zones and nature recovery zones is necessary to inform the planning system. It is anticipated that in future RENs will benefit from recognition in planning, and incentivise landscape partnerships to undertake the mapping process.

## 5.5 Lessons Learnt and Limitations

The REN design process yielded several key insights, particularly concerning data, evidence, and the resources required. These learnings will inform future REN development in South East and South Central regions. The defined products are only valid to the Gwent Levels area.

This report acknowledges certain limitations. The methodology has been explicitly detailed where it diverges from or expands upon the Practitioners' Guide.

### 5.5.1 Evidence

The importance of data cannot be overstated in the REN design process. The mapped GIS layer products were limited by the availability of data. Therefore, validation through stakeholder engagement was important. Engaging stakeholders to provide evidence and data sources was crucial, and introducing additional data through workshops, such as OS green space and peatland data, significantly enhanced the mapping process. The GGGP Ecological Network and Opportunity Mapping tool added value to the evidence base. Stakeholder engagement validated the decisions made, with few areas initially considered for core or nature recovery zones being excluded. Input from stakeholders significantly enhanced our efforts, especially in mapping connectivity and identifying areas with similar landscape characteristics.

Additionally, incorporating real-world knowledge from stakeholders into the GIS requires clear communication and understanding between the requirements for GIS mapping and the expertise of specialists and field experts.

Designing RENs at an appropriate scale was also crucial. While it is possible to go into great detail looking at small scale habitats which are important to local biodiversity, doing so over a large landscape would require excessive time and resources and result in increasingly large datasets. Part of the process involves linking habitats into coherent networks, balancing detail with practicality of mapping. Developing site-based or detailed habitat restoration plans should be considered at the action planning stage. The evidence used to understand the place, landscape and area of search will vary across Wales.

It should be noted that land ownership, and Local Development Plan allocations have not been considered in the mapping process, to prevent positive or negative bias arising on the selection of zones contributing to the ecological networks.

### 5.5.2 Resources

Resource allocation was another critical lesson. Significant staff time and resources were required to run workshops and engage stakeholders effectively. Holding workshops locally within the landscape proved beneficial for stakeholder participation. Understanding the different user groups and their needs helped tailor the RENs to be more effective and user-friendly. The time taken to develop the RENs was substantial, emphasising the need for efficient project management and realistic timelines. Diverse input from various stakeholders, including public services like the Local Authorities, was essential. During mapping discussions, actions for nature recovery delivery often arise, making it crucial to capture these insights from the early stages of the process.

The lessons learned may lead to updates in RENs guidance, ensuring continuous improvement and adaptation to new insights.

This work though has quantified the staff time and resource required, and provides a potential method for other REN practitioners to utilise. The work around designing workshops and methodology has now been done and will reduce the resource required to develop RENs elsewhere in Wales.

# 6. Conclusion

The purpose of designing and mapping the RENs was to contribute spatial evidence to influence land management objectives and actions, to maintain and build ecosystem resilience in the Gwent Levels landscape. This report evidences the Gwent Levels REN core zones and nature recovery zones, as identified and mapped spatial units to inform nature recovery interventions (Figure 7). It has described the methods for defining 42 core zones and 86 nature recovery zones (Sections 2 and 3). Two GIS shapefile layers will be available on the Wales Environmental Information Portal and DataMapWales for use by the Living Landscape Partnership, Local Nature Partnerships, Local Planning Authorities in South East and South Central, interested parties and any members of the public, as DataMapWales is a public catalogue.

The shapefiles provide a baseline to identify RENs, using a combination of best available evidence and technical and local knowledge, following the Practitioners' Guide. They form the basis for further REN development (Steps 2 and 3) by the Gwent Levels landscape LLP and LNPs.

The other key findings were expanding on the Practitioners' Guide and lessons learnt. The REN design process provided several key insights, primarily around data and evidence, and resources required to conduct the process.

The importance of co-designing RENs was considered through collaboration, ensuring we are involving the right people so that we integrate views and using best available evidence, taking account of ecosystem resilience and services (i.e. the multiple benefits) at the appropriate scale - looking ahead into next steps it will focus on codeveloping preventative action (through RENs delivery action plans) and managing adaptively by planning, monitoring and reviewing and where appropriate changing action.

The RENs are joint South East Area Statement and South Central Area Statement products and contribute to describing the priorities, risks and opportunities for SMNR.

Area Statement products, under Section 11 of the Environment Act, should be given regard to by Public Bodies and their strategies and plans. The RENs within the Gwent Levels should now be incorporated into the following:

- NRW South East Operations Place Plan and team work programmes

- NRW South Central Operations Place Plan and team work programmes
- NRW Forest Resource Plans
- NRW national ecosystem programmes
- Local and Strategic Development Plans, particularly:
  - How the RENs are considered in current planning policy
  - How the RENs are used to inform Green Infrastructure Assessments and influence decision making in formulating development plan strategies and policies
- Public Body Section 6 duty plans

The Gwent Levels RENs could be incorporated into the following:

- LNP local Nature Recovery Action Plans (Cardiff, Monmouthshire, and Newport, respectively)
- Funding applications to grant programmes
- As an evidence base in the Living Landscape Partnership development work for their next phase and funding application
- Help inform the development of Policy 9 planning guidance by a Welsh Government led pilot project for the Gwent Levels

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# Appendices

## 1. Data Archive Appendix

Data outputs associated with this project are archived in NRW's Central Geospatial Data Drive on server–based storage at Natural Resources Wales.

The data archive contains:

[A] The final report in Microsoft Word and Adobe PDF formats.

[B] A full set of maps produced in JPEG format.

[C] A series of GIS layers on which the maps in the report are based with a series of word documents detailing the data processing and structure of the GIS layers

Metadata for this project is publicly accessible through Natural Resources Wales' Data Discovery Service https://metadata.naturalresources.wales/geonetwork/srv (English version) and https://metadata.cyfoethnaturiol.cymru/geonetwork/cym/ (Welsh Version). The metadata is held as record NRW_DS161346.

## 2. RENs in legislation and policy

| Driver | Priority |
|---|---|
| Natural Resources Policy (2017) | To build resilience into our ecosystems we need to proactively develop and support resilient ecological networks to maintain and enhance the wider resilience of Wales' ecosystems. |
| Environment (Wales) Act 2016 & SMNR Statutory Duty | A public authority must seek to maintain and enhance biodiversity in the exercise of functions in relation to Wales, and in so doing promote the resilience of ecosystems; In complying, a public authority must take account of the resilience of ecosystems, in particular the following aspects— (a)diversity between and within ecosystems; (b)the connections between and within ecosystems; (c)the scale of ecosystems; (d)the condition of ecosystems (including their structure and functioning); (e)the adaptability of ecosystems. |
| Planning Policy Wales 12 (2024) | The planning system, development plan strategies, policies and development proposals must consider the need to secure a net benefit for biodiversity through the maintenance and enhancement of ecosystem resilience and resilient ecological networks |
| Well-being of Future Generations (Wales) Act 2015 | A Resilient Wales - maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change |
| NRW Corporate Plan (2024) | Identifying opportunities to enlarge and better connect the series of Sites of Special Scientific Interest (SSSI); Scaling up connectivity between habitats; landscape scale nature recovery through developing collaborative partnerships; stimulating action for scalable nature positive management through collaborative working with key sectors to define effective solutions |
| Biodiversity Deep Dive Recommendations (2022) | Transform the protected sites series so that it is better, bigger, and more effectively connected; Expanding and scaling up the Nature Networks Programme to improve the condition, connectivity and resilience of protected sites; the programme also focuses on the active involvement of local communities, creating networks of people in addition to resilient ecological networks. |

| Driver | Priority |
|---|---|
| Future Wales: The National Plan 2040 (2021) | Resilient ecological networks are vital for nature recovery and are networks of habitat in good ecological condition linking protected sites and other biodiversity hotspots across the wider landscape, providing maximum benefit for biodiversity and well-being (Policy 9) |
| NRW's Remit Letter (annually) | Further develop and deliver the Nature Networks Programme including the overall strategic approach, refining priorities and delivery mechanisms; implementation and delivery of the recommendations arising from the biodiversity deep dive |
| WG & NRW Nature Networks Programme | Welsh Government (WG) programme to deliver actions to improve the condition of protected sites and their features, and to build Resilient Ecological Networks (REN) with protected sites at their core |
| Wales Nature Recovery Action Plan (2020) | Maintaining and Enhancing Resilient Ecological Networks, through targeted place-based spatial action to deliver benefits for biodiversity, species and habitats, reduce negative impacts and maximise our well-being; Resilient ecological networks are needed everywhere to create mosaics across Wales, with dentification of 'core resilience areas' in which to prioritise action |
| Area Statements (2020) | The purpose of area statements is to facilitate the implementation of the Natural Resources Policy which sets out the requirement for resilient ecological networks as a priority for action, and therefore will be taken forward through area statements |
| State of Natural Resources Report (2020) | Wales needs to build resilient ecological networks, where protected sites and other biodiversity hotspots can be brought to good condition and connected across the wider landscape to increase permeability for the movement of species and their genes within and between habitats by reducing fragmentation |
| Nature Positive 2030 | In Wales, nature networks, or Resilient Ecological Networks (RENs) are recognised in the Welsh Government's Nature Recovery Action Plan107 as vital for nature recovery. RENs put protected sites at their core, incorporate the four key attributes required for ecosystem resilience (diversity, extent, condition and connectivity) and apply these at an effective and appropriate scale. |

**Table Appendix 2. List of policy and legislative drivers, strategies, plans and programmes that identify and prioritise RENs as a key mechanism to meeting objectives.**

# 3. Geographic Information Systems maps

## Initial area of search

**Nature Recovery Zones** (as above plus the following) – the spatial data used to create the nature recovery zones included all the data used to create the core zones plus the following:

| GIS Layer | Source | Date |
|---|---|---|
| Gwent Levels Landscape Character Areas | National Landscape Character Areas \| DataMapWales | 2023 |
| South East Landscape Profiles | Natural Resources Wales | 2020 |
| Living Levels Partnership project boundary | Living Levels Partnership | 2018 |

## Core Zones – The spatial data used to create the core zones included:

| GIS Layer | Source | Date |
|---|---|---|
| Sites of Special Scientific Interest | Sites of Special Scientific Interest (SSSI) \| DataMapWales | 2025 |
| Special Areas of Conservation | Special Areas of Conservation (SAC) \| DataMapWales | 2022 |
| GGGP Envys Mapper | Gwent Resilient Ecological Network Mapper - Monlife | 2025 |
| Gwent Levels Orchards data | Gwent Wildlife Trust | 2020 |
| SINCs | Cardiff Local Development Plan<br>Monmouthshire Local Development Plan<br>Newport Local Development Plan | 2016<br>2014<br>2015 |
| Section 7 Habitat – Priority Habitat Coastal Grazing Marsh | Environment (Wales) Act Section 7 Terrestrial Habitats of Principal Importance \| DataMapWales | 2022 |
| Section 7 Habitat Priority Habitat Traditional Orchards | Traditional Orchards \| DataMapWales | 2022 |

**Nature Recovery Zones** (as above, plus the following) – the spatial data used to create the nature recovery zones included all the data used to create the core zones plus the following:

| GIS Layer | Source | Date |
|---|---|---|
| Local Nature Reserves | Local Nature Reserves (LNR) \| DataMapWales | 2024 |
| National Nature Reserves | National Nature Reserves (NNR) \| DataMapWales | 2022 |
| Ancient Woodland Inventory | Ancient Woodland Inventory 2021 \| DataMapWales (gov.wales) | 2024 |
| Habitat Networks | Habitat Networks \| DataMapWales | 2022 |
| Priority Ecological Networks | Priority Ecological Networks (PENs) \| DataMapWales | 2023 |
| River catchments and main rivers | Water Framework Directive (WFD) Regulations Cycle 3 Classification \| DataMapWales | 2023 |
| National Peatland Map for Wales | Peatlands of Wales Maps \| DataMapWales | 2022 |
| OS Open Greenspace | OS Open Greenspace \| Data Products \| OS | 2025 |

**Table Appendix 3a. GIS layers used in creation of Gwent Levels Resilient Ecological Networks**

## Ecosystem services and Benefits

| GIS Layer | Source | Date |
|---|---|---|
| WINS - Wales Information for Nature-based Solutions | Welsh Information for Nature-based Solutions (WINS)<br><br>Most layers used – separated into ecosystem service groupings/ themes | 2024 |
| Buglife Important Invertebrate Area | IIA Fine-scale Network \| GIS Data Hub | 2025 |
| Buglife B-lines | B-Lines UK Network \| GIS Data Hub | 2024 |

| GIS Layer | Source | Date |
|---|---|---|
| Current Relative Value of Ecosystem Resilience (CuRVe) | Current Relative Value of ecosystem resilience (CuRVe) \| DataMapWales | 2021 |
| River catchments and main rivers | Water Framework Directive (WFD) Regulations Cycle 3 Classification \| DataMapWales | 2023 |
| National Development Framework | Available to NRW | |
| Agricultural land classification | Available to NRW | |
| NatMap Soilscapes | Available to NRW<br><br>LandIS - Land Information System - Soilscapes soil types viewer | |
| Soil carbon density 1km grid | Available to NRW | |
| NRW forestry ownership | NRW Forest Ownership \| DataMapWales | 2025 |
| Shoreline management plan policies | Shoreline Management Plan Policies \| DataMapWales | 2024 |
| Fire and rescue authorities | Available to NRW | |

| GIS Layer | Source | Date |
|---|---|---|
| **Cadw Historic Assets**<br><br>Listed Buildings<br><br>World Heritage Sites in Wales - WHS - Significant Views<br><br>World Heritage Sites in Wales - WHS - Arcs of View<br><br>World Heritage Sites in Wales - WHS - Essential Setting<br><br>World Heritage Sites in Wales - WHS - Site Boundary<br><br>Local Authorities - High Water mark 2016<br><br>Scheduled Monuments<br><br>Registered Historic Parks & Gardens: Registered Areas<br><br>Registered Historic Parks & Gardens: Garden/Kitchen Garden<br><br>Registered Historic Parks & Gardens: Significant View<br><br>Communities Wales May 2022<br><br>The Registered Landscapes of Outstanding and of Special Interest in Wales<br><br>Conservation Area Boundaries | Cadw Historic Assets \| DataMapWales | 2021 |
| Sustrans national cycle network | Sustrans: National Cycle Network \| DataMapWales | 2021 |

| GIS Layer | Source | Date |
|---|---|---|
| National Trails | National Trails \| DataMapWales | 2022 |
| Wales Coast Path | Wales Coast Path \| DataMapWales | 2024 |
| Public Rights of Way | Held by Local Authorities | |
| Country Parks | Country Parks \| DataMapWales | 2014 |
| Special landscape areas | Special Landscape Areas Wales \| DataMapWales | 2023 |
| AONB | Area of Outstanding Natural Beauty (AONB) \| DataMapWales | 2022 |
| National Parks | National Parks \| DataMapWales | 2024 |
| National Landscape character areas | National Landscape Character Areas \| DataMapWales | 2023 |
| National marine character areas | National Marine Character Areas \| DataMapWales | 2025 |
| Tranquillity and place | Tranquillity and Place – Dark Skies \| DataMapWales | 2023 |
| Green Infrastructure layers if available from LAs | Held by Local Authorities | |
| Air quality<br><br>SSSI NH3 critical levels<br><br>N sensitive ancient woodlands and parklands<br><br>Air quality concentrations 2019<br><br>Air quality management areas | | |

| GIS Layer | Source | Date |
|---|---|---|
| Drinking water protected areas | Drinking Water Protected Area \| DataMapWales | 2024 |
| DCWW drinking water catchments | Available to NRW | |
| Sewage works | Available to NRW | |
| Flood defences | Available to NRW | |
| Flood map for planning | Flood Map for Planning Flood Zones 2 and 3 \| DataMapWales | 2024 |
| Unitary authorities | Local Authorities \| DataMapWales | 2016 |
| NRW operational areas | Natural Resources Wales (NRW) Operational Areas \| DataMapWales | 2017 |

**Table Appendix 3b. GIS layers used in the ecosystem services and benefits workshop**

| Data / GIS Layer | Description | Source | Date |
|---|---|---|---|
| National Trust Climate Hazards | Dataset developed by the National Trust and partners, extreme events/climate hazards, fairly low resolution but shows some local/regional current and projected data – recently updated | Climate Hazards 23 | Updated 2024 |
| UK Climate Risk Indicators | Based on UKCP18 climate projection scenarios, various resolutions, wide range of climate indicators. | Climate Risk Indicators | Updated 2023 |
| Met Office Local Authority Climate Service | New product from the Met Office to explore climate change in a local area – produces report based on inputted variables for that local authority | Local Authority \| The Met Office climate data portal | 2024 |

| | | | |
|---|---|---|---|
| Climate Central Coastal Risk Screening Tool | Global maps to show risk of coastal flooding over various scenarios of year, sea level rise, GHG projections. | Climate Central \| Land projected to be below 10-year flood level in 2060 | 2021 |
| NRW – coastal erosion and flood risk maps | Coastal and fluvial flooding | Flood and Coastal Erosion Risk Maps | 2023 |

**Table Appendix 3c. GIS layers used in the ecosystem services climate change workshop**

# 4. Stakeholder engagement workshops attendance

## Gwent Levels REN mapping workshop one attendees

| Stakeholder | Organisation |
|---|---|
| Justin Groves | Cardiff Council |
| Oliver Jenkins-Boobyer | Newport City Council / Local Nature Partnership |
| Kate Stinchcombe | Monmouthshire County Council / Gwent Green Grid Partnership |
| Colette Bosley | Monmouthshire County Council / Gwent Green Grid Partnership |
| Chris Harris | Living Levels Partnership |
| Steve Spode | Welsh Government |
| Kate Rogers | Natural Resources Wales |
| Andy Karron | Gwent Wildlife Trust |
| Sam Eaves | Cardiff Council |
| Sali Palmer | Monmouthshire County Council / Local Nature Partnership |
| Gill Barter | Natural Resources Wales |
| Alexis J Alders | Natural Resources Wales |
| Matthew Harris | Newport City Council |
| David Penny | Natural Resources Wales |
| Abigail Sanders | Living Wales |
| Justin Waite | Natural Resources Wales |
| Daniel Hulmes | Monmouthshire County Council |
| Isla Townley | Natural Resources Wales |
| Kyran Duggan | Natural Resources Wales |

Facilitators

| | |
|---|---|
| Elizabeth Hancocks | Natural Resources Wales |
| Richard Thomas | Natural Resources Wales |
| Elliot Waters | Gwent Green Grid Partnership |
| Kate McCabe | Natural Resources Wales |

Notetakers

| | |
|---|---|
| Megan Howells | Natural Resources Wales |
| Rebekah Stephens | Welsh Government Planning Directorate |
| Brian Davies | Welsh Government Planning Directorate |
| Llinos Quelch | Welsh Government Planning Directorate |
| Justin Waite | Natural Resources Wales |

**Table Appendix 4a. Gwent Levels REN mapping workshop one attendees**

## Gwent Levels REN mapping workshop two attendees

| Stakeholder | Organisation |
|---|---|
| Chris Harris | Living Levels Partnership |
| Joshua DaCruz | Living Levels Partnership |
| Chrissie Ingle | Severn Estuary Partnership |
| Abigail Sanders | Living Wales |
| Richard Lucas | Living Wales |
| David Penny | Natural Resources Wales |
| Kate Rodgers | Natural Resources Wales |
| Harrhy James | Natural Resources Wales |
| Lucia Z Watts | Natural Resources Wales |
| Jacob Kevern | Severn Estuary Partnership |
| Nicola Rimington | Natural Resources Wales |
| Neil Maylan | Cadw |
| Tricia Cottnam | Natural Resources Wales |
| Matthew Harris | Newport City Council |
| Andrew Nevill | Monmouthshire County Council |
| Colette Bosley | Monmouthshire County Council / Gwent Green Grid |
| Tom Porter | Cardiff & Vale University Health Board – Public Health Team |
| Sarah Davies | Aneurin Bevan University Health Board - Public Health Team |
| Hannah Davies | Natural Resources Wales |
| Sarah Bloomfield | Natural Resources Wales |
| Catrin Grimstead | Natural Resources Wales |
| Kate Stinchcombe | Monmouthshire County Council / Gwent Green Grid Partnership |
| Gemma Bode | Gwent Wildlife Trust |
| Justin Groves | Cardiff Council |
| Hazel Clatworthy | Monmouthshire County Council |

| | |
|---|---|
| Elaine Blanchard | Monmouthshire County Council |
| Steve Spode | Welsh Government |

Facilitators

| | |
|---|---|
| Naomi Davies | Natural Resources Wales |
| Richard Thomas | Natural Resources Wales |
| Elliot Waters | Gwent Green Grid Partnership |
| Kate McCabe | Natural Resources Wales |
| Megan Howells | Natural Resources Wales |
| Daniel Lewis | Natural Resources Wales |

Notetakers

| | |
|---|---|
| Llinos Quelch | Welsh Government Planning Directorate |
| Rebekah Stephens | Welsh Government Planning Directorate |
| Brian Davies | Welsh Government Planning Directorate |
| Isla Townley | Natural Resources Wales |
| Justin Waite | Natural Resources Wales |

**Table Appendix 4b. Gwent Levels REN mapping workshop two attendees**

## Gwent Levels REN mapping workshop three attendees

| Stakeholder | Organisation |
|---|---|
| Matthew Lewis | Chair of Living Levels Partnership Partners Board |
| Chris Harris | Living Levels Partnership |
| Joshua DaCruz | Living Levels Partnership |
| Diana Jones | Friends of the Gwent Levels |
| Richard Lucas | Living Wales |
| Isla Townley | Natural Resources Wales |
| David Penny | Natural Resources Wales |
| Kate Rodgers | Natural Resources Wales |
| Alexis J. Alders | Natural Resources Wales |
| Catrin Grimstead | Natural Resources Wales |
| Gill Barter | Natural Resources Wales |
| Tricia Cottnam | Natural Resources Wales |
| Samantha Borley | Cardiff Council |
| Sam Kremzer | Newport City Council |
| John Gibson | Newport City Council |
| Matthew Harris | Newport City Council |
| Marc Benson | Newport City Council |
| Oliver Jenkins-Boobyer | Newport City Council / Local Nature Partnership |
| Colette Bosley | Monmouthshire County Council/ Gwent Green Grid Partnership |
| Kate Stinchcombe | Monmouthshire County Council / Gwent Green Grid Partnership |
| Sali Palmer | Monmouthshire County Council / Local Nature Partnership |
| Phillip Thomas | Monmouthshire Council |
| Tom Powell | Dŵr Cymru Welsh Water |
| Lowri Watkins | Gwent Wildlife Trust |
| Diana Jones | Friends of the Gwent Levels |
| Jo Smith | Welsh Government |
| Steve Spode | Welsh Government |

Facilitators

| | |
|---|---|
| Elizabeth Hancocks | Natural Resources Wales |
| Richard Thomas | Natural Resources Wales |
| Elliot Waters | Gwent Green Grid Partnership |
| Kate McCabe | Natural Resources Wales |
| Kyran Duggan | Natural Resources Wales |

Notetakers

| | |
|---|---|
| Llinos Quelch | Welsh Government Planning Directorate |
| Rebekah Stephens | Welsh Government Planning Directorate |
| Brian Davies | Welsh Government Planning Directorate |
| Justin Waite | Natural Resources Wales |

**Table Appendix 4c. Gwent Levels REN mapping workshop three attendees**

For the three Local Authorities, the following functions were invited, but not all able to attend: Countryside and Conservation, Environment and Leisure, Civil Contingencies, Environmental Protection, Climate Change, Head of Planning, Planning Policy, Landscape Architect, Ecologist, Decarbonisation Officer, Head of Placemaking, Green Infrastructure, Planning Operations

A number of other stakeholders were invited but unable to attend. These were from the following organisations:
Welsh Government – Sustainability and Environment
Aneurin Bevan University Health Board
Cardiff & Vale University Health Board
Office of the Future Generations Commissioner
Network Rail
Buglife
Severn Estuary Partnership
Glamorgan-Gwent Archaeological Trust
Campaign Protection of Rural Wales

# 5. Nature Recovery Zone components criteria

The nature recovery zone components are:

- Buffers adjacent to core zones,
- Corridors between core zones,
- Linear landscape features such as hedges, native tree lines, ditches and the vegetated margins of fields, watercourses, hedgerows, roads and active travel routes,
- Stepping-stones between core zones,
- Habitat patches between core zones:
    - supporting degraded semi-natural habitats with potential for restoration
    - Habitat in process of restoration from a degraded to a functional state

**Overarching principles:**

- Only linear features can overlap core zones
- Different components can overlap where necessary, as they are delivering different functions in the ecological network. Shouldn't overlap other nature recovery zones.
- Could be functional or supportive nature recovery zone between Resilient Ecological Networks

**Buffer zones**

Must be adjacent to a core zone.
The size is ecosystem / function dependent.

**Corridors and Linear landscape features**

Must connect at least: two core zones, a core zone and a nature recovery zone patch or stepping stone, or two nature recovery zone patches or stepping stones.
Aim to facilitate species dispersal with greater success, e.g. increasing survival, species persistence through increased provision of resources (food, water), decreased predation (e.g. small mammals in open landscape vs. hedgerow) and support genetic dispersal (reducing genetic bottlenecks)
Drawn as a polygon to catalogue as an area.

**Stepping stones**

Smaller than patches but still functional for species dispersal.

**Patches**

Larger than stepping stones, functional size for species persistence, e.g. food, water, shelter, breeding

# 6. GIS cataloguing attributes

| Attribute | Shapefile Field Name | Type of data |
|---|---|---|
| Core Zone Name | CZ_name | Text (80 characters) |
| Landscape Name | Landscape | Text (80 characters) |
| Enw Tirwedd | EnwTirwedd | Text (80 characters) |
| OBJECTID | OBJECTID | Number |
| Core Zone ID | CZ_ID | Number |
| Core Zone Code | CZ_Code | Number & Text |
| Ecosystem 1 | Eco_1 | Text (80 characters) |
| Ecosystem 2 | Eco_2 | Text (80 characters) |
| Ecosystem 3 | Eco_3 | Text (80 characters) |
| Area (ha) | Area (ha) | Number |
| Date defined | D_defined | Date |
| Date reviewed | D_reviewed | Date |
| Last edited | D_edited | Date |
| SHAPE | SHAPE | Polygon |

**Table Appendix 6a. Attributes of REN core zones in the GIS dataset.**

| Attribute | Shapefile Field Name | Type of data |
|---|---|---|
| Nature Recovery Zone Name | NRZ_name | Text (80 characters) |
| Landscape Name | Landscape | Text (80 characters) |
| Enw Tirwedd | EnwTirwedd | Text (80 characters) |
| OBJECTID | OBJECTID | Number |
| Nature Recovery Zone ID | NRZ_ID | Number |
| Nature Recovery Zone Code | NRZ_CODE | Number & Text |
| Component Type | C_type | Text (80 characters)<br><br>Buffers / corridors & linear landscape features / stepping stones / patches / hole in core zone |
| Site Type | S_type | Text (80 characters) |
| Ecosystem 1 | Eco_1 | Text (80 characters) |
| Ecosystem 2 | Eco_2 | Text (80 characters) |
| Ecosystem 3 | Eco_3 | Text (80 characters) |
| Area (ha) | Area (ha) | Number |
| Date defined | D_defined | Date |
| Date reviewed | D_reviewed | Date |
| Last edited | D_edited | Date |
| Status | Status | Text (80 characters) |
| SHAPE | SHAPE | Polygon |

**Table Appendix 6b. Attributes of REN nature recovery zones in the GIS dataset.**

# 7. Ways of Working

| Well-Being and Future Generations way of working | How it was considered | Point of reference in report |
|---|---|---|
| Thinking for the long-term | The RENs project aims to enhance the resilience of ecosystems, ensuring long-term benefits for future generations. | The project's focus on sustainable management of natural resources and the creation of resilient ecological networks. |
| Prevention | By identifying core and nature recovery zones, the project aims to prevent the degradation of ecosystems and promote their recovery. | The identification of 42 core zones and 86 nature recovery zones to protect and restore ecosystems. |
| Integration | Ecosystem services and ecological networks were integrated into local planning and policy to ensure a holistic approach to environmental management. | Ecosystem services and ecological networks. |
| Collaboration | Stakeholder engagement and collaborative design were key components, involving various partners and stakeholders in the RENs development process. | Stakeholder engagement and collaborative design. |
| Involvement | The project involved desk studies and workshops with members of the Living Levels Partnership and wider stakeholders to ensure broad participation. | Desk studies and workshops with stakeholders. |
| Thinking for the long-term | The RENs project aims to enhance the resilience of ecosystems, ensuring long-term benefits for future generations. | The project's focus on sustainable management of natural resources and the creation of resilient ecological networks. |

**Table Appendix 7a. Application of Well-being of Future Generations (WBFG) ways of working in the Gwent Levels RENs project**

SMNR Principles table

| SMNR Principle | How it was considered | Point of reference in report |
|---|---|---|
| Adaptive management | Implementing a dynamic approach by planning, monitoring, reviewing, and adjusting actions as necessary to respond to changing conditions. | The project's iterative process and feedback mechanisms. |
| Scale | Considering the appropriate spatial scale for actions to ensure effective ecological network design and implementation. | The delineation of core and nature recovery zones across the Gwent Levels. |
| Collaboration and engagement | Promoting and facilitating cooperation among stakeholders, including various partners and experts, in the RENs development process. | Stakeholder engagement and collaborative design methodologies. |
| Public participation | Ensuring inclusive decision-making by involving the public and stakeholders in the planning and implementation phases. | Desk studies and participatory workshops with stakeholders. |
| Evidence | Utilising comprehensive and relevant data to inform decision-making and address uncertainties in ecological network design. | Use of GIS data, desk studies, and workshops to gather and analyse evidence. |
| Multiple benefits | Aiming to achieve a range of ecological, social, and economic benefits through the implementation of RENs. | Identification of ecosystem services and their integration into planning. |

| SMNR Principle | How it was considered | Point of reference in report |
|---|---|---|
| Long term | Focusing on long-term ecological resilience and sustainability to ensure enduring benefits for future generations. | Emphasis on sustainable management of natural resources and resilient ecological networks. |
| Preventative action | Proactively identifying and mitigating potential threats to ecosystem health and resilience. | Designation of core and nature recovery zones to prevent ecosystem degradation. |
| Building resilience | Enhancing the capacity of ecosystems to withstand and recover from disturbances. | Establishment of resilient ecological networks and recovery zones. |
| Diversity | Promoting biodiversity by protecting and restoring a variety of ecosystems and species. | Inclusion of diverse ecosystems such as freshwater, fen, bog, semi-natural grassland, and native woodland. |
| Extent | Ensuring the spatial coverage of RENs is sufficient to support ecological processes and species populations. | Coverage of 18,979 hectares in core zones and 2,214 hectares in nature recovery zones. |
| Condition | Maintaining and improving the ecological condition of habitats and ecosystems. | Focus on habitat quality and ecological integrity in REN design. |
| Connectivity | Enhancing ecological connectivity to facilitate species movement and genetic exchange. | Design of RENs to improve landscape connectivity and ecological corridors. |

**Table Appendix 7b. Application of Sustainable Management of Natural Resources (SMNR) principles in the Gwent Levels RENs project.**

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