Sustainable Places Research Institute
Sefydliad Ymchwil Mannau Cynaliadwy

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# BIODIVERSITY AND THE AREA-BASED APPROACH IN WALES

## How can the sustainable management of natural resources (SMNR) framework deliver nature recovery?

Sustainable Places Research Institute, Cardiff University
July 2018
Commissioned by The Royal Society for the Protection of Birds (RSPB) Cymru

Cardiff University
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# Summary and Key Findings

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# About this report

The Royal Society for the Protection of Birds (RSPB) Cymru commissioned Cardiff University's Sustainable Places Research Institute to develop a report which addressed the question, "how can Area Statements in combination contribute to achievement of biodiversity targets in Wales?"

To tackle this question, literature reviews and meta-analyses were conducted on four key topics – the legislative and policy context in Wales, comparable international approaches, evaluating ecosystem services toolkits for biodiversity/ resilience provision, and the relationship between biodiversity and ecosystem resilience. In addition, the University partnered with Bridgend County Borough Council, REACH and the Ecosystems Knowledge Network to design and host a stakeholder workshop to explore the question on a more local scale.

The report is divided into five chapters, and is accompanied by a 'Summary and Key Findings' document which brings together the conclusions from all five chapters, and demonstrates how it is possible for the Area Statement process to be an effective means of ensuring Wales meets its biodiversity objectives.

# Full report contents



**The full report, its individual chapters and the summary can all be downloaded from** http://bit.ly/SPRIareastatements

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# Summary and Key Findings

## Key Findings

This report illustrates the need for and value of incorporating biodiversity as a critical component of Area Statements. It reviews the legislative and policy context in Wales and comparable international approaches (Chapters 1 and 2), evaluates the suitability of ecosystem services toolkits for delivering resilient ecosystems and nature recovery objectives (Chapter 3), examines the relationship between biodiversity and ecosystem resilience (Chapter 4), and explores with stakeholders at a local level how biodiversity objectives can be met through SMNR (Chapter 5).

The evidence detailed in this report demonstrates that SMNR and Area Statements can be an effective means of Wales meeting its biodiversity objectives by using the following guiding principles:

- **Visibility of biodiversity priorities:** ensure that existing biodiversity priorities and objectives across land and sea are understood by all involved as integral to achieving SMNR
- **Local action ←→ national policy:** support the delivery of SMNR at local level, while communicating how it links to national policy
- **Strong leadership:** catalyse action through strong local leadership
- **Multi-level communication:** secure effective coordination and communication between stakeholders, and SMNR and biodiversity specialists
- **Visually represented data:** use appropriate tools to visually represent data to facilitate understanding of the spatial linkages between biodiversity, ecosystem services and priority actions
- **Build relationships and participation:** widen and deepen stakeholder participation to ensure it is meaningful and give the time needed to build strong relationships and understanding

## Summary

NRW is required to produce Area Statements under the Environment (Wales) Act, 2016 as part of the national framework for the Sustainable Management of Natural Resources (SMNR). The definition and objective of SMNR are outlined in section 3 of the Environment Act:

> "(1) In the Part, 'sustainable management of resources' means—(a) using natural resources in a way and at a rate that promotes achievement of the objective in subsection (2), (b) taking other action that promotes achievement of that objective, and (c) not taking action that hinders achievement of that objective. (2) The objective is to maintain and enhance the resilience of ecosystems and the benefits they provide and, in so doing—(a) meet the needs of present generations of people without compromising the ability of future generations to meet their needs, and (b) contribute to the achievement of the well-being goals in section 4 of the Well-being of Future Generations (Wales) Act 2015 (anaw2)."

The objective of SMNR demonstrates strong links to the Well-being of Future Generations (Wales) Act, 2015 by requiring a contribution to all seven goals, one of which (A Resilient Wales) recognizes the importance of biodiversity and ecosystems to ecological resilience but also to Wales' society and the economy[1].

Species diversity plays an important role in the healthy functioning of ecosystems, ecological resilience and Wales' capacity to adapt to change. The relationship between the four main attributes of ecosystem resilience is integral:

- Diversity: the range of variation, from genes to species and from habitats to landscapes, which supports the complexity of ecosystem functions and the delivery of ecosystem services;
- Extent/ scale: habitat area that supports species diversity and ecosystem function;
- Condition: how a system is managed, inputs applied, resources extracted and impacts from management of surrounding land;
- Connectivity: the movement that occurs within and between ecosystems, increasing the effective habitat range of species and the source pool for seed and genetic dispersal.

These components work together to form a fifth attribute – adaptability, which refers to the dynamic nature of ecosystems and their ability to adapt to change[2]. However, the extent, condition and connectivity are important because of how they impact diversity, which is the linchpin of adaptability, and therefore resilience (see Chapter 4 for a review of the research on this). Ecosystems can be considered resilient when they feature the capacity to deal with disturbances, either by resisting, recovering or adapting to them, whilst retaining the ability to deliver goods or services[2].

Additionally, biodiversity supports economic resilience through the provision of services, for example flood control. A diversity of tree species can help pull water into varying depths of the soil profile and also lead to a woodland area with greater resistance to pests or diseases, that might otherwise destroy a woodland consisting of a single evergreen species. Furthermore, social well-being is increased through increased biodiversity, which is a source of enjoyment and relaxation for nature lovers, and can attract people into areas through a variety of eco-tourism and recreation opportunities, thereby boosting economic resilience, particularly important for rural communities.

While the Environment (Wales) Act and the Well-being of Future Generations (Wales) Act set out legislative commitments for sustainable management of natural resources and sustainable development respectively, Wales' legal commitments to maintaining and

[1] Well-being of Future Generations (Wales) Act, 2015, section 4 –"A Resilient Wales: A nation which 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 (for example climate change). http://www.legislation.gov.uk/anaw/2015/2/section/4/enacted

[2] Natural Resources Wales (2016) State of Natural Resources Report (SoNaRR): Assessment of Sustainable Management of Natural Resources. Technical Report. Chapter 4 Resilient Ecosystems, pp. 6-8 https://naturalresources.wales/media/679405/chapter-4-resilience-final-for-publication.pdf

enhancing biodiversity extend beyond Welsh legislation to UK, EU and International commitments.

International commitments notwithstanding, Welsh legislation clearly states that all public authorities have a duty to *"seek to maintain and enhance biodiversity* [… and] in so doing promote the *resilience of ecosystems*" (section 6(1) Environment (Wales) Act). Biodiversity recovery is a key goal of the Environment (Wales) Act, expressed clearly by the Welsh Government in Wales its Natural Resources Policy[3] and described as an integral component of delivering ecosystem resilience in NRW's SoNaRR[4]. The full range of legislative and policy commitments and drivers in Wales relevant to Area Statement development are summarized in **Chapter 1**. Tables 1-4 include details of all statutory and non-statutory designated sites as well as planning instruments which directly or indirectly support biodiversity. Chapter 1 acts as a baseline checklist of what Natural Resources Wales (NRW) and other bodies are obliged to comply with and/ or utilise in developing Area Statements.

**Chapter 2** explores ways in which spatial approaches to biodiversity management, similar to the development of Area Statements in Wales, have been used in other countries. Australia, South Africa and California have all implemented spatial approaches with varying degrees of success and provide learning opportunities for the development of Area Statements in Wales. The use of ecosystem service assessment toolkits can help to identify areas important for biodiversity conservation. However, these processes do not occur in a vacuum free from bias. Stakeholders participating in the process of natural resource management planning—as will be the case for Area Statements—all have an agenda to promote, which may or may not support biodiversity objectives. Making trade-offs explicit does not predetermine an outcome necessarily beneficial to biodiversity, and particularly not in all places at all times. These examples illustrate how important it is to strike a balance between the competing demands of natural resource users, which if left unaddressed in Wales could undermine the achievement sustainable management of natural resources.

**Chapter 3** provides a summary of nine toolkits available for assessing ecosystem services and measures each tool against a list of 20 criteria. Ecosystem service toolkits enable the user to assess the delivery of different ecosystem services in a specified location, based on information given. The objective of different toolkits varies, but in general they allow the user to understand how changes in natural resource management will affect the delivery of different ecosystem services, in order to better understand the trade-offs associated with different management decisions.

Eight of the nine toolkits reviewed incorporate some element of biodiversity within their calculation of ecosystem service delivery. SENCE, LUCI, EcoServ-GIS and TESSA all explicitly map areas of biodiversity and identify areas important for conserving or enhancing biodiversity. However, the treatment of ecological resilience is far less comprehensive.

[3] "…[O]ur aim is to improve resilience and reverse the decline of biodiversity." Welsh Government (2017) Natural Resources Policy, pp.10. https://gov.wales/docs/desh/publications/170821-natural-resources-policy-en.PDF

[4] Natural Resources Wales (2016) State of Natural Resources Report (SoNaRR): Assessment of Sustainable Management of Natural Resources. Technical Report. Chapter 4 Resilient Ecosystems. https://naturalresources.wales/media/679405/chapter-4-resilience-final-for-publication.pdf

Table 3 in **Chapter 3** considers how each tool addresses each of the five attributes of resilience (diversity, extent, condition, connectivity and adaptability). Of the tools that map biodiversity, only SENCE and LUCI also address elements of ecosystem resilience and encourage stakeholder engagement, both critical elements to meeting the requirements of the Environment (Wales) Act. As a result, these toolkits have the functionality to help stakeholders to prioritize actions in different places that maintain biodiversity and healthy functioning ecosystems for ecosystem resilience, and maximize economic, social and cultural benefits to Welsh communities.

It is important to note, that with 20 criteria for evaluation, none of the ecosystem service assessment tools can act as a magic bullet for delivering all of the functionalities needed for implementing the Area Statements. More specifically, an ecosystem service approach does not explicitly ensure biodiversity protection or recovery, particularly in the case of priority species. However, if stakeholders are clear in identifying and agreeing the most important criteria for an area, using a well-matched ecosystem service assessment toolkit can assist in making explicit the trade-offs between multiple natural resource management strategies.

When considering which ecosystem service assessment toolkit is best matched, the following points should be considered as minimum requirements:

- Sufficient data availability
- Understanding of the characteristics of the study area
- Availability of sufficient resources
- Clarity over the policy context and the scientific purpose of the study

**Chapter 4** of the report provides a review of the scientific literature for evidence of the linkages between biodiversity, healthy functioning ecosystems and ecological resilience. While the mechanics of how biodiversity relates to ecological resilience is still being investigated, the body of research as a whole is unequivocal that ecological resilience is compromised when biodiversity is diminished. Healthy functioning ecosystems are critical for society for many reasons; high on the list are the services that we receive from natural ecosystems that support society, i.e. ecosystem services.

Wales' natural resources provide many ecosystem services with economic, social and cultural benefits. For example, from SoNaRR 2016[5]:

- £385 million from agriculture to the Welsh economy every year. This figure underpins the £6.1 billion annual turnover and £1.55 billion gross value added attributed to the on-farm production and food manufacturing sector.
- 951 million litres of drinking water per day.
- £499.3 million from the forestry sector* to the Welsh economy (*covers forestry and logging, manufacture of wood and products of wood and cork, and manufacture of paper and paper products).
- 8,919 gigawatt hours of energy from renewable sources, and rising, creating a renewable energy industry that employs 2,000 people.

[5] Natural Resources Wales (2016) A Summary of the State of Natural Resources Report (SoNaRR): Assessment of Sustainable Management of Natural Resources. https://cdn.naturalresources.wales/media/682366/sonarr-summary-september-2016-edited-august-2017.pdf

- 410 million tonnes of carbon stored in soil to soak up emissions and protect against climate change.
- £2,870 million in tourism to Wales.
- 25% of adults meeting the recommended level of physical activity through outdoor pursuits.
- £18.2 million in health benefits to people from walking the Wales Coast Path.
- £840 million and 30,000 jobs from the historic environment sector.

All of these benefits are dependent upon healthy functioning ecosystems which biodiversity supports. However, without sustainable management, many of these activities can threaten the degradation of biodiversity, which presents risks to the future delivery of these services.

Theoretically it should be possible to develop Area Statements which identify win-win outcomes. To test how this might be achieved and to examine more broadly how an Area Statement process could work, report partners commissioned the Ecosystems Knowledge Network to design and facilitate a one-day workshop with stakeholders, using Bridgend County Borough as a case study. The *Naturally Bridgend* workshop, held on 25 October 2017, brought together individuals across a spectrum of public, private and charity sectors. **Chapter 5** contains a detailed report on this workshop in which stakeholders sought new ways of working together more effectively in order to identify opportunities for enhancing biodiversity.

The workshop was an opportunity to understand how stakeholders relate to biodiversity within their needs and priorities, and to identify the gaps in knowledge that act as barriers to taking advantage of opportunities. Key outcomes included:

1. The value of maps and information resources.
2. The need to help stakeholders navigate complexity.
3. The need for local leadership and vision for both SMNR and biodiversity.
4. Understanding the diverse perspectives and capabilities of stakeholders.
5. Targeted action for biodiversity is not always easy to integrate with local priorities.

Strong local leadership and vision for SMNR and biodiversity can be used to help stakeholders navigate the complexity of ecosystem resilience, linkages across ecosystems and the application of SMNR. Local leadership can be used to mobilize broad stakeholder engagement, which contributes more diverse perspectives and capabilities. While more diverse perspectives can lead to increased conflicts of interest, it can also generate more ideas and connections between priorities. Maps generated through the use of an ecosystem service assessment toolkit can help stakeholders to understand how biodiversity is situated across the landscape in different habitats, and how the delivery of different ecosystem services is linked to biodiversity and different habitat types. Visually representing real data makes it possible for non-expert stakeholders to engage with complex relationships in both space and time.

Maps at the local to regional scale also enable stakeholders to relate national policy targets to local priorities, an important process recommended as a result of analysis of both the workshop activity and the review of spatial approaches to biodiversity management used in other countries. Discussion and understanding generated from the use of such visual tools

may also facilitate recognition of a wider range of actions for targeting biodiversity *and* other local priorities, such as economic development, and reduction in antisocial behaviour.

Area Statements have the potential to help stakeholders to begin to see their relationship to biodiversity in ways they have not realised before. The *Naturally Bridgend* workshop framed local issues in the context of biodiversity in order to see how stakeholders perceived biodiversity in relation to their priorities. As this was a difficult task for many workshop participants, it raises doubts as to whether or not stakeholders would tend to consider biodiversity objectives when working towards a plan to sustainably manage natural resources in the development of an Area Statement. To realise stakeholders' potential to identify win-win scenarios, consideration should be given to explicitly stating the need to achieve biodiversity objectives in any Area Statement.

The *Naturally Bridgend* workshop demonstrated that stakeholders have a broad and positive view of the environment, but turning SMNR concepts into practical outcomes requires long-term dialogue and coordination. In addition to local leadership to engage and connect stakeholders, the process of developing Area Statements will require an investment of time. Allowing stakeholders time to build and deepen both relationships and technical understanding may result in a cooperative plan that meets the needs of more people while achieving biodiversity objectives.

### 6 guiding principles to help the SMNR framework deliver nature recovery

As a result of the cumulative work of this report, there are a number of principles that can be used to guide the effective delivery of biodiversity commitments through the Sustainable Management of Natural Resources Framework.

- **Visibility of biodiversity priorities:** ensure that existing biodiversity priorities and objectives across land and sea are understood by all involved as integral to achieving SMNR
- **Local action ←→ national policy:** support the delivery of SMNR at local level, while communicating how it links to national policy
- **Strong leadership:** catalyse action through strong local leadership
- **Multi-level communication:** secure effective coordination and communication between stakeholders, and SMNR and biodiversity specialists
- **Visually represent data:** use appropriate tools to visually represent data to facilitate understanding of the spatial linkages between biodiversity, ecosystem services and priority actions
- **Build relationships and participation:** widen and deepen stakeholder participation to ensure it is meaningful and give the time needed to build strong relationships and understanding

By adhering to these principles in combination, the development of Area Statements can contribute to achieving Wales' biodiversity commitments and building resilient ecosystems and more sustainable communities with benefits for all of society.

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# Chapter 1.

# The legislative context for the area-based approach in Wales

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# 1. The legislative context for the area-based approach in Wales

## Introduction

This chapter summarises the specific obligations and mechanisms for supporting biodiversity, relevant to those responsible for developing 'Area Statements' under the Environment (Wales) Act 2016. International, European Union (EU), United Kingdom (UK), and Welsh legislation, as well as action plans are considered with respect to what they imply obligation-wise during the development of the Area Statements.

A baseline checklist of what Natural Resources Wales (NRW) and other bodies are legally obliged to conform to in developing Area Statements is set out and is subdivided into lists. The lists are as follows:

- The designated statutory and non-statutory sites for supporting biodiversity in Wales, and the regulations already governing them (Section 1.2).
- Legislation and plans governing biodiversity beyond designated sites (Section 1.3).
- Legislation and plans not specifically designed to govern biodiversity, which nevertheless support the governing of biodiversity through linkage to biodiversity policies (Section 1.4).

## 1.1 The scope for developing Area Statements

### *1.1.1 The scope of the Environment (Wales) Act 2016*

In passing the Environment (Wales) Act 2016 ('the Environment Act'), National Assembly for Wales has created legislation intended to fully provision for the sustainable management of natural resources (SMNR) in the whole of Wales. It has stated its goal with the Act is to deliver this provision in an organised and integrated fashion, which fosters economic and social benefits for communities at the same time as also maintaining and enhancing resilience of natural systems (WG 2016a).

The legislation includes the setting out of an integrated framework designed to support core-decision making on SMNR. Firstly, it mandates the Welsh Government sponsored body, Natural Resources Wales, to produce a State of Natural Resources Report (SoNaRR) to assess the extent to which sustainable management is being achieved and in doing so undertake an assessment of biodiversity. Secondly, it mandates the Welsh Government to produce a Natural Resources Policy (NR Policy) for Wales, setting out the priorities, risks, and opportunities for managing national natural resources sustainably with reference to the findings of SoNaRR. Thirdly, it mandates NRW to produce Area Statements that include the local evidence necessary to guide all agencies in addressing the priorities, risks and opportunities identified in the NR Policy (WG 2016a).

The provisions in part 1 of the Environment Act (SMNR) relate to all natural resources, as listed in section 2, and therefore the purpose of this section is not exclusively biodiversity conservation. However, a number of provisions in the Act work together to support nature

conservation and recovery. Biodiversity is defined in section 26 of the Act as "*the diversity of living organisms, whether at the genetic, species or ecosystem level*", and included as a 'natural resource' as "*animals, plants and other organisms*" in section 2(a). The Act contains in section 6(1) a biodiversity and resilience of ecosystems duty for all public authorities[1], by which each "*must seek to maintain and enhance* [Welsh] *biodiversity* [… and] in so doing promote the *resilience of ecosystems*". Welsh Government must do this while having "*regard to the United Nations Environmental Programme Convention on Biological Diversity of 1992* [('the CBD')]" as per section 6(4)(a).

More widely, those public authorities defined in the Act must, in complying with the section 6 duty, take account of a number of aspects of ecosystem resilience including "*diversity between and within ecosystems*" under section 6(2)(a), as well as having regard to the Act's section 7 list of living organisms and types of habitat of principal importance for maintaining and enhancing biodiversity in Wales, the SoNaRR and Area Statements. Action with relation to biodiversity is also required by the Act in NRW's assessment of Welsh ecosystems through SoNaRR, and by Welsh Ministers in the NR Policy[2].

Essentially, supporting biodiversity is a key goal of the Environment Act. This is perhaps unsurprising as the legislation has its origins in the National Assembly for Wales Sustainability Committee inquiry into biodiversity following the failure to meet the international CBD targets in 2010 The Assembly recommendations in 2011 made clear the need for Wales legislation and policy to integrate the consideration of ecosystem resilience and biodiversity into decision making and moving away from situations where biodiversity was considered as a 'bolt on' or 'nice to have'. The Welsh Government acknowledges this in their insistence that its implementation will reverse declines in biodiversity and secure long-term ecosystem resilience in Wales (WG 2016a). With regard to the creation of Area Statements, it is also worth noting that all aspects of resilience are outlined in section 6 (2)(a) to (e), meaning public authorities must take account of *"diversity between and within ecosystems"*, "*connections between and within ecosystems*", "*the scale of ecosystems*", *"the condition of ecosystems (including their structure and function)"* and *"the adaptability of ecosystems"* in complying with the duty to maintain and enhance biodiversity in the exercise of their functions.

Following the passing of the Environment Act into law in May 2016, SoNaRR was published by NRW in September 2016. The report highlighted Wales' failure to meet national and international biodiversity targets, as well as the continued decline in national biodiversity. Declines were particularly marked in areas where ecosystem resilience had declined due to land-use patterns that had driven habitat loss and the break-up of connectivity between ecosystems (e.g. in river valleys) (NRW 2016). Welsh Government held a public consultation on the interlinking NR Policy from November 2016 to February 2017. The policy was published by Welsh Government in August 2017, and outlined the opportunities and challenges regarding achieving SMNR in Wales, specifically regarding climate change and biodiversity decline, and highlighted the priorities that should be addressed in response (WG, 2017).

[1] A 'public authority' in the Environment Act is defined as including any of Welsh Ministers, the First Minister for Wales, the Counsel General to the Welsh Government, a Minister of the Crown, a public body (including a government department, a local authority, a local planning authority and a strategic planning panel, a person holding an office—under the Crown (created or continued in existence by a public general Act of the National Assembly for Wales or of Parliament, or the remuneration in respect of which is paid out of money provided by the National Assembly for Wales or Parliament), or a statutory undertaker.
[2] These obligations are explicitly described for NRW (Section 8.2b) and the Welsh Ministers (Section 9.2) in the Environment Act.

Following publication of the policy, NRW was tasked with preparing the third and final component of the trio of major products from Part 1 of the Environment Act, Area Statements. The Area Statements are the primary mechanism for implementing the policy's priorities and addressing challenges and opportunities. The production phase is scheduled to run from 2017 to 2019. To date NRW has involved stakeholders from a range of sectors in consultations on how the process should develop, and intends to open consultations to yet more groups and individuals (NRW, 2017c). Having set out the steps that will likely take place in producing Area Statements (NRW, 2017c), NRW has invited information and knowledge sharing on the development process since February 2017 and asked openly for ideas on what approaches and partnerships may be formed so that the statements can deliver SMNR[3].

The Environment Act sets out a framework that enhances the scope for supporting biodiversity within Wales. In stipulating that NRW publish Area Statements, the Environment Act introduces a mechanism for supporting biodiversity more comprehensively at a regional level. In not defining the size of an "area", the policy allows for Area Statements to be of any size considered appropriate by NRW. NRW plans to develop 7 Area Statements, including one that covers inshore marine waters (0-12 nautical miles). Area Statements have the potential to be an approach for SMNR at the local level in every locality, although the scale of the statements as large regional areas may preclude or at least make challenging the level of detail required for a truly local approach. Despite some semi-contradictory wording within the Environment Act, it is clear that Area Statements are required to cover all areas of Wales[4] and provides an excellent opportunity for Welsh Government to extend and integrate the consideration of biodiversity in any local planning decision, e.g. through changes to Planning Policy Wales.

An important area of scope for the Act is its application to Welsh territorial waters, which are included in the Government of Wales Act 2006 definition of 'Wales', and thus covered by section 11(1) of the Environment Act. NRW, on behalf of the Welsh Ministers, controls all marine licensing in the Welsh inshore and offshore regions[5]. While WG and NRW already have approaches for protecting biodiversity in marine and coastal areas (e.g. Natura 2000 sites, a Marine Conservation Zone, coastal Sites of Special Scientific Interest, and wider marine management for section 7 species/ habitats) (WG 2015), the Area Statements offer an opportunity for a joined approach to achieving SMNR across the entire Welsh inshore region. Further extending Area Statements to cover the Welsh offshore area in the future would enhance SMNR delivery.

The Environment Act is a piece of legislation that deepens the existing geographical obligations of NRW in making assessments to support biodiversity. In addition, it creates a link between the SMNR objective of maintaining and enhancing the resilience of ecosystems and their benefits to wider well-being by stipulating under section 3(2)(b) that in pursuing SMNR, NRW must "*contribute to the achievement of the well-being goals in section 4[6] of the Well-being of Future Generations (Wales) Act 2015*". This recognises the role of resilient

[3] The digital platform for the online hub where these processes are occurring is found at: https://khub.net/web/area-statements-natural-resources-wales
[4] With the exception of the offshore region
[5] Section 46, Wales Act, 2017 https://www.legislation.gov.uk/ukpga/2017/4/part/2/crossheading/marine-licensing-and-conservation
[6] Section 4 of the Well-being of Future generations (Wales) Act 2015 sets out goals of Wales being prosperous, resilient, healthier, more equal, with cohesive communities, and of vibrant culture. https://www.legislation.gov.uk/anaw/2015/2/section/4

ecosystems in supporting social, economic, cultural and environmental well-being.

It is important to note that the Welsh Government does not lay the full burden of this expanded scope for supporting biodiversity on NRW. The Act (Section 14) and supporting policy briefs (e.g. WG 2015) explicitly state that Welsh public bodies[7], when within their remit and capacity, should assist NRW in its development of Area Statements through the provision of information and the exercising of their functions. It is not solely NRW, therefore, that is legally obliged to develop Area Statements, but any public body that NRW asks to assist them in a supporting capacity. It seems likely that NRW will open up the Area Statements design and development process to such bodies, as well as other stakeholder groups. NRW is already consulting with stakeholders across a range of sectors and expresses the intention to reach out further in its reports on progress (NRW, 2017c). NRW is showing commitment to its mandate[8] under the Environment Act to "*promote and engage in collaboration and co-operation*" and to "*make appropriate arrangements for public participation in decision-making*", section 4(c) and (d), as part of its adherence to the principles of SMNR.

### *1.1.2 Further legislative scope for developing Area Statements*

The Environment Act refers to, and amends, several existing Acts. In integrating these Acts with the Environment Act, it introduces additional legislation that needs to be considered in Area Statements development. These additional Acts are highlighted in **bold** throughout this subsection.

In section 11(7)(a) and (b), the Environment Act includes the provisions that "*another plan, strategy or similar document* [can] *be incorporated into* [an area] *statement*" or "[an] *area statement* [can] *be incorporated into another plan, strategy or similar document*", respectively. An amendment to the **Environment Act 1995** included in the Environment Act then states that any National Park Authority in Wales "*must have regard to any area statement* [...] *that includes all or part of the park*". Therefore, the management plans for Snowdonia, the Brecon Beacons, and the Pembrokeshire Coast National Parks could be incorporated into Area Statements, or vice versa. Revised at intervals of no more than five years, their next periods of revision could be *de facto* Area Statement design periods. Legislatively, the authorities for all three National Parks share a mandate to assist NRW in development of the Area Statements that cover these designated landscapes. This is especially the case with regard to activities where the park authorities have existing remits or duties, which are conserving natural beauty, promoting public enjoyment, and supporting local socio-economic well-being.

Similar amendments passed within the Environment (Wales) Act itself reshape the **Countryside and Rights of Way Act 2000**, the **Planning and Compulsory Purchase Act 2004,** and the **Well-being of Future Generations Act 2015**. These Acts all now stipulate the consideration of Area Statements design. For example, section 38(3)(ga) of the Well-Being of Future Generations Act now states that assessments of well-being prepared by public service boards must take into account "*each area statement under section 11 of the Environment (Wales) Act 2016 (if any) which relates to any part of the local authority's area*." Section

[7] 'Public bodies' are defined in the Environment (Wales) Act 2016 as a council of a county or county borough in Wales, a Local Health Board, the Public Health Wales and Velindre NHS Trusts, a National Park authority for a National Park in Wales, a Welsh fire and rescue authority, the Higher Education Funding Council for Wales, the Arts Council of Wales, the Sports Council for Wales, the National Library of Wales, and the National Museum of Wales.
[8] Section 5.2.1a of the Environment Act states NRW must "*apply the principles of sustainable management of natural resources*".

39(5)(b) then states the same public services board that prepared the assessment must include a statement in its local well-being plan "*explaining how the objectives and any proposed steps have been set with regard to any matters mentioned in the most recent assessment of well-being* […]".

The amendments to the Acts mentioned here legally ensure that planning and management in any Area of Outstanding Natural Beauty, any local development plan, and any local well-being plan, must have regard to at least one Area Statement. Adherence to the amended provisions in these Acts further establishes the obligation of local authorities and conservation boards to work with NRW to maintain and enhance biodiversity, while simultaneously working toward improved economic, social and cultural conditions for Welsh communities.

While the Environment Act specifically mentions the above Acts, its provision in section 11(7)(a) for the consideration of incorporating any other "*plan, strategy or similar document*" into an Area Statement, broadens the legislative scope considerably. Essentially, any spatial approach to management or planning under Welsh, UK, EU, or international law falls under this definition. The full range of planning instruments is found later in this report under Sections 1.2 to 1.4.

### *1.1.3 Potential changes to the legislative scope for developing Area Statements*

The signing into statute of the Wales Act 2017 devolves extra competencies to the Welsh Government in terms of licensing and conservation in its offshore region. Welsh Minsters now have powers to designate Marine Conservation Zones (MCZs) in Wales' offshore areas; however this has not yet resulted in the extension of NRW's marine remit and it is not currently expected to design Area Statements for the offshore region. The result of the 2016 referendum vote for the UK to leave the EU ('Brexit') may have more immediate implications for how the statements are designed. Environmental policy is one of the policy areas that derives most heavily from the EU, and UK and Welsh environmental policy is directly determined by the EU to a large degree. Post-Brexit implications for Area Statement design could range from minor to major.

As members of the last UK Parliament noted, the EU has over 800 pieces of environmental legislation and these have shaped close to 80% of UK environmental legislation (House of Commons Environmental Audit Committee 2016). The most important of these in respect to spatial approaches for biodiversity conservation are listed in Sections 1.2 to 1.4. EU Directives, such as the Directive on the Conservation of Wild Birds 2009 ('Birds Directive'), the Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora 1992 ('Habitats Directive') collectively known as the Nature Directives, the Strategic Environmental Assessment Directive 2001 ('SEA Directive'), and the Marine Strategy Framework Directive 2008 (MSFD) have informed the human activities permissible in designated and non-designated sites. They have also underpinned strengthened protections through allowing the designation of both terrestrial and marine Special Protection Areas (Birds Directive) and Special Areas of Conservation (Habitats Directive) that make up the Natura 2000 network[9].

[9] The Natura 2000 network is a network of sites selected to support the continued existence of Europe's most important and threatened species and habitats.

Between 60% and 70% of Important Biodiversity and Bird Areas (IBAs) in the UK, for instance, overlap with Natura 2000 sites (Beresford et al. 2016). The destiny of these EU-derived legislations in UK and Welsh law is largely dependent on the type of Brexit that occurs, and how the governments of the UK choose to act afterwards.

Under a 'soft Brexit' scenario, where the UK negotiates membership of the European Free Trade Area (EFTA) and the European Economic Area (EEA), or retains bespoke access to the Single Market, much EU environmental legislation (e.g. SEA Directive) might be adopted by the UK as a condition (see Sections 1.2 to 1.4 for all specific legislation that would apply). Importantly, however, the Nature Directives need not be adopted to achieve these memberships, nor the Maritime Spatial Planning Directive 2014 ('MSP Directive'). It is uncertain whether the MSFD would continue to apply. The Nature Directives have strengthened commitments for the designation, management and monitoring of protected areas in Welsh waters, including through the recent designation of three harbour porpoise SACs and area extensions and additional SPAs for seabirds[10].

Wales will remain a signatory to OSPAR (through the UK) after Brexit and the Marine and Coastal Access Act, 2009 (MaCAA) including the designation of Marine Conservation Zones, will still apply. However, it should be noted that the requirements for identifying, managing and monitoring protected sites under the MaCAA are significantly different to those under the Nature Directives. The post-Brexit legislative landscape cannot be stated with certainty before negotiations are complete, however, the information presented here is the perceived view of experts (Burns et al. 2016, Hull 2016). Under a 'hard Brexit', the same experts state that the UK would not have to retain, adopt, or replicate any EU Environmental legislation.

The long-term future of EU law in the UK remains highly uncertain. The passage of the European Union (Withdrawal) Bill through the UK Parliament provides some short-term security around arrangements for EU legislation, which will be transferred into domestic law. However, there are concerns about the scope of amendments that could be made during the process of transfer via Statutory Instruments, and the 'governance gap' that will result in the loss of the role of EU institutions in the UK[11]. Furthermore, although Welsh Ministers have spoken favourably about EU law[12], no firm or detailed commitments have been given by the Welsh or UK governments over how they intend to proceed post-departure.

## 1.2 Site-based environmental instruments for supporting Welsh biodiversity

When designing Area Statements, it will be possible to integrate their design with over 35 existing spatial approaches for protecting Welsh biodiversity (see checklists in Table 1.1 and Table 1.2). Depending on the expanse of terrestrial and marine area covered by Area Statements, this may involve integrating site plans for designated areas in full (if the designated site is smaller or the same size as the expanse covered by an Area Statement), or conversely, designing multiple Area Statements to complement an existing biodiversity

[10] https://gov.wales/newsroom/environmentandcountryside/2017/170131-extra-protection-wales-sea-birds-harbour-porpoise-approved/?lang=en

[11] Greener UK (2017) The governance gap: why Brexit could weaken environmental protections. http://greeneruk.org/resources/Greener_UK_Governance_Gap.pdf

[12] *"EU policies and legislation have delivered clear improvements to our environment and health and provided welcome protection and support for our farming and fishing industries. As the UK prepares to leave the EU we will be looking at how these important safeguards can be built upon to meet Welsh needs."* Lesley Griffiths AM, Cabinet Secretary for Environment and Rural Affairs, September 2016.

management plan (where the designated site is larger in expanse than that of a single Area Statement). The use of protected site management plans within Area Statements is likely to be a key approach to achieve biodiversity objectives and contribute to the objective of SMNR in line with the national priorities set by Welsh Government. However, additional approaches which seek to address root-causes, for example the regulatory tools and market instruments that create current context and contribute to pressures and drivers of biodiversity decline, will also be important to include in Area Statement design.

Whatever the approach adopted by NRW, as lead body charged with Area Statement design, it will be in an excellent position to draw on the existing instruments for nature conservation, such as National Parks, SSSIs, AONBs, National Nature Reserves (NNRs), etc. For most of the instruments, NRW is either the establishing authority or a partner in their implementation, working closely with local authorities, the Welsh Government, and other institutions in delivery.

Of spatial instruments, the National Parks (statutory) and Biosphere Reserves (non-statutory) have perhaps the most integrated plans for biodiversity protection. They would likely be highly compatible with fulfilling the goals for Area Statements. Statutory Natura 2000 sites (SPAs and SACs) are amongst the most extensive of instruments covering 7% of Welsh land area and a significant proportion of Welsh waters[13] (Beresford et al. 2016; Burns et al. 2016; Carr et al. 2016; Wales Biodiversity Partnership 2017). However, due to Brexit there remains uncertainty over the future of these tools. With regards the marine environment, whilst Wales will remain a signatory to OSPAR, the EU Nature Directives may cease to apply, and there is currently a significant difference between the designation, monitoring and management approaches required under the EU legislation in comparison with UK domestic legislation.

Whilst the protected area system in Wales appears extensive, NRW highlights the limitation of site-based protection for enhancing biodiversity and ecosystem resilience as the area covered extends to around a third of Wales' land and sea (NRW 2017a). In meeting the mandate to cover every part of Wales, Area Statements may be integral in extending approaches to protecting biodiversity through integrating site-based approaches with other approaches to SMNR. They can be a mechanism for improving biodiversity and well-being at new, and greater scales.

[13] There are 15 SACs with marine components and 12 SPAs with marine components. These represent 44.3% and 17.1% respectively of Wales' waters (NRW (2018) pers.comms)

## Table 1.1. Statutory designated sites relevant to Area Statement development

| Site | Purpose | Designated under (UK/ Wales unless stated) | Establishing authority | Status post-Brexit |
|---|---|---|---|---|
| Areas of Outstanding Natural Beauty (AONB) | Conserving natural beauty; meeting recreational needs; preserving rural industry and communities | National Parks and Access to the Countryside Act 1949; Environment Act 1995; The Countryside and Rights of Way Act 2000 | NRW | Unchanged |
| Areas of Special Protection (AoSP) | Bird protection | Wildlife and Countryside Act 1981 | Welsh Government | Unchanged |
| Country Parks | Meeting recreational needs | Countryside Act 1968 | Local authorities | Unchanged |
| Limestone Pavement Orders | Protecting limestone pavements | Wildlife and Countryside Act 1981 | NRW; local authorities | Unchanged |
| Local Nature Reserves (LNRs) | Nature conservation; site for research and education; meeting nature-based recreational needs | National Parks and Access to the Countryside Act 1949; Environment (Wales) Act 2016 | NRW; local authorities | Unchanged |
| Marine Conservation Zones (MCZs) | Protecting marine biodiversity, marine habitats, and geology and geomorphology | Marine and Coastal Access Act 2009 | Welsh Government | Unchanged. |
| National Nature Reserves (NNRs) | Protecting habitats with high terrestrial/ coastal biodiversity | Access to the Countryside Act 1949; Wildlife and Countryside Act 1981; Environment (Wales) Act 2016 | NRW; local authorities | Unchanged |
| National Parks | Conserving landscapes; meeting recreational needs; preserving rural industry and communities | National Parks and Access to the Countryside Act 1949, Environment (Wales) Act 2016 | NRW subject to approval by Welsh ministers | Unchanged |
| Ramsar sites | Wetland conservation | Convention on Wetlands of International Importance (International) | UK Government | Unchanged |
| Sites of Special Scientific Interest (SSSIs) | Protecting nationally important flora, fauna, or geological or physiographical features; underpinning other national / international site designations (terrestrial and intertidal) | Countryside and Rights of Way Act 2000; Environment (Wales) Act 2016 | NRW | Unchanged |

**Table 1.1. (cont.)**

| Site | Purpose | Designated under (UK/ Wales unless stated) | Establishing authority | Status post-Brexit |
|---|---|---|---|---|
| Special Areas of Conservation (SAC) | Protecting important habitats and areas for important (non-bird) species (terrestrial and marine); form Natura 2000 network | Habitats Directive (EU); (other drivers include Marine Strategy Framework Directive (EU); OSPAR) | European Commission; Welsh Government | Uncertain. Habitats Directive need not be retained for EEA or EFTA membership. However, OSPAR will continue to apply which acts as a driver for network completion[14] |
| Special Protection Areas (SPA) | Protecting important bird habitats (terrestrial and marine); form Natura 2000 network | Birds Directive (EU); (other drivers include Marine Strategy Framework Directive (EU); Wildlife and Countryside Act 1981) | European Commission; Welsh Government | Uncertain. Birds Directive need not be retained for EEA or EFTA membership. MSFD may not need to be retained. |

[14]The Convention for the Protection of the Marine Environment of the North-East Atlantic or OSPAR Convention is a key driver for the delivery of an ecologically coherent network of MPAs around the UK. Welsh Government's recent assessment into Wales' contribution to this network did not include SPAs. As such, OSPAR has not been listed as a driver for SPA designation. Ref - http://jncc.defra.gov.uk/pdf/JNCC_NetworkProgressWelshWaters_Final.pdf

## Table 1.2. Non-statutory designated sites relevant to Area Statement development

| Site | Purpose | Designated under (UK/ Wales unless stated) | Establishing authority | Status post-Brexit |
|---|---|---|---|---|
| Biogentic Reserves | Creation of living laboratories of 'typical', 'unique', 'rare' and/or 'endangered' habitats and species | Resolutions 76(17) and 79(9). (EU) | Council of Europe; Welsh Government; NRW | Uncertain. No indication of whether designation would be transposed into UK or Welsh law |
| Biosphere Reserves | Conservation of biodiversity with sustainable use (integrate land and water conservation) | Soft law designation. Protected through other designations of: NNR, SAC, SPA, SSSI, and RAMSAR site | UK Government; UNESCO; UK Man and the Biosphere Committee | Uncertain. Areas covered by SAC and SPA subject to their future designation status. |
| Forest Nature Reserves | Meeting recreational needs; nature conservation | None; often overlap statutorily designated sites | NRW | Unchanged |
| Geological Conservation Review (GCR) | Protection of geology, palaeontology, mineralogy or geomorphology | No designation of their own, but often designated as SSSIs. | NRW | Unchanged |
| Geoparks | Preservation of geological heritage | European Geopark Charter (International), Global Geopark Charter (International) | UNESCO, UK Committee for UNESCO Global Geoparks, Others (including NRW) | Unchanged |
| Heritage Coasts | Conserving natural beauty and important coastal features; meeting recreational needs | Designated by local authorities; often overlap statutorily designated sites | NRW; local authorities | Unchanged |
| Local Wildlife Sites (known also as SINCs - Sites of Importance for Nature Conservation) | Conserving locally important nature | None (do not overlap statutorily designated sites) | Local authorities | Unchanged |
| NGO properties | Nature conservation; landscape conservation; meeting recreational needs | None; often overlap statutorily designated sites | NGOs (e.g. RSPB, Woodland Trust) | Unchanged |
| Regionally Important Geological and Geomorphological Sites (RIGS) | Protect regionally important geology and geomorphology | None (do not overlap statutorily designated sites) | Local authorities | Unchanged |
| Woodland Parks | Meeting recreational needs | None | NRW | Unchanged |
| International Dark Sky Reserve | Protected for its scientific, natural, educational, cultural, heritage and/or public enjoyment. | None | International Dark-Sky Assn. | Unchanged |
| Special landscape areas | Protect locally important landscapes | Wales – Through LDPs | Local Planning Authorities | Unchanged |

### 1.3 Overarching planning initiatives directly supporting Welsh biodiversity

The initiatives listed in Table 1.3, including recent Assembly Acts (e.g., the Well-being of Future Generations Act), as well as government guidance documents (WG 2016b), make it clear that the Nature Recovery Action Plan (NRAP) will be central in guiding biodiversity conservation and recovery at the national scale. Nested within the national ambitions of the NRAP is a re-purposing of the LBAPs – the now defunct Local Biodiversity Action Plan partnerships – to deliver and co-ordinate nature recovery action at local levels. NRW has worked extensively on the delivery and design of these instruments and should be well placed to integrate these with Area Statements where possible and appropriate.

The overarching NRAP and locally-focused re-purposed LBAPs are active policies well-grounded in domestic legislation and the CBD, so they should be resistant to weakening by Brexit. The consultation on the Welsh National Marine Plan (WNMP) closed in spring 2018. It is underpinned by the Marine and Coastal Access Act 2009, but it should also be framed in the context of the Well-being of Future Generations (Wales) Act, 2015 and the Environment Act. The WNMP was a key driver in NRW's decision to create a single Area Statement covering Wales' inshore marine area.

As agriculture is the geographically dominant land use in Wales, a key mechanism for delivering biodiversity objectives is through the EU Common Agriculture Policy (CAP) and the Welsh voluntary agri-environment scheme, the Glastir programme. Glastir pays farmers for the delivery of specific environmental goods and services aimed at combating climate change, improving water management, and maintaining and enhancing biodiversity. It is designed to deliver measurable outcomes at both a farm and landscape level. Glastir is funded by the Welsh Government Rural Communities - Rural Development Programme 2014-20, which is financed by the European Agricultural Fund for Rural Development (under CAP) and the Welsh Government.

Leaving the EU will put an end to CAP policies in the UK, significantly impacting the British agri-food sector, and raising a number of uncertainties about the future level of funding for farm subsidies and how these will be structured, including the provision of funding for agri-environment schemes. UK internal policy preferences for reduced spending on the agricultural sector in the EU (Buckwell 2016, p.4) mean that an overall reduction in spending under Brexit is likely. What this will mean for agri-environmental schemes is uncertain, and will depend on a number of factors, including the government in charge of presiding over the development of new policies, the strength of the farming and environmental lobbies, devolved perspectives and whether or not differences between regulations in the EU and UK need to be minimized to meet new trade agreements (Burns et al. 2016b). Announcements by the current UK Secretary of State for Environment, Food and Rural Affairs, Michael Gove, indicate that CAP-like payments will continue at least until 2022, and that a new subsidy scheme "would use public money for public goods" (BBC, 4/1/2018).

## Table 1.3. Planning instruments directly supporting biodiversity and relevant to Area Statement development

| Site | Purpose | Policies/ plans integrated (UK/ Wales unless stated) | Establishing authority | Status post-Brexit |
|---|---|---|---|---|
| EU Common Agricultural Policy (CAP)/ Glastir | Agri-environment schemes to improve farmland environment and biodiversity | Non-statutory | Welsh Government | Will likely be removed and replaced by a scheme under a yet-to-be-determined UK agricultural framework |
| Estuary Management Plans (EMPs) | Coastal flooding protection; preservation of natural environment and biodiversity | Non-statutory | Local authorities, NRW | Unchanged |
| Re-purposed Local Biodiversity Action Plan Partnerships (LBAP) | Undergoing revision in the context of the NRAP. Likely to have similar functional responsibility for maintaining and enhancing biodiversity at scale of local authority; raising public awareness of need to preserve biodiversity; monitoring progress toward nature recovery targets | Non-statutory | Welsh Government, NRW; local authorities; Wales Biodiversity Partnership; NGOs | Unchanged – NRAP process is driving change however |
| Heritage Coast Plans | To protect undeveloped coasts | Non-statutory | Local authorities, NRW | Unchanged |
| Nature Recovery Action Plan | Embedding the concept of biodiversity in all Welsh policy-making; protecting important species and habitats; restoring and creating habitats; tackling pressures on key habitats; improving evidence-collecting on biodiversity | Convention on Biological Diversity (UN); | Welsh Government, NRW; local authorities; Wales Biodiversity Partnership; NGOs | Unchanged. While the plan is influenced by EU plans for biodiversity recovery, it is well grounded in domestic commitments to an international convention. |
| Planning Policy Wales | Maintain and enhance biodiversity and ecosystem resilience through informing all Welsh town and country planning | Non-statutory | Welsh Government | Unchanged |
| Technical Advice Note 5 (TAN5): Nature Conservation and Planning | Protecting and enhancing biodiversity through informing all Welsh land use planning | Supplement to Planning Policy Wales (see above) | Welsh Government | Unchanged |
| Technical Advice Note 8 (TAN8): | Provisions for protection of biodiversity within land use planning considerations for renewable energy | Supplement to Planning Policy Wales (see above) | Welsh Government | Unchanged |
| Technical Advice Note 14 (TAN14): Coastal Planning | Protecting and enhancing coastal biodiversity through informing Welsh planning | Supplement to Planning Policy Wales (see above) | Welsh Government | Unchanged |

**Table 1.3. (cont.)**

| Site | Purpose | Policies / plans integrated (UK/ Wales unless stated) | Establishing authority | Status post-Brexit |
|---|---|---|---|---|
| Shoreline Management Plans (SMPs) | Coastal flooding protection; preservation of natural environment and biodiversity | Non-statutory | Local authorities, NRW | Unchanged |
| Welsh National Marine Plan | Sustainable development of the marine area (elaborated in UK Marine Policy Statement and Strategy, including commitment to taking an ecosystem-based approach, and elaborated in the Wales NRP as the main driver of achieving SMNR in the marine environment). | Marine and Coastal Access Act 2009 (MaCAA); UK Marine Policy Statement (under MACA); Directive for Maritime Spatial Planning (EU); Marine Strategy Framework Directive; Well-Being of Future Generations (Wales) Act 2015 | Welsh Government; NRW | Unchanged. |

## 1.4 Overarching planning initiatives indirectly supporting Welsh biodiversity

There are several plans and policies (see Table 1.4) that, while not focussing on biodiversity protection, have the potential to provide for protection and enhancement of biodiversity in and beyond designated sites. Local Development Plans (LDPs), which can be established at the local authority scale or to tackle cross-boundary issues, cover the whole of terrestrial Wales to the low tide mark. In common with the Local Well-Being Plans (LWPs) and National Park Management Plans mandated by the Well-being of Future Generations Act and Environment Act, 1995 respectively, these commit local authorities and National Park authorities to safeguarding local sustainability. In addition to informing the strategic context for LDPs, a new National Development Framework (NDF)[15] will also nest discretional regional Strategic Development Plans (SDPs) that sit across multiple local authority areas. Replacing Area Strategies (established under the now repealed Wales Spatial Plan), these will allow planning on cross-boundary issues that are of regional rather than national importance.

Attention to environmental issues will permit consideration of biodiversity protection and enhancement at a new scale. LDPs and LWPs are statutory, as are SDPs under the Planning (Wales) Act 2015. SDPs, however, may only be implemented for limited areas, if at all (Cardiff, Swansea, A55 Corridor; Henderson 2016). The Water Strategy for Wales Action Plan and the River Basin Management Plans (RBMPs), which again cover the whole of Wales, address biodiversity protection through their attention on water quality as an important component of ecosystem health. Catchment Management Plans (CMPs) deliver the RBMPs at the scale of tributary catchments.

Efforts are also increasingly being devoted to ensuring ecosystem functions and functional diversity under the umbrella of an 'ecosystem approach' to conservation and environmental management. An ecosystem approach focuses on levels of biological organization that encompass the essential structure, processes, functions and interactions among organisms and their environment (Secretariat of the Convention on Biological Diversity, 2004). It also recognizes that humans, with their cultural diversity, are an integral component of many ecosystems.

The processes linking ecosystems and species are complex, and actions taken in one location may have unforeseen consequences elsewhere, often far away and many years later (spatial and temporal scales). In this context, the ecosystem approach offers the RSPB a powerful strategy for the integrated management of land, water and living resources to promote species conservation and sustainable use. These are opportunities to utilise an array of current practices, such as ecosystem-based management, integrated river-basin management, and integrated marine and coastal area management for the purposes of both species and habitat protection. This includes developing synergies with landscape level approaches embedded in the Water Framework Directive.

The Water Framework Directive (WFD), in particular, has been important in shaping RBMPs and CMPs. The requirement under the WFD for every catchment to have a management plan to sustain and improve water quality for wildlife supports higher biodiversity. Included in the Western Wales River Basin Management Plan 2015 – 2021, for instance, are measures explicitly included to meet the conditions of the WFD. The primary measures include

[15] The NDF is expected to be delivered in 2020, and the SDPs on a similar timeline.

preventing deterioration in all water bodies, improving compliance in all water bodies currently assessed as of moderate/ poor or poor quality, developing the capacity and approach for biodiversity at local and larger scales, and identifying how positive change in ecological status may be delivered, especially in National Parks and areas protected under the Habitats Directive. A 2015-2020 Welsh Water investment programme of £1.5 billion has subsequently included spending of at least £55.9 million on water quality improvement (NRW 2015).

NRW has had a prominent role in designing RBMPs and CMPs and have experience working with the Welsh Government, local authorities, and National Park authorities on all of the other planning initiatives described in this section. Leveraging and integrating these approaches in Area Statements should not prove an obstacle for them.

Problematic in the context of Brexit, perhaps, is the degree to which almost all of the plans in Table 1.4 are driven by EU legislation (e.g. the WFD, the Nature Directives, the European Landscape Convention [16] [ELC]). RBMPs, for example, were put in place to achieve commitments under the WFD (Department for Environment Food and Rural Affairs & WG 2014). Whilst they also rely heavily on domestic legislation, there is potential for some planning mechanisms and procedures to be interrupted/ destabilised as a result of Brexit.

[16] The ELC was originally written with close regard to the Habitats Directive and it has been used to guide design of several of the instruments in Table 1.4.

## Table 1.4. Planning instruments indirectly supporting biodiversity and relevant to Area Statement development

| Site | Purpose | Policies / plans integrated (UK/ Wales unless stated) | Establishing authority | Status post-Brexit |
|---|---|---|---|---|
| Catchment Management Plans (CMPs) | To protect and improve water for people and wildlife | Water Framework Directive (EU); Marine Strategy Framework Directive (EU); The Welsh National Marine Plan; Strategic Environmental Assessment (SEA) Directive (EU); | NRW | Uncertain. While the Marine Strategy Framework directive is a requisite for EFTA or EEA membership, the Water Framework Directive is not in relation to habitat protection. Enshrinement in the Welsh National Marine Plan would increase certainty of continuity. |
| Local Development Plans (LDPs) | Achieving development that is environmentally, socially and economically sustainable at the local scale | National Development Framework; Local Government Act 2000; Planning and Compulsory Purchase Act 2004; Town and Country Planning (Local Development Plan) (Wales) Regulations 2005; Well-being of Future Generations (Wales) Act 2015; Strategic Environmental Assessment (SEA) Directive (EU); Environmental Assessment of Plans and Programmes (Wales) Regulations 2004; Conservation of Habitats and Species Regulations 2010 (the Habitats Regulations); Habitats Directive (EU); Planning (Wales) Act 2015 | Local authorities; National Park authorities | Unchanged but will need to operate within a currently uncertain legislative landscape post-Brexit. Largest impacts regarding status of Strategic Environmental Assessment (SEA) Directive (EU) and Habitats Directive.. |
| Local Well-Being Plan | Meeting local well-being goals while satisfying the principle of sustainable development | Well-being of Future Generations (Wales) Act 2015 | Welsh Government, local authorities | Unchanged |
| National Development Framework (NDF) | From 2020, will set out national strategic plan for land use. SDPs and LDPs must conform to it. Supports economic, environmental, cultural, etc. policy. | Planning (Wales) Act 2015; Planning Policy Wales; Well-being of Future Generations (Wales) Act 2015; Strategic Environmental Assessment (SEA) Directive (EU) | Welsh Government | Unchanged. (The Strategic Environmental Assessment (SEA) Directive (EU) would need to be met as an EEA or EFTA member) |
| River Basin Management Plans (RBMPs) | To protect and improve water for people and wildlife | Water Framework Directive (EU); Marine Strategy Framework Directive (EU); The Welsh National Marine Plan; Strategic Environmental Assessment (SEA) Directive (EU); | NRW; The Environment Agency (Dee and Severn) | Uncertain. While the Marine Strategy Framework directive is a requisite for EFTA or EEA membership, the Water Framework Directive is not in relation to habitat protection. |

**Table 1.4. (cont.)**

| Site | Purpose | Policies / plans integrated (UK/ Wales unless stated) | Establishing authority | Status post-Brexit |
|---|---|---|---|---|
| Strategic Development Plans (SDPs) | To be established under NDF. Regional plans, nested between the NDF and LDPs, which set strategic planning on non-national issues across a number of local authorities. | National Development Framework; Planning (Wales) Act 2015; Strategic Environmental Assessment (SEA) Directive (EU); | Welsh Ministers, Strategic Planning Panels | Unchanged. (The Strategic Environmental Assessment (SEA) Directive (EU) would need to be met as an EEA or EFTA member.) |
| Water Strategy for Wales Action Plan | To enhance resilience of ecosystems through water resource management; supporting healthy communities | Environment (Wales) Act 2016; Well-being of Future Generations (Wales) Act 2015; Flood and Water Management Act 2010; Marine Strategy Framework Directive (EU); Water Framework Directive (EU); Nitrates Directive (EU); Bathing Water Directive (EU); Environmental Liability Directive (EU); Groundwater Directive (EU); Habitats Directive (EU); Birds Directive (EU) | Welsh Government | Uncertain. Much of the plan is grounded in UK and Welsh policy, but several EU Directives influence the plan. None of the Habitats, Birds, Bathing Water or Maritime Spatial Planning Directive need be met for EFTA or EEA membership. Meeting the Water Framework Directive is not required for EFTA or EEA where it relates to Natura 2000 provisions. |
| Wales Infrastructure Investment Plan | Significant infrastructure | National Development Framework; Planning (Wales) Act 2015; Strategic Environmental Assessment (SEA) Directive (EU); | Welsh Government | Unchanged. (The Strategic Environmental Assessment (SEA) Directive (EU) would need to be met as an EEA or EFTA member.) |
| Wales National Transport Plan | Significant infrastructure | National Development Framework; Planning (Wales) Act 2015; Strategic Environmental Assessment (SEA) Directive (EU); | Welsh Government | Unchanged. (The Strategic Environmental Assessment (SEA) Directive (EU) would need to be met as an EEA or EFTA member.) |

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# Chapter 2.

# International approaches to area-based management of biodiversity

July 2018

**Biodiversity and the area-based approach in Wales**

**How can the sustainable management of natural resources (SMNR) framework deliver nature recovery?**

# About this report

The Royal Society for the Protection of Birds (RSPB) Cymru commissioned Cardiff University's Sustainable Places Research Institute to develop a report which addressed the question, "how can Area Statements in combination contribute to achievement of biodiversity targets in Wales?"

To tackle this question, literature reviews and meta-analyses were conducted on four key topics – the legislative and policy context in Wales, comparable international approaches, evaluating ecosystem services toolkits for biodiversity/ resilience provision, and the relationship between biodiversity and ecosystem resilience. In addition, the University partnered with Bridgend County Borough Council, REACH and the Ecosystems Knowledge Network to design and host a stakeholder workshop to explore the question on a more local scale.

The report is divided into five chapters, and is accompanied by a 'Summary and Key Findings' document which brings together the conclusions from all five chapters, and demonstrates how it is possible for the Area Statement process to be an effective means of ensuring Wales meets its biodiversity objectives.

# Full report contents



**The full report, its individual chapters and the summary can all be downloaded from** http://bit.ly/SPRIareastatements

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# 2. International approaches to area-based management of biodiversity

## Introduction

This chapter reviews priorities, experiences and outcomes of spatial approaches to biodiversity management in countries and regions beyond Wales. Only approaches that have parallels with the Area Statement approach and are within the context of similar democratic governance arrangements are considered. Approaches taken in Australia (section 2.1.1 and section 2.2.1), South Africa (section 2.1.2), and California, USA (section 2.2.2) are summarized. These were the only legislative examples found that shared similarities with the Area Statement approach[1]. The degree of success achieved in each example has also been assessed.

In Chapter 1 the complexities of applying the Area Statements process in the marine environment were identified. In this chapter, section 2.2 brings specific focus on possible solutions for the design of marine Area Statements. In section 2.3, suggestions are made on best practice for Area Statement development, based on the international cases featured in sections 2.1 and 2.2.

## 2.1 National approaches to area-based management of biodiversity

### *2.1.1 Australia*

Australia's Biodiversity Conservation Strategy 2010–2030 compares in scope and scale to the Environment Act. While designed as a non-binding strategy rather than a law, its delivery to-date has been especially relevant to Area Statement development. The Strategy identifies statutory natural resource management (NRM) bodies as primary delivery agents and stipulates that they must work in collaboration with local communities, NGOs, academic institutions, and industry partners. It also calls on NRM bodies to adhere to its guidance while also referencing other legislation (e.g. the Environment Protection and Biodiversity Conservation Act 1999 [Australia], the CBD [United Nations], and National Biodiversity Strategy Review Task Group 2010).

The brief for the NRM bodies is not unlike that of NRW's to design Area Statements in collaboration with local authorities and National Parks to ensure integration with instruments like the local wellbeing plans (LWPs) of the Well-Being of Future Generations Act. NRW's general purpose and duties to which it is bound also gives it a mandate to act beyond statutory requirements[2]. Further to this, NRW is directed to form similar collaborations with local communities, NGOs, academic institutions, and industry partners in compliance with the 'five ways of working' in the Well-being of Future Generations Act sustainable development principle and as a result of clauses in the Environment Act's Principles of

[1] Extensive online searches were conducted, including of online academic libraries, to find potentially useful examples for comparison. Few other appropriate examples were found. Some appropriate countries may have evaded the searches because a high level of the information on their spatial approaches to biodiversity management was not published in English.
[2] Section 9 of the Natural Resources Body for Wales (Establishment) Order 2012 states, "*The Body may do anything that appears to it to be conducive or incidental to the discharge of its functions*."

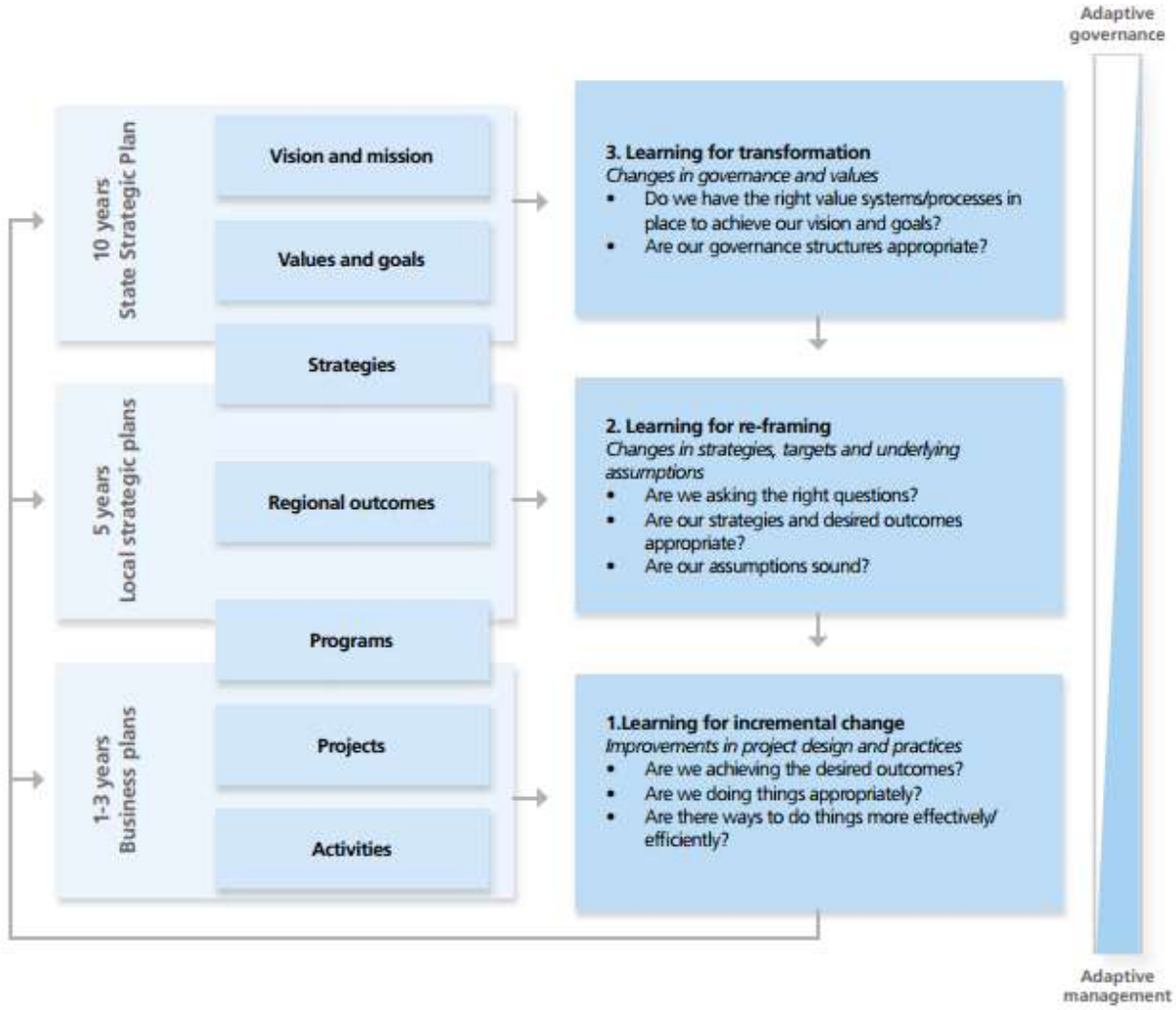
Sustainable Management of Natural Resources[3]. Indeed, NRW has indicated they will take this approach for Area Statement development (NRW, 2017).

To progress the implementation of Australia's Biodiversity Conservation Strategy the Australian Government launched an initiative similar to the design stipulations for Welsh Area Statements. The National Landcare Programme (NLP) tasks 56 NRM bodies to take action on biodiversity conservation, with each NRM body taking responsibility for 1 of 56 distinct regions that collectively span *all* of Australia's terrestrial and marine territory. This matches the mandate for multiple Area Statements to provide coverage for *every* part of Wales.

The NRM bodies have differing styles of jurisdiction, with a number overseeing river catchment areas (Australian Government 2014). However, these catchment area jurisdictions are carried over from a previous area-based approach to biodiversity conservation in Australia. Newer NRM jurisdictions that have followed the introduction of the NLP are called Local Land Services (LLS). The LLS regions are more closely aligned with administrative boundaries used for land-use planning (Howard 2017). Each LLS has its own 5-year strategic plan, for example, the LLS Murray Local Strategic Plan 2016-2021 for an NRM region in the state of New South Wales (NSW).

Figure 2.1 shows how this local strategic plan is nested in a similar 10-year plan for the whole state (itself nested in Australia's Biodiversity Conservation Strategy).

[3] Well-being of Future Generations (Wales) Act, 2015 section 5 http://www.legislation.gov.uk/anaw/2015/2/section/5/enacted Environment (Wales) Act, 2016 section 4 (c) and (d) http://www.legislation.gov.uk/anaw/2016/3/section/4/enacted




Source: LLS Murray (2016b)

**Fig 2.1. Framework for landscape governance and its review in NSW, Australia**

LLS staff include environmental managers of terrestrial and aquatic ecosystems, as well as those with expertise in agriculture, community engagement, and animal disease. This is because the goals of each LLS include “healthy, diverse and connected natural environments”, as well as “biosecure, profitable, productive and sustainable primary industries”. LLSs address their mixed portfolio of biodiversity conservation and industry support through having a third consolidating goal of supporting resilient, self-reliant and prepared communities (Local Land Services Murray 2016b). The parallels with the Area Statement remits of contributing, through SMNR (with the objective of maintaining and enhancing ecosystem resilience), to the well-being goals (which cover social, economic, cultural and environmental well-being) are clear.

Further, taking Murray as an example, the LLSs frame their mission in the context of a mix of environmental and economic development policy (e.g. the Agriculture Industry Action Plan (2014), the Native Vegetation Act (2003), and the NSW State Water Management Outcomes Plan 2000; Local Land Services Murray 2016b), just as Area Statements must also fulfil obligations under various legislation on environment and economic development.

The LLSs are achieving the type of collaborations Area Statements will need to forge among local authorities, National Parks, and other relevant stakeholder groups, through engaging local community advisory groups that communicate with the LLS Board. An LLS general manager takes on the role of ensuring the LLS is integrated within state governance structures (Local Land Services Murray 2016b). One of the ways in which the stakeholders are engaged is in the learning process described in figure 2.1, where their feedback is sought on the effectiveness of environmental plans and programs.

Conservation actions in LLSs are then taken as programs guided by the five-year strategic plans, or as one- to three-year business plans (programs or projects) nested within the five-year plan. LLS Murray programmes have included a bush stone-curlew conservation programme to protect a specific bird species under threat, as well as a RAMSAR wetland and buffer zone project to protect an area of forest habitat seen as rich in natural, social, cultural and economic resources. Murray LLS has partnered with a national parks service, the NSW state forestry agency and community NGOs to deliver the RAMSAR project. Micro-scale projects have also been executed through community grants disbursed by the LLS, such as a group capacity project to run sustainable agriculture workshops, and a citizen science project to monitor flora and fauna (Local Land Services Murray 2016a).

The NLP approach is one that appears to allow for integration across policies, and so provides a useful model for area statements. However, the Australian approach has limitations that should be considered when designing the Area Statements.

Firstly, the regional approach is only as good as the regional NRM body and the local strategic plan they develop. Variability in the plans in NSW and other states, have lead to varied goal achievement (Potts 2016). Secondly, the NLP has sometime been *ad hoc* with success of short-term projects prioritised over the type of long-term integration of policy and management bodies and stakeholder groups that is needed for comprehensive biodiversity planning (Benham et al. 2015). Thirdly, the close association of biodiversity protection with agricultural and land-use management has been seen by some as weakening biodiversity conservation efforts. Their concern is that it frames biodiversity protection within an incompatible production and profit agenda (Howard 2017).

### *2.1.2 South Africa*

South Africa's development of a similar Area Statement design began with the passing of its National Environmental Management Act of 1998, its Protected Areas Act in 2003, and a Biodiversity Act in 2004. Together, these laid the foundation for the country's ecosystem approach to biodiversity conservation. Further impetus for the approach followed the 2008 publication of the South African State of the Environment Report, which identified several active and imminent threats to the nation's high levels of marine and terrestrial biodiversity.

The Biodiversity Act, similar to the Environment (Wales) Act, recognises that biodiversity conservation extends beyond statutory and non-statutory protected areas. It extends to the ecosystems where human activities are more prevalent. The South African policy assigns a statutory NRM the primary responsibility to protect biodiversity. In this case, the South

African National Biodiversity Institute (SANBI) performs the equivalent NRW function[4]. As is the case for NRW, SANBI's remit is to manage biodiversity in all areas (Cadman et al. 2010).

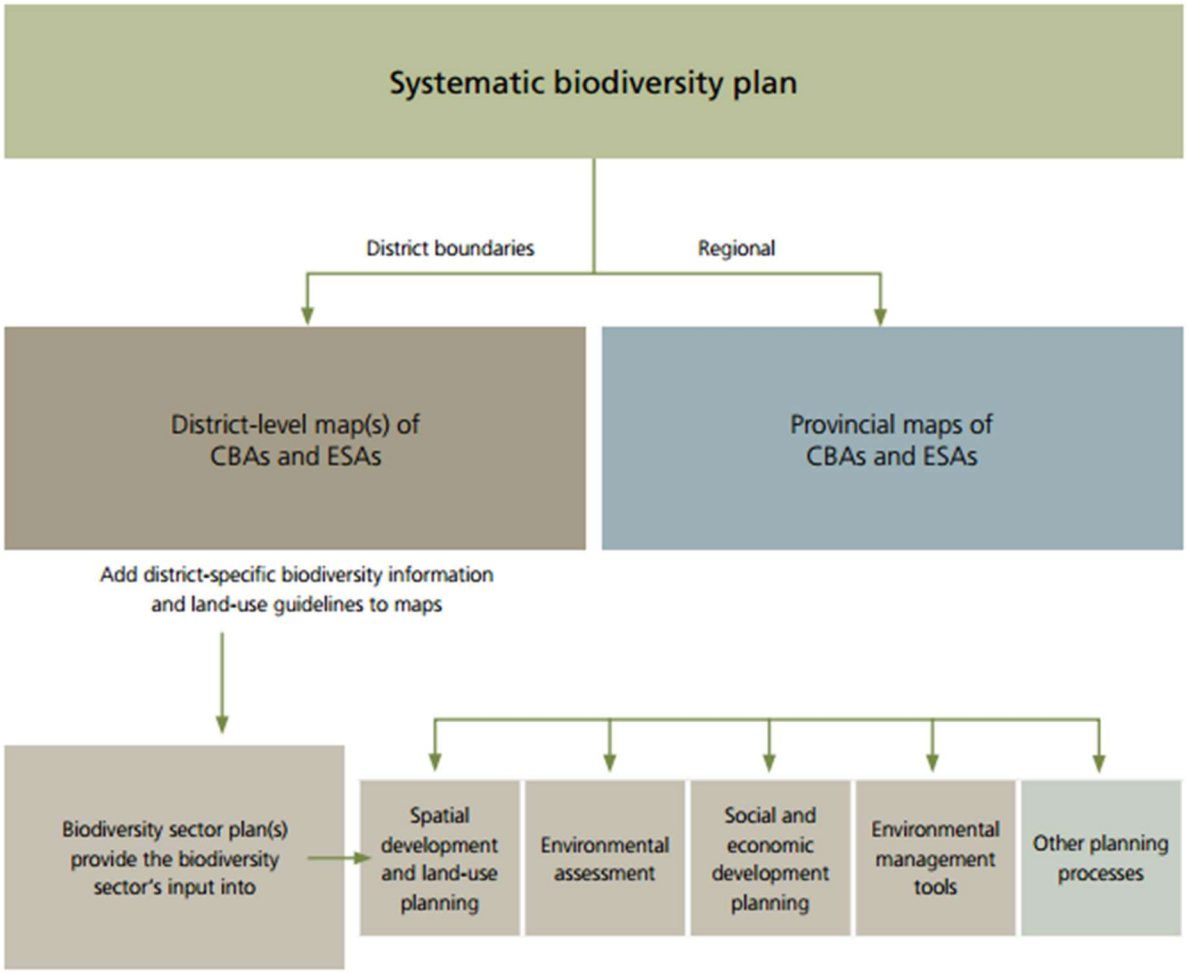
Biodiversity planning for each region is delivered in systematic biodiversity plans (called 'bioregional plans' in the Biodiversity Act of 2004) that determine the level of threat for every ecosystem in South Africa. The National Biodiversity Framework (NBF), a requirement under the Biodiversity Act, empowers SANBI to collaborate on monitoring and reporting with government actors, universities, and civil society organisations to complete the National Spatial Biodiversity Assessment (NSBA).

The NSBA is used to identify critical biodiversity areas (CBAs) and ecological support areas (ESAs) that are regions of national importance. The NSBA is also used to identify CBAs and ESAs at the district scale (Cadman et al. 2010). This dual approach to systematic biodiversity planning is seen in figure 2.2. The NSBA approach recognises that some areas are more important for biodiversity than others, which may be better suited to other uses (e.g. agricultural production).

South African budget restrictions mean that the Biodiversity Act 2004 only provides for biodiversity in CBAs and ESAs to be prioritised in the next stage of systematic biodiversity planning. These are the only areas where finer-scaled biodiversity plans are made.

For each CBA and ESA, SANBI assist in the production of a 'biodiversity sector plan' that consists of detailed GIS biodiversity maps augmented by locally-specific guidelines on the types of land use compatible with maintaining the area's high biodiversity and/ or ecological support (Cadman et al. 2010). It is the biodiversity sector plans that interface with other local plans, similar to how Area Statements are expected to influence local development plans (LDPs), local wellbeing plans (LWPs), and other non-biodiversity specific Welsh planning instruments (see figure 2.2).

[4] SANBI has a statutory mandate under the National Environmental Management Biodiversity (NEMBA) Act No. 10 of 2004. Functionally, SANBI "*must monitor and report regularly to the Minister on the status of the Republic's biodiversity* [and] *the conservation status of all listed threatened or protected species and listed ecosystems*" (Section 1a & b). It must also "assist the Minister and others involved in the preparation of the National Biodiversity Framework, a bioregional plan or a biodiversity management plan […,] make recommendations to organs of state or municipalities […, and] align their plans referred to in that subsection with the National Biodiversity Framework and any applicable bioregional plan.




Source: Cadman et al. (2010)

**Fig 2.2. How South Africa's systematic biodiversity plans integrate with the country's multi-sectoral planning process**

The guidelines in biodiversity sector plans can include recommendations to prohibit intensive development, to allow low-intensive land-use only, or to prohibit or allow only specific industries and activities. Biodiversity planners in South Africa aim to incorporate these guidelines in mainstream planning in a number of ways.

SANBI has developed online tools like Biodiversity-GIS (providing spatial information on biodiversity) and Land-Use Decision Support (LUDS). They have ensured colleagues in other planning departments have applied these tools through extensive engagement. For instance, they have organised events for provincial governments, training sessions and workshops (attended by public sector workers, NGO employees, and consultants), and mentoring initiatives, which have resulted in the tools being used in the design of local integrated development plans and spatial development frameworks. South African municipalities are legally mandated to produce both of these and they have proved the best conduits for building biodiversity protection opportunities (Cadman et al. 2010; Reyers et al. 2007).

Creating local biodiversity management plans within higher scale ones when the priority for biodiversity protection merits the use of limited planning resources, is an interesting approach to spatial planning. While biodiversity protection should not be under-resourced when developing Area Statements, a two-tier system where capacity for biodiversity protection can be distributed where it is most needed is a pragmatic approach to the realities of limited planning resources.

Regional Area Statements could provide broad, but still robust protections, while Statements for more focused areas could have greater detail and targeting (e.g. of a specific species or habitat). It is questionable whether Welsh planning infrastructures would allow the same informal integration of biodiversity planning and local development / wellbeing planning that appears present in South Africa. A more formal approach may be required, and the Environment Act allows this through its mandate to NRW to engage with other Welsh statutory bodies. The legislation also requires Area Statements to be treated as part of the evidence base for LDPs and LWPs.

## 2.2 Approaches to area-based management of marine biodiversity

### *2.2.1 Australia*

In Chapter 1, it was noted that NRW will need to produce Area Statements to cover the Welsh inshore region, with this responsibility possibly extending to the offshore region at a later date. Australia has taken an approach with its NLP that implements a local approach along the coastline, while taking a broad one for most of the inshore and offshore zones. Of the country's 56 NRM bodies, those with coastlines take responsibility for planning coastal biodiversity protection (and sometimes marine biodiversity protection). A single NRM plan then covers all of Australia's waters, including those already covered by regional NRM plans.

At the regional scale, for instance, the Reef Catchments NRM body (an NGO) oversees the Mackay Whitsunday Isaac NRM area, which includes 2000 km of coastline and 50 000 $km^2$ of ocean. Its 2014-2021 plan sets out how the region will achieve biodiversity conservation goals alongside managing healthy agriculture, mining, and tourism industries. Like for LLS Murray, the region's NRM plan is guiding rather than legally binding, but it is underpinned in national law (e.g. the Environment Protection and Biodiversity Conservation Act 1999, the Water Act 2007) and state law (e.g. the Coastal Protection and Management Act 1995, the Sustainable Planning Act 2009).

The Mackay Whitsunday Isaac NRM plan was finalised following consultations with a large range of stakeholder groups (e.g. with local government, research institutes, NGOs, consultants and local industry), many of whom are cited as collaborators of the Reef Catchments NRM body in implementing the plan (Reef Catchments 2014). Achievements under the Mackay Whitsunday Isaac NRM plan include the production of at least 18 beach management plans and the involvement of community members and contractors in multiple targeted monitoring and management projects (e.g. weeding of invasive species, planting of native seedlings) for 900 hectares of coastal area (Reef Catchments 2015).

In 2014, the Australian Government announced that a separate NRM plan would be developed for the country's entire marine area, as regional NRM bodies had proven partially ineffective in managing marine habitats and biodiversity (OceanWatch Australia 2017). Most of the work of the regional NRM bodies like Reef Catchments has been coastal or very close to shore, with less attention to marine areas further offshore (Reef Catchments 2015). The interim national marine plan was published in October 2017[5], led by the marine biodiversity NGO, OceanWatch Australia, with its goal to protect marine biodiversity alongside healthy marine industries, especially fishing (OceanWatch Australia 2017). This plan could be considered a potential model for a Welsh marine Area Statement under the legislative scope of the Environment Act.

Despite the feasibility of the Australian approach in the Welsh context, the critiques identified in section 2.1.1 persist. The regional NRM plans are *ad hoc* in the initiatives they deliver, not necessarily targeting all of the pressing biodiversity protection requirements in an area. The national marine plan also appears it will be strongly oriented toward prioritising the seafood industry (OceanWatch Australia 2017), echoing findings that profitability of agriculture was the greatest concern for regional NRMs (Howard 2017).

### *2.2.2 California, USA*

California's Marine Life Protection Act (MLPA) 1999 was passed in response to previous *ad hoc* marine planning (Gleason et al. 2010). The MLPA divided California's marine zone into seven regional areas. Each area has six goals designed to ensure a comprehensive approach to marine planning:

1. To protect the natural diversity and abundance of marine life, and the structure, function and integrity of marine ecosystems.
2. To help sustain, conserve and protect marine life populations, including those of economic value, and rebuild those that are depleted.
3. To improve recreational, educational and study opportunities provided by marine ecosystems that are subject to minimal human disturbance, and to manage these uses in a manner consistent with protecting biodiversity.
4. To protect marine natural heritage, including protection of representative and unique marine life habitats in California waters for their intrinsic value.
5. To ensure that California's marine protected areas (MPAs) have clearly defined objectives, effective management measures and adequate enforcement, and are based on sound scientific guidelines.
6. To ensure that the MPAs are designed and managed, to the extent possible, as a component of a statewide network.

The Act has been implemented by two state agencies, one of which is the California Department of Fish and Game (DFG). The DFG holds a similar mandate to NRW. A private foundation partners with the two agencies. While the MLPA has required the three

[5] http://www.oceanwatch.org.au/marinenrm/
http://www.oceanwatch.org.au/wp-content/uploads/2016/01/Interim-marine-NRM-plan-2017.pdf

institutions to implement a comprehensive network of MPAs to achieve the Act's goals in each region, it has allowed them to do this in a staggered fashion, region by region, under the umbrella of an overarching framework. This has permitted institutional resources to be concentrated, fostering extensive assessments and consultations for each region (Gleason et al. 2010).

In addition to the three implementing institutions, a regional stakeholder group and a master plan science advisory team (SAT) were involved in the implementation of the MLPA in the north central coast region.

The stakeholder group was largely charged with ensuring the sustained economic viability of marine industries (e.g. fishing) and recreational activities, while the SAT provided the scientific advice required to inform creation of an MPA network capable of supporting high levels of marine biodiversity. Their inputs were facilitated partly through participatory GIS mapping that allowed DFG and their implementing partners to map spatial conflicts between human activities and biodiversity protection. At the end of the consultation process the stakeholder group was asked to forward three plans (one favoured by industry, one favoured by conservationists, and one plan integrating the views of both interest groups). The implementing agencies compared these with the advice of the SAT and accepted and implemented the plan with the median number of MPAs (the integrated plan). This solution was broadly accepted by stakeholders and met the six goals for Californian marine regions set out under the MLPA (Gleason et al. 2010).

The Californian approach has been deemed highly successful in the north central coast and the other regions where it has been implemented (Gleason et al. 2010), because institutional roles and legislative goals were well-defined, stakeholders and conservationists were allowed the requisite input to identify their priorities, and the process was in-depth and well-resourced**.** With restricted budgets, a staggered approach like that used in California may be desirable to NRW and other Welsh bodies implementing Area Statements.

## 2.3 Good practice and recommendations

Each of the case studies presented in this chapter have benefits that can inform the design of Wales' Area Statements.

- Australia's NRM plans succeed a planning system that was often seen as too tough on economic and social interests (The Conversation 2011), but is now criticized for prioritising industry over biodiversity (as has been noted in this chapter).
- South Africa's biodiversity sector plans offer guidelines, but despite initial success, without enforceability this success may not prevail. Section 11(5)(a) of the Environment Act dictates that NRW must implement the Area Statements they co-design, so they need to have a provision that makes them more enforceable than their South African counterparts.
- The MLPA in California has been praised, but is expensive even in a well-resourced state (Kirlin et al., 2013).

It is up to the implementing bodies and various interest groups to pick and choose the elements they see working best in Wales. In making this decision they will want to consider the similarities and differences between Wales and the other places taking similar approaches to Area Statements (e.g. on legal base, policy style, constitutional division of responsibility across governance scales, political culture, and level of economic development).

To help inform this decision we have selected the following 'best practice' elements for area-based conservation planning. Taken from the international examples described in this chapter, these points should be integrated into the Welsh approach where possible:

- Nesting of local plans for biodiversity conservation within plans for larger areas.
- Developing more fine detail management plans for localities with higher biodiversity.
- Using overarching regional/ national approaches to determine a clear vision/ goals, and local plans and mechanisms to implement targeted biodiversity protection and recovery initiatives.
- Involving a wide range of stakeholders in consultations and planning, not just the statutory authorities such as NRW, local authorities, national park authorities.
- Staggering development of area statements to ensure enough resources are allocated to each one. Under-considered plans tend to prove ineffectual.
- Reviewing plans after a five- to ten-year period to ensure they are effective in achieving identified goals.
- Conducting outreach sessions to inform other implementing agencies of how best to integrate biodiversity plans in other local plans (e.g. development, wellbeing).
- Taking a separate approach to marine planning, but one that integrates effectively with terrestrial biodiversity plans. The challenges to marine management are different (e.g. the stakeholders for marine areas do not live in those areas, marine areas do not have natural boundaries like catchments).

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# Chapter 3.

# An evaluation of ecosystem services toolkits

July 2018

**Biodiversity and the area-based approach in Wales**

**How can the sustainable management of natural resources (SMNR) framework deliver nature recovery?**

# About this report

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# Full report contents



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# 3. An evaluation of ecosystem services toolkits

## 3.1 Context and aims

The full and appropriate consideration of biodiversity (i.e. the role of redundancy in ecological resilience, as well as intrinsic value and moral obligation) is at the centre of thinking in this evaluation of ecosystem services tools and toolkits.

This chapter presents the results of a desk-based review of existing ecosystem services tools/ toolkits and identifies which of these tools/ toolkits are best suited for use as part of a comprehensive area-based approach, i.e. are congruent with and contribute to the full and appropriate delivery of ecosystem resilience and achievement of biodiversity priorities (also known as the holistic ecosystem approach).

Based on this evaluation, a list of recommendations has been generated on the various parameters that should be considered when connecting biodiversity to the delivery of ecosystem services. The recommendations will focus on the strengths and weaknesses of the reviewed tools.

To meet the aims stated above, the work was organised into the following tasks:

- A desk-based review of a maximum of ten existing ecosystem service tools/ toolkits and development of evaluation criteria to assess the chosen tools. (Section 3.2)
- Discussion of the strengths and weaknesses for each of the tools. (Sections 3.3 and 3.4)
- Evaluation linking toolkits to nature recovery and ecosystem resilience:
    - Whether the tools ensure biodiversity is considered when connecting it to the delivery of ecosystem services.
    - Whether intrinsic value of biodiversity is considered within these ecosystem services tools.
    - Whether the tools consider components of resilience.
- Conclusions and recommendations relating to tool usage for connecting ecosystem services to biodiversity.

**Box 3.1. Definitions**

*Biodiversity*

Biodiversity encompasses a whole range of life forms, from mammals to invertebrates, plants, fungi and microorganisms. It is the genetic and morphological variability within a species and the assemblages of plants, animals and microorganisms, which together form their ecosystems and natural habitats (JNCC 1994). There are three levels of biodiversity: 1) diversity between and within ecosystems and habitats; 2) diversity of species; and 3) genetic variation between individual species. It is this diversity that underpins ecosystem functioning and the provision of ecosystem services.

*Ecosystem Services*

Ecosystem Services are the contributions of ecosystem structure and function to human well-being (Burkhard *et al.* 2012). They give rise to a variety of benefits that humans obtain either directly or indirectly from ecological systems (Troy and Wilson 2006). For example, services pertaining to food provision, carbon sequestration, water regulation and many others (MEA 2005).

*Ecosystem Resilience*

Ecosystem resilience refers to "*the capacity of an ecosystem to deal with disturbances, either by resisting them, recovering from them, or adapting to them, whilst retaining their ability to deliver services and benefits now and in the future*" (Natural Resources Wales 2016). The Environment (Wales) Act 2016 brings in the idea of building resilience, recognising five key attributes *diversity*, *extent, condition, connectivity* and *adaptability* (Natural Resources Wales, 2016). These attributes are described in detail in the resilience chapter of the '*The State of Natural Resources Report*' (Natural Resources Wales 2016) and in Latham *et al.* (2013).

*Intrinsic value of biodiversity*

The intrinsic value of biodiversity refers to acknowledging its importance, or its well-being as its own entity and not just for the provision of ecosystem services (Small *et al.* 2017). In other words, "*the sense of value that exists [for biodiversity] independently of human valuations*" (O'Neill 1993).

*Ecosystem services tools*

Ecosystem services tools have been defined by Scott *et al.* (2014) as methods which specifically incorporate ecosystem services to quantify, capture and assess the benefits derived from ecosystems for policy and decision making.

## 3.2 Methods for selecting and evaluating ecosystem service tools

### *3.2.1 Taking a biodiversity perspective*

Nine ecosystem service tools falling within the categories of ecosystem services mapping, ecosystem assessments, ecosystem valuation/ accounting and engagement were reviewed and examined through a biodiversity and ecological resilience lens.

Consideration was given to the fact the tools in this review originally had different purposes, which were not necessarily biodiversity specific, and were developed outside the biodiversity lens through which they have been viewed.

The tools were reviewed to establish whether biodiversity was considered, and if so to what extent. Ecosystem resilience was also considered, with the aim of determining the extent to which tools measured the attributes of ecosystem resilience, and how the tools could give

indications of biodiversity as well as ecosystem services in the proposed Area Statements.

### *3.2.2 Method of tool review*

Literature on ecosystem services tools (Bagstad *et al.* 2013; Scott *et al.* 2014; Vorstius and Spray 2015), mapping ecosystem services (Crossman *et al.* 2013; Malinga *et al.* 2015; Martnez-Harms and Balvanera 2012; Schägner *et al.* 2013; Seppelt *et al.* 2011; Wolff *et al.* 2015), knowledge and values in natural resource management (Lynam *et al.* 2007), and on tools for supporting land-use decision making (Howard *et al.* 2016; Scott *et al*. 2014) were collected. Nine ecosystem service tools were chosen, with further information on each tool collected (see Table 3.1) when evaluating the tools against the evaluation criteria.

### 3.2.3 Overview of the tools

The tools selected for review are outlined in Table 3.1. The table provides an overview of the tools including a brief description about the tool, a summary of the tool's original intended purpose, and a web URL for the tool/ and tool documentation (accessed between December 2016 – February 2017).

## Table 3.1. Ecosystem services tools selected for evaluation

| Tool | Brief description | Intended purpose | Web URL | References |
|---|---|---|---|---|
| **Accounting for Biodiversity in Planning (Wales version)** | An online toolkit that aims to help local authorities introduce a transparent and auditable framework for accounting for biodiversity at the site scale. Provides a quantitative assessment of impacts using the Government 'biodiversity metric'. | The toolkit is designed to help local authorities account for biodiversity, deliver their biodiversity obligations under the Environment (Wales) Act 2016 and their planning responsibilities under the Planning Policy Wales. | http://www.environmentbank.com/library.php#booklets | Environment Bank (2016) |
| **Co$ting Nature** | An internet based tool that maps services and combines them in the analysis of current pressures, future threats, biodiversity and conservation priority to produce an assessment of priority areas for conservation and careful management. | Used for natural capital accounting and analysing the ecosystem services provided by the environment. The focus on the tool is not on valuing nature but understanding the opportunity cost of nature being protected to produce ecosystem services. | http://www.policysupport.org/costingnature | Howard *et al*. (2016) Bagstad et al. (2013); Mulligan (2017) |
| **EcoServ-GIS** | Open access toolkit that provides ecosystem services maps which specifically focus on 'Supply and demand mapping', that can be used for project planning, landscape management, funding bids, education work and publicity. | The toolkit was produced for "in-house" use by conservation organisations or partnerships to produce Ecosystem Service maps that will be of use to project planning, landscape management, funding bids, education work and publicity. | https://drive.google.com/folderview?id=0B_v9QO2jyC4eNlVUbzY1UUstZU0&usp=sharing | Howard *et al* (2016) Winn *et al.* (2013) Southgate (2016) Durham Wildlife Trust (2014) Rouquette and Holt (2016) |
| **Green infrastructure Valuation toolkit** | A publicly available toolkit that allows the user to assess the benefits associated with green assets and proposed green investments, to help stakeholders choose between different green infrastructure approaches, and to help determine whether those benefits directly contribute to the local economy, or provide wider non-market returns for society and the environment. | The toolkit is intended to help bridge the gap between evidence and practice when it comes to environmental investments. It uses practical methods to value benefits of green infrastructure.<br><br>It is aimed at helping land managers, developers and other organisations investing in local sustainable development. | http://bit.ly/givaluationtoolkit | Howard *et al* (2016) Natural Economy Northwest *et al.* (2010) |
| **LUCI** | A GIS toolbox that maps areas providing services, and potential gains or loss of service under different management scenarios It provides decision support at farm and landscape scales. | This is a second generation extension to the previously known 'Polyscape' tool. LUCI is a reporting and decision support tool to enable better spatial planning of land management interventions for the delivery of multiple ecosystem services. | http://www.lucitools.org/ | Bagstad *et al* (2013), Howard *et al* (2016), Jackson *et al.* (2013), National Ecosystem Approach Toolkit (2014). |

**Table 3.1. (cont.)**

| Tool | Brief description | Intended purpose | Web URL | References |
|---|---|---|---|---|
| **SENCE** | A consultancy based tool developed by Environment Systems that takes a place based approach and uses multiple datasets and knowledge to model ecosystem services, and producing resulting maps and data to support evidence based decision-making. | This tool developed from research initially conducted for Natural Resources Wales 'SCCAN Mapping' approach. The tool provides information on the spatial distribution of existing ecosystem services, where the opportunities to enhance service delivery are, and where to target land management action to produce multiple ecosystem service benefits. | http://www.envsys.co.uk/sence/ | Environment Systems Ltd (2013); Howard *et al* (2016), Medcalf *et al.* (2012), Medcalf *et al.* (2014a),(Ecosystems Knowledge Network 2016b); Natural Resources Wales (2016); Vorstius and Spray (2015). |
| **Social values for ecosystem services (SolVES)** | The tool assesses, maps and quantifies the perceived social values of ecosystem services. SolVES 3.0 is integrated with the maxent maximum entropy modelling software to generate more complete social value maps. | The tool was developed to address the need to account for differing values, attitudes and preferences among diverse stakeholders in the analysis of trade-offs among ecosystem services | https://solves.cr.usgs.gov/ | Bagstad *et al*. (2013); Sherrouse *et al.* (2014), Sherrouse *et al.* (2011). |
| **Toolkit for Ecosystem Service Site-Based Assessment (TESSA)** | A web-accessible toolkit that guides non-specialists to identify which ecosystem services may be important at a site. It also provides guidance on appropriate methods to use for evaluating the magnitude of benefits that people obtain from these sites currently, as well as an alternative future state. | There was a need for an assessment technique which was site based, not technically demanding, did not rely on expensive fieldwork, and had the capability to estimate the net consequences of a particular management action on ecosystem services. The toolkit addresses this gap and is designed to enable stakeholders with limited resources to gather robust and locally relevant ecosystem service information. | http://tessa.tools/ | Birch *et al.* (2014), Blaen *et al.* (2016); Blaen *et al.* (2015); Peh *et al.* (2013), Peh *et al.* (2015); Peh *et al.* (N.D.). |
| **Participatory GIS Tool (PGIS tool)** | The participatory GIS tool is an interactive website that is used to record perceptions about the natural environment. | The tool was developed with the aim of improving the understanding of how the general public perceive and value different landscapes and where they may experience cultural ecosystem services. | http://web1.adas.co.uk/pgis/ | Davies *et al.* (2015); Ecosystems Knowledge Network (2016a) |

### *3.2.4 Rationale and Evaluation Criteria*

Based on examining current ecosystem services tool literature, a list of twenty evaluation criteria were developed to describe important tool characteristics. In addition to the criteria usually highlighted in literature as being important for ecosystem services assessments (e.g. valuation systems, scalability, transferability, resource needs, data etc.)(Bagstad *et al*. 2013), the evaluation criteria described here also focused on qualitatively gauging each of the selected tool's capability to assess biodiversity, and the extent to which they contribute towards the achievement of biodiversity requirements, as well as investigating whether these tools have the capacity to assess ecosystem resilience.

The criteria were applied to each tool in order to assess its relative strengths and weaknesses. The evaluation criteria are listed in Table 3.2.

### Table 3.2. Evaluation criteria

| | Criteria | Evaluation |
|---|---|---|
| CONTET | ***Biodiversity representation*** | Does the tool incorporate biodiversity? If it does, how is it incorporated? Does the tool consider priority species and habitats? |
| | ***Ecosystem service representation*** | How are ecosystem services represented in the tool? For example, does the tool assess stocks, flows, opportunities etc? |
| | ***Building resilience*** | Does the tool examine ecosystem resilience? Are any of the *ecosystem resilience* attributes (‘*scale/extent, condition, connectivity, diversity and adaptability’*) measured? |
| | ***Cultural perspectives*** | Does the tool provide information that incorporates cultural perspectives? |
| | ***Valuation systems*** | Does the tool incorporate multiple valuation systems?<br>Does the tool provide information on intrinsic value? |
| | ***Engagement*** | To what extent are stakeholders involved with the tool, and at what stages of tool implementation? |
| APPLICATION | ***Resource requirements*** | Can the tool be independently applied? |
| | ***Tool accessibility*** | Is the tool freely available, or are there costs associated with its use? |
| | ***Transparency of tool*** | Is the tool open or closed? |
| | ***Transferability*** | Does the tool have the capacity for widespread use? |
| | ***Data*** | What are the key data requirements for the tool? |
| | ***Examples of Use*** | Where has this tool been applied? What has it previously addressed? |
| OUTCOMES | ***Land use scenarios*** | Does the tool have the capability to examine future land use? How does the tool achieve this? |
| | ***Evidence outputs*** | What sort of evidence can the tool produce? |
| | ***Scalability*** | At what scale(s) is the tool most applicable to? |
| | ***Policy and management*** | How does the tool contribute towards delivering policy and management objectives? |
| SWOT | ***Strengths*** | What is the tool’s internal strengths (with caveats)? |
| | ***Weaknesses*** | What are the internal weaknesses (with implications)? |
| | ***Opportunities*** | What are the external opportunities? |
| | ***Threats*** | What are the external threats? |

### *3.2.5 Applying the evaluation criteria to the selected tools*

The criteria were applied to the tools listed in Table 3.1, and the results are presented in Tables 3.3 (content), 3.4 (application), 3.5 (outcomes), and 3.6 (S.W.O.T) in Chapter 3 Appendix.

## 3.3 Strengths – common themes where tools contribute positively

### *a) Encouraging engagement*

A majority of the tools have the capacity to involve stakeholders during their application. Those that do have a stakeholder engagement component, do so in different ways and to different extents. For instance, LUCI facilitates participation and learning of different stakeholder groups, and engages them through its open rule-base, where assumptions made are transparent. This is a strength of the LUCI tool as it gains the stakeholders' trust early on in the tool's implementation and allows the incorporation of stakeholder knowledge to be built in early. Furthermore, engagement with stakeholders has also proven successful because of the 'on-the-fly' editing capabilities the tool has for its rule-bases and algorithms. Stakeholders are encouraged to update or correct any flaws in data/ rules and to enter their own requirements, with the tool revealing results promptly. This would contribute to the stakeholders holding a sense of ownership when engaging with the tool. Adding to this, the maps LUCI produces can aid the development of a common language within which ecosystem approach principles can be communicated to multiple stakeholders.

Engagement activities are a dominant element of the TESSA, and stakeholder engagement occurs at each stage of TESSA's methodological framework for conducting an ecosystem services assessment. The design of the toolkit ensures that collaboration with stakeholders occurs. During the crucial preliminary stage of the toolkit, the key task is to identify and engage with relevant stakeholders and decision makers who contribute by identifying habitats and key species (and their importance), suggesting possible plausible alternative future states, providing existing data, preparing for new data collection, and interpreting results. The tool advocates stakeholder involvement as an input into the assessment process. Their interpretation of results is crucial to the effectiveness of any mitigation response to be implemented as a result of the assessment carried out, as well as to more general biodiversity conservation interventions at the site (Peh *et al*., N.D). By making engagement an essential component of the toolkit, studies adopting TESSA have found it defuses existing tensions between stakeholder groups due to the sharing of information and better communication amongst them (Peh *et al*., 2013).

Engagement is encouraged in other ways by coordinating activities within project steering groups (e.g. EcoServ-GIS), consulting local experts and encouraging them to participate in the development of mapping rule-bases (SENCE), utilising their local knowledge and expertise for checking the validity and accuracy of spatial maps for a place (SENCE). Furthermore, tools like the PPGIS (Public Participation Geographical Information Systems) interface encourage engagement with the general public via a web mapping portal to capture perspectives on the places people value.

### b) *Cultural perspectives*

The tools SolVES, TESSA and PGIS have the capability to measure cultural aspects of ecosystem services. The literature on these tools commented on their capability to assess preferences and social values for ecosystem services assessments. For example, SolVES analyses non-monetary preferences and values, and considers non-use values in ecosystem service assessments. It achieves this by integrating attitude and preference survey results relating to perceived social values of natural features (e.g. forests) with data that characterises the physical environment of the study area (Sherrouse *et al*. 2011). SolVES has the potential to be used to quantify and illustrate the connections between social values, the attitudes and preferences that manifest these values, and the environmental characteristics, locations, and associated ecosystem services that elicit such values (Sherrouse *et al*. 2011).

TESSA offers guidance to help users understand and consider all services, for example, services important to distant beneficiaries but which are not recognised by local stakeholders (Peh et al. N.D.). The toolkit provides guidance to users on how to assess the distribution of ecosystem benefits between stakeholders according to both scale (local, national and global) and among different socio-economic groups (Peh *et al*. 2013). For the local scale, the toolkit provides advice on how to disaggregate the values held by the beneficiaries. The toolkit can be used to indicate who will be the 'winners' and 'losers' as a result of any change in the state of a site and the associated ecosystem service delivery (Peh *et al*. N.D.). A cultural ecosystem services module is planned for a future release of the TESSA toolkit[1].

The PGIS tool uses participatory mapping to capture cultural perspectives of Morecambe Bay. A Public Participation Geographical Information Systems (PPGIS) interface is used to collect spatial information directly from the public on where and why they value places within the Morecambe Bay area for recreation, local history, solitude, or to see or hear wildlife (Davies *et al*. 2015). Participatory mapping is an individual or group method that builds representations of spatial relationships among physical features. A strength of PGIS tools is that they support public participation and can be used to facilitate more frequent and rapid collection of social-values information (Sherrouse *et al*., 2014).

SENCE and EcoServ-GIS includes cultural ecosystem services in the assessments, but it was unclear from the literature the extent to which cultural perspectives were measured.

### c) *Spatial and temporal scales*

Natural systems have intrinsic scales of operation, differing across space and time. The tools were evaluated on the spatial scale that they can be applied to, and whether they had the scope to incorporate the temporal scale too.

[1] Version 2.0 of TESSA is now live (launched in December 2017) and includes the cultural ecosystem services module. http://www.cambridgeconservation.org/news/tessa-version-20

### *Spatial scale*

The tools fell into two categories: 1) those which were only applicable to one scale, for example, the Green Infrastructure Valuation Toolkit, TESSA, or Accounting for Biodiversity in Planning toolkit, where it was most appropriate to apply them at the site scale; 2) those which were appropriate for multiple scales. For example, SENCE can be applied at the local to national scale. However, the suitable scale of analysis is determined by the accuracy of the input data. LUCI can be applied at the landscape scale, from fields to catchments, whilst EcoServ-GIS, can also be applied to analyse ecosystem services from county to regional scale (the scale of the analysis is also strongly determined by the combination of data layers that go into the tool).

The services being supplied are available at the range of scales that ecosystems are organised (organism, patch, ecosystem, landscape, biome, global) which rarely meet governance and social levels of organisation (neighbourhood, local, regional, national, intergovernmental) (Small *et al*., 2017). As a result, this leads to a mismatch between point of provision (the supply) and the location it is most needed (demand) (Medcalf *et al.* 2014b). For example, the provision of Salmon fry upstream, and the demand for fish downstream when angling. Ecoserv-GIS is a useful tool to map the supply and demand of ecosystem services and how they flow across county and regional scales.

### *Temporal scale*

When considering the most appropriate tools to use within the Area Statements, it is important to consider whether they have been designed to incorporate temporal scale, in addition to being applied to the most appropriate spatial scale. Through evaluating the nine tools, it was often found that a majority of the tools use scenarios to examine alternative future states for a particular environment or place (i.e. how a landscape may change if future policy drivers drive land-use change). Scenarios provide alternative images of how future land use may play out, and are a popular tool for envisaging dynamic, uncertain and complex futures (Dockerty *et al.* 2006; Reed *et al.* 2013; Rickebusch *et al.* 2011). This method is useful for examining environments where the system is impossible to experimentally manipulate and test (Reed *et al*. 2013). In this review the tools were evaluated on whether or not they incorporated scenarios (or similar), and how this scenario capability was applied.

Ecoserv-GIS, Co$ting Nature, SENCE and TESSA have the capability to assess and explore alternative future states or scenarios to some extent. Three of these tools explore alternative future states by taking a spatial approach. For instance, EcoServ-GIS claims to be able to examine future scenarios by re-running the tool models with data representing potential future scenarios (Winn *et al*. 2013). The results are then quantified to see if there are differences in the ecosystem service capacity, demand or flow results. The SENCE tool bases its opportunity mapping on scenarios grounded in relevant policy drivers. In contrast, Co$ting Nature takes a baseline for current ecosystem service provision and takes policy relevant scenarios of change to better understand the impact these policies have on ecosystem service delivery (Mulligan 2017). Additionally, the LUCI tool examines how land-use change may be beneficial at the farm and landscape scale, and can be used to examine where existing features should have extra effort targeted to preserve them (Jackson *et al.* 2013).

TESSA approaches the exploration of alternative future states differently to the previous tools. Instead, it guides the users into applying a net benefits framework to examine two alternative states of a site of interest (Peh *et al*. 2013). Users are encouraged in the toolkit to take empirical measurements for alternative states (as opposed to creating hypothetical scenarios) and gather information about drivers of land-use change for the site being investigated (Peh et al. N.D.). Here it is essential that engagement with local stakeholders takes place so that plausible alternative states of the site being investigated can be identified (Peh *et al*., 2013).

### *d) Guidance on existing data use*

The provisions in the Environment (Wales) Act 2016 are designed to catalyse a change in management of Wales's natural resources to become more sustainable, proactive and integrated. Fundamental to the success of such an integrated approach is the unification of the evidence base.

Taking a holistic approach to evidence gathering would ensure that the supporting evidence base is not just restricted to environmental data, but also cultural, social and economic data. The data and information we currently have, and will continue to gather, are helping us to understand our environments, how they are changing, and the role being played by human activities in driving these changes. To be able to make the right decisions for the future, and to coordinate natural resource management, requires access to reliable and up-to-date information on how human and natural environments are evolving and interacting with each other.

The majority of the tools examined rely on these existing data. However, these existing data can often be difficult to locate/ identify and once access is granted, the skills and expertise of individuals or teams to overcome problems interpreting and combining the data are not always available. It is also important to develop mechanisms for information exchange and management. When examining the tools, some of guidance documents accompanying them were transparent about data and how they should or should not be used in the tools.

The tools examined are limited by the accuracy and resolution of the available and accessible input data. Existing data are the key inputs in to the spatial tools SENCE, Ecoserv-GIS, LUCI, and although used in Co$ting Nature and SolVES, it is to a lesser degree. Guidance for these tools needs to ensure users are informed of the limitations of using existing data, and for what purposes they are most suited too. SENCE and Ecoserv-GIS in particular provide guidance and information on the existing data these tools require.

For example, the age of the datasets need to be considered as these act as time-stamps on the analysis. If a land cover dataset is dated 2007, the final output map will also be for 2007, and the analysis is not a representation of current reality. Users should be aware of this. It is important to use the most up to date geographically linked accessible data available that describes the social and economic features of the landscape, which indicate levels of societal demand, with the environmental and biophysical features of the landscape, which indicate ecosystem service capacity over space *(Winn et al. 2013)*.

### 3.4 Weaknesses – common themes where tools are limited

#### *a) Uncertainty reporting*

Uncertainty is a key problem in decision making and research. Little information was found on how uncertainty is dealt with within these analytical tools. TESSA incorporates a guidance note to raise awareness amongst its users about the importance of considering uncertainty and how uncertainty can be derived.

#### *b) The plurality of beneficiaries*

There is a strong need to identify the values held by different beneficiaries, and thus their different needs and perceptions. This information is key to understanding what individual beneficiaries consider important and what motivates them, helping to inform trade-offs, and resolving potential social conflicts in an area (Martín-López *et al.* 2012).

To understand the complex socio-cultural values held by beneficiaries requires an exploration of the relationship between places, people, and the values they reflect and sustain at a range of scales (Small *et al.*, 2017). With the exception of TESSA, SoIVES and the PGIS tool, the other tools evaluated do not begin to examine the plurality of beneficiaries and the social values in a location.

PPGIS and participatory mapping elicits knowledge and can contribute towards the teasing out of preferences expressed by stakeholders, often revealing the different motivations, agendas and thus potentially competing demands individuals, or groups of beneficiaries may have for their environment. The participatory mapping method encourages communication and learning among different stakeholders, as well as encouraging co-learning. When multiple stakeholders are involved, discussions between these stakeholders are needed to become aware and address diverse knowledge, experiences and values (Keen and Mahanty 2006). Participatory mapping methods are not often used alone and should be used as part of a series of methods.

#### *c) Monetary valuation*

Only two of the tools evaluated had monetary valuation capability included within them.

- The Green Infrastructure Valuation Toolkit gives the benefits of green infrastructure an economic value. The toolkit allows the user to conduct a cost benefit assessment and produce an economic value summary. The economic valuation aspect of the tool means that it has the potential to translate findings into a business case (Natural Economy Northwest *et al*. 2010).
- TESSA provides biophysical and monetary units, but does not provide full economic valuations (Peh *et al*. 2013; Peh *et al*. N.D.).

## 3.5 Linking toolkits to nature recovery and ecosystem resilience

### *3.5.1 Consideration of biodiversity*

A majority of the spatial tools evaluated use land cover/ habitat data as the underpinning dataset to connect biodiversity to the delivery of ecosystem services. SENCE also combines data on species, soil, geology, landform and land management information. EcoServ-GIS also suggest using additional BAP datasets to update the habitat base map attributes.

The SENCE tool maps the existing biodiversity resource, focusing on three elements:

1. Naturalness, which is defined through the use of spatial information on habitats (Phase 1 habitat survey)
2. Diversity (species), which is defined through the use of spatial data on notable species (international, national and local importance)
3. Location within the landscape (which is defined by examining the connectivity of the habitats and establishing which habitats are well connected and which are potentially degraded due to fragmentation).

This tool also includes a future perspective of biodiversity provision by mapping the opportunities for biodiversity enhancement and nature conservation. In the Scottish Borders, the mapped areas show where there is a significant opportunity to enhance large blocks of native habitats, see Environment Systems Ltd (2013).

The Accounting for Biodiversity in Planning (Wales version) toolkit evaluates biodiversity loss and gain through development and assessment of avoidance, mitigation and where necessary compensation measures (Environment Bank 2016). It aims to guide local authorities to introduce a transparent and auditable framework for accounting for biodiversity, delivering their biodiversity obligations under the Environment (Wales) Act 2016 (Environment Bank 2016). It aims to deliver proper ecological accountability for proposed developments and the accounting within the toolkit is designed to demonstrate and deliver *'No Net Loss'* of biodiversity for impacts to all habitats which contribute to biodiversity (including low value habitats) (Environment Bank 2016).

### *3.5.2 Consideration of intrinsic value of biodiversity*

Here the tools were evaluated on whether they consider priority species and habitats. Species and habitats have been prioritised on the basis that they are important, and are not derived from a utilitarian based process, but on a process that examines their rarity, rate of decline, and the level of threat to the species. The importance assigned is a product of the shared view that there is intrinsic value to them and require conservation action under the UK Biodiversity Action Plan (UK BAP).

TESSA does not assign ecosystem service values to specific species, as the toolkit is based around sites. The way the toolkit could connect with species or biodiversity is through examining the ecosystem service values of a site where the species or high biodiversity is known to exist. For example, if the toolkit was being applied to a site designated as a Special Protection Area (SPA), intrinsic value is being implicitly applied as it is already known that the area is important for bird species under Article 4 of the EC Birds Directive. Therefore, the toolkit helps to examine the other human benefits these sites provide.

Other tools incorporate intrinsic value implicitly through the use of datasets that represent the locations of priority species and habitats. For example:

- The SENCE tool incorporates existing datasets on important species (internationally, nationally and locally) in its mapping of biodiversity features (Environment Systems Ltd 2013, 2014).
- For Ecoserv-GIS Biodiversity Action Plan (BAP) habitat data are optional datasets users can include to update the attributes of the habitat base map that feeds into the ecosystem service mapping. These data are implicitly describing the intrinsic value of species as the BAP data are collected on the shared view that certain priority species are important in their own right, and it is important to know the location and extent of these species.

From the literature on the other tools evaluated it is not clear the extent to which the tools incorporate (implicitly, explicitly) intrinsic value of biodiversity.

### *3.5.3 Incorporation of attributes of resilience*

The tools were evaluated on whether they incorporated the attributes of ecosystem resilience.

It was found that very few of the tools incorporate components of ecosystem resilience. The tool that has progressed the most with incorporating ecosystem resilience is SENCE. It does this through its mapping of biodiversity resilience and networks. Here the value of a habitat parcel for biodiversity resilience is assessed in the tool by considering patch size, vulnerability and connectivity and is demonstrable in the Scottish Borders Land Use Strategy project (Environment Systems Ltd 2013). The mapping included important habitats scored by their patch size and the type of habitat present. Further weighting was given to those habitats within networks, as an assumption was made that habitats that are well connected are likely to be more resilient and less likely to suffer edge effects (Environment Systems Ltd 2013, 2014). More recently, the SENCE tool was used to map '*habitat based erosion control'* in '*The State of Natural Resources Report'* (Natural Resources Wales 2016).

Ecoserv-GIS focuses on current ecosystem service delivery and does not incorporate information on ecological resilience or habitat state (Winn *et al.* 2013). This is also true for TESSA, which does not currently examine ecosystem resilience, nor does it explore non-linearities and tipping points (Peh *et al.* 2013). LUCI was also found to analyse habitat connectivity in its mapping by utilising Forest Research's BEETLE tool, which is based on a least cost model approach.

Whilst the Excel based Accounting for Biodiversity in Planning (Wales version) toolkit assesses development impacts to biodiversity by relating it to distinctiveness, rarity, condition and supported wildlife populations, location, as well as habitat type and extent of habitat loss.

## 3.6 Conclusions and recommendations

No single tool provides all the answers. A suite of tools (including tools not reviewed here) will be required to answer questions on ecosystem resilience and biodiversity priorities and assist in the creation of an effective area-based approach in Wales.

It is important to not look at things in isolation. Each of these tools can provide different insights. It is key not to simply focus on a single toolkit or tool, or a single aspect of the system being investigated. A combination of methods and implementation design is required to determine if the tool is fit for the purpose for which it has been selected. For example, there are potential opportunities to use TESSA data to feed into landscape scale decision tools.

### *3.6.1 General principles*

Currently, there is no consensus on which ecosystem service tools are best used for a specific purpose and for what circumstances (Schägner *et al*., 2013). When choosing the most appropriate ecosystem services tools/ toolkits to use in the creation of Area Statements and in the development of interventions for SMNR, the following points should be considered as minimum requirements:

- Sufficient data availability
- Understanding of the characteristics of the study area
- Availability of sufficient resources
- Clarity over the policy context and the scientific purpose of the study

### *3.6.2 Specific recommendations*

#### *Selection of tools*

When assessing which tools to use for the area statements, we conclude that general tools should be used as a first step, with more context specific tools applied in a more precise way to narrow the focus. An alternative and equally valid approach is to select a number of tools to test and apply to the same geographic area, where the outputs can be compared and contrasted to assess which tools provide the most useful and robust outputs. It is essential to clearly communicate the purpose and usefulness of the tools to ensure that the tools are used effectively.

#### *Participation*

It is important to encourage high levels of participation, however, what needs to be considered is how to manage the associated risks of finding out what people really value in their landscapes, and what can realistically be prioritised in the Area Statements. It can be difficult to involve all stakeholders in every decision made about natural resource management, due to budget and resource restraints. Thought needs to be given to strategies and tools (including ones not discussed in this review) that need to be put into place in order to best represent local people and their perspectives on natural resources, including biodiversity.

### *Datasets*

Links should be clearly understood and where possible enhanced between existing datasets and ecosystem service tools. For instance, some of the spatial tools discussed in this review require data that are not comprehensive and are more appropriate to use in urban environments due to the characteristics of the baseline data e.g. EcoServ-GIS, which uses Ordnance Surveys MasterMap Topography layer[2]. This dataset does not provide adequate detail for rural areas, and therefore a tool that utilises the Habitat Survey of Wales (Terrestrial Phase 1 data)[3] or Land Cover Map 2007[4] may be more appropriate in these areas.

To gain a better understanding on what data are available and to assess access to this information on biodiversity and ecosystem services there needs to be an evaluation in order to incorporate more existing biodiversity data (e.g. species) into ecosystem service tools.

### *Key parameters for consideration*

Depending on the services being examined within the proposed area statements, some of the key parameters to be considered when connecting ecosystem services to biodiversity will be determined by the evidence-base available, and could include some of the following:

- EU exit and potential legislative changes
- governance structure,
- land management,
- agri-environment status (in-scheme/ out-of-scheme)
- socio-economic characteristics
- temporal scale
- spatial scale
- designation status
- extent of area protection
- naturalness (semi-natural types, truly natural habitats in the UK are rare)
- size (extent/population size)
- rarity
- diversity
- fragmentation & connectivity (proximity to other high biodiversity areas)
- availability and accessibility of habitat and species data (includes priority and non-priority)
- longevity of data
- age of dataset (useful for longitudinal studies)
- resolution, accuracy, coverage, and supporting metadata

However, each situation, and the parameters used, will need to be considered within its own context.

[2] Ordnance Survey MasterMap: https://www.ordnancesurvey.co.uk/business-and-government/products/topography-layer.html
[3] Terrestrial Phase 1 habitat survey: http://lle.gov.wales/catalogue/item/TerrestrialPhase1HabitatSurvey/?lang=en
[4] Land Cover Map 2007: http://www.ceh.ac.uk/services/land-cover-map-2007

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## Chapter 3 Appendix. An evaluation of ecosystem services toolkits

| Table no. | Analysis type | Criteria for analysis | | | | | |
|---|---|---|---|---|---|---|---|
| 3 | Content of the tools - biodiversity, resilience and ecosystem services | Biodiversity representation | Ecosystem services representation | Building ecosystem resilience | Cultural perspectives | Valuation systems | Engagement |
| 4 | Application of the tools | Resource | Accessibility | Transparency | Transferability | Data | Examples of use |
| 5 | Outcomes of the tools | Future alternative states | Evidence outputs | Scalability | Policy and Management | | |
| 6 | SWOT analysis | Strengths | Weaknesses | Opportunities | Threats | | |

| Tool no. | Tool name |
|---|---|
| 1 | Accounting for Biodiversity in Planning (Wales version) |
| 2 | Co$ting Nature |
| 3 | EcoServ-GIS |
| 4 | Green infrastructure Valuation toolkit |
| 5 | LUCI |
| 6 | SENCE |
| 7 | Social values for ecosystem services (SolVES) |
| 8 | TESSA |
| 9 | Participatory GIS Tool |

Table 3.3 - Content of the Tools (Biodiversity, Resilience and Ecosystem Services)

| Tool no. | Tool name | Biodiversity representation | Ecosystem service representation | Building ecological resilience | Cultural perspectives | Valuation Systems | Engagement |
|---|---|---|---|---|---|---|---|
| 1 | Accounting for Biodiversity in Planning (Wales version) | The tool incorporates biodiversity by evaluating loss and gain through the development and assessment of avoidance, mitigation and where necessary compensation measures. | Not included. | The toolkits process of assessing impacts relates to distinctiveness, rarity, condition and supported wildlife populations, location, as well as habitat type and extent of habitat loss. | Not included. | Identifies the feasibility of a project, and the best mitigation hierarchy measures. This contributes to cost calculations for compensating impacts to biodiversity. Valuation of ecosystem services goes beyond scope of this tool. | Specifically for local authorities, and engaging with local authority personnel and developers. |
| 2 | Co$ting Nature | Biodiversity index that combines relative species richness of animals. | The tool compares overall service aggregation with biodiversity and conservation priorities. It estimates and aggregates values to create bundled services index for potential and realised services by accounting for ecosystem service provision, beneficiary locations, and flows. | Information on ecological resilience is not incorporated in this tool. | Not included. | Does not support individual ecosystem service valuation. | Literature on the tool does not give clarity on this. |
| 3 | EcoServ-GIS | The tool incorporates biodiversity through the use of ecological networks, and can be used to identify biodiversity opportunity areas for enhancement. | The tool quantifies the supply (capacity) of ecosystem services and the demand of those ecosystem services. The flow of services to beneficiaries is mapped. | Information on ecological resilience is not incorporated into the tool. | Not enough information is given in the literature about the tool to comment. | Does not support monetary valuation. | Engagement activities are coordinated via a project steering group. |
| 4 | Green infrastructure Valuation toolkit | Biodiversity is advocated in the toolkit as providing non-use values to society. A 'willingness to pay for protection or enhancement of biodiversity' tool is included in the toolkit. | Includes 14 ecosystem services across regulating and cultural services. | Information on ecological resilience is not incorporated into the tool. | Incorporates non-use valuation for some of the tools in the toolkit. | The tool looks at how the range of green infrastructure benefits can be valued, 1) use of economic valuation techniques, 2) quantitatively and 3) qualitatively. | No information is given on direct engagement with beneficiaries/ stakeholders or how this is achieved. |
| 5 | LUCI | The tool identifies areas of existing high value for biodiversity, highlighting them to stakeholders as being worthy of protection. | Includes 5 ecosystem services. The tool analyses where trade-offs and synergies between these services exist. Tool supplies ecosystem flows. | Habitat connectivity is analysed and mapped in the tool. One of the key attributes of building ecological resilience. | The tool does not have capacity to develop shared understanding of many identities and values of places from the perspectives of multiple stakeholders. | This tool does not incorporate valuation. | The tool facilitates participation and learning by many different stakeholder groups. This is a useful negotiating tool. |
| 6 | SENCE | Biodiversity is represented in the ecosystem services stock and opportunity mapping. The tool maps existing biodiversity resource and biodiversity resilience and networks. The tool also creates a map illustrating the areas that could potentially enhance biodiversity and nature conservation'. | 19 services across provisioning, regulating and cultural groups. The tool produces stock, opportunity, interaction and multi-benefit mapping. | The tool has been used to map biodiversity resilience and networks which includes patch size, vulnerability and connectivity. | The tool does not explicitly incorporate socio-cultural values. | This tool does not incorporate monetary valuation. | Encourages stakeholder engagement. Local experts are consulted and encouraged to participate with developing the rule base. Stakeholder engagement also feeds into checking the validity and truthing of the mapping. |

| Tool no. | Tool name | Biodiversity representation | Ecosystem service representation | Building ecological resilience | Cultural perspectives | Valuation Systems | Engagement |
|---|---|---|---|---|---|---|---|
| 7 | Social values for ecosystem services (SolVES) | Not enough information is given in the literature to determine the extent to which biodiversity is incorporated. | The tool has capacity to assess, map, and quantify social values into ecosystem service assessments such as aesthetics, biodiversity, and recreation by deriving social-value map. | The tool does not incorporate ecological resilience. | Incorporates quantified and spatially explicit measures of social values into ecosystem service assessments. | The tool analyses non-monetary preferences and relative values of stakeholders for ecosystem services. Considers non-use values (option, existence and bequest value). It derives a non-monetary value index from responses to public attitude and preference surveys. | Public domain tool for decision makers and researchers to help facilitate discussion amongst diverse stakeholder groups. |
| 8 | TESSA | The toolkit measures ecosystem services to strengthen arguments for conserving important sites for biodiversity. It defines sites of biological importance and perceived threats to it. | 5 ecosystem services are included. It helps users identify which ecosystem services to assess, what data are needed to measure them, and which methods or sources could be used in different contexts. | This toolkit does not currently incorporate ecological resilience, nor does it explore non-linearities and tipping points. | Provides guidance on how to disaggregate social values at the local level. | Biophysical and monetary units, but does not provide full economic valuations this will be in a future release. | Toolkit gives guidance on the processes of engaging with stakeholders and decision makers in the preliminary stage of the framework. |
| 9 | Participatory GIS Tool | The tool captures cultural perspectives on the places people value for seeing or hearing wildlife. | The tool focuses on 5 cultural ecosystem services. The participatory mapping approach is used to capture information on the locations where people experience cultural ecosystem services. | Ecological resilience goes beyond the scope of this tool. | The tool aims to improve the understanding of how the public perceive and value different landscapes. The tool captures information on why places are valued by people for recreation, local history, solitude, to see or hear wildlife. | Tool does not support monetary valuation. | The tool encourages engagement with the general public and those familiar with the Morecambe Bay area through the PPGIS interface and survey. |

**Table 3.4 - Application of the Tools**

| Tool no. | Tool name | Resource requirements | Accessibility | Transparency | Transferability | Data | Examples of Use |
|---|---|---|---|---|---|---|---|
| 1 | **Accounting for Biodiversity in Planning (Wales version)** | The author of the toolkit offers support and training for those wishing to use the toolkit. Requires Excel as an Excel based calculator is incorporated in the toolkit. | Toolkit can be downloaded from: http://www.environmentbank.com/files/eb-planning-toolkit-wales.pdf | It is a publicly available toolkit. Utilises the documented 'Biodiversity Metric', created by DEFRA and Natural England. | Transferable across local authorities and planners. | #N/A | South and Vale Local Authority (Oxfordshire) – applied metric to assess impacts and calculate a compensation scheme for a housing development in the Vale of White Horse. |
| 2 | **Co$ting Nature** | Basic internet use skills. Requires an internet browser. No GIS capability required if using the data supplied with the tool. | Net based tool. Open access for non-commercial use. | It is fully documented and user support is provided. Information on algorithms are not discussed in the model documentation. | Generalisable sacrificing detail at the local scale. | Pre-loaded global datasets at 1 $km^2$ or 1 ha resolution. Users can use their own data. | Used to examine biodiversity, ecosystem services, pressures, threats and conservation priorities in the UK. Also used in Amazon rainforest, Brazil. |
| 3 | **EcoServ-GIS** | GIS User with intermediate-expert level skills. ArcGIS and spatial analyst extension required. One to four months of GIS staff time to create mapped outputs. | Open access tool and open to being modified. Restrictions if users do not have spatial analyst. | Open source tool is open. The background models can be modified and adapted. An extensive user guide accompanies the tool which explains the models. | The ecosystem service maps produced relate to the urban/ peri-urban areas. It is less appropriate for exclusively rural areas (upland landscapes) and those landscapes lacking urban areas. | The tool requires Ordnance Survey's Mastermap Topography data. A wide range of optional data can also be used. Licensing is dependent on data used. | Durham BAP area; ARC Project - Horsham; Cumbernauld, North Lanarkshire; Pilot studies - Somerset, Sussex and Northamptonshire Wildlife Trusts. |
| 4 | **Green infrastructure Valuation toolkit** | It requires Microsoft Excel. The toolkit requires data to be collected which could take some time. No specialism is required to use this toolkit. However, a user with good research skills and familiarity with urban planning, the environmental field or economics would be best suited to use this tool. | Open access tool with a creative commons attribution non-commercial 3.0 unported licence. | The tool guides a user through the valuation process, so how the values are generated can be understood by the user. | There is overlap between some of the toolkit models so the user must make sure no double-counting occurs. | Examples of data required include: tree cover, local populations etc. Land cover is an optional dataset. | The focus has been on urban case studies. E.g. Belvedere, Erith and Thamesmead in London. |
| 5 | **LUCI** | Requires some experience of modelling to apply the tool. Intermediate GIS skills. Needs ArcGIS v10.x | Currently not freely available and requests to use the tool are considered on a case by case basis. | This tool is closed. It is not possible for users to see how the tool works in the background. | Focus on agricultural landscapes. Field to 10,000 $km^2$ scale. | Designed to cater for data scarce environments. Key data need include: elevation, land use and soil data. Stakeholder engagement fills data deficiencies at the local scale. | **Wales**: Conwy catchment, Pontbren, Glastir monitoring and evaluating programme (GMEP); **England:** Bassenthwaite and Lowes Water catchments. **International:** New Zealand, Ghana, Greece. |
| 6 | **SENCE** | No resource requirements from the user. The tool is run as a consultancy service. If GIS layers have been purchased as part of a consultancy service, GIS software will be needed to analyse the data further. | This is a consultancy service. GIS files, maps and reports including the rule-base that supports the analysis are free to use by the user who commissioned Environment Systems. | As the tool is offered on a consultancy basis, the full rule-base and assumptions made in the mapping are only revealed to those who purchased the service and who are involved in the project partnership. | Place based approach - Takes in the context of a place by examining the habitat, what it is on (soils/geology), where in the landscape it is, and management. | Uses a wide range of existing data but as a minimum the tool uses: habitat type, geology, soils, a digital terrain model and management information. | UK Examples include: **National:** SoNaRR mapping (NRW); **Regional:** Scottish Borders pilot regional land use framework; Bridgend County Borough Council; Norfolk; Galloway and Southern Ayrshire Biosphere; Dyfi Biosphere; **City/ Local:** Winchester City Council |

| Tool no. | Tool name | Resource requirements | Accessibility | Transparency | Transferability | Data | Examples of Use |
|---|---|---|---|---|---|---|---|
| 7 | **Social values for ecosystem services (SolVES)** | GIS software is needed to work with grid based rasters. It is an add-in toolbar to be installed into ArcGIS. Requires Maxent Maximum Entropy modelling software. An understanding of statistical analysis and familiarity with Maxent modelling is beneficial. It is time consuming for new studies where primary data needs to be collected. | Tool can be accessed here: https://solves.cr.usgs.gov/ | A user guide accompanies the toolkit. Explains the 3 models the tool is based on. Information on the background algorithms and values are not explicitly stated, but the process flows are described and illustrated. | The tool was originally developed for use in America. The tool has low transferability due to the value transfer model not successfully estimating values at new sites. | The tool requires geospatial and tabular data as inputs for the 3 models. The tool is for mapping and analysing already collected social survey response data. | Pike and San Isabel National Forests, USA. Few case studies found in literature where this tool has been applied. |
| 8 | **TESSA** | The toolkit provides information on appropriate methods to use. The chosen methods will be dependent on the user's time availability, resources, expertise and the extent to which useful data has been already collected. | Toolkit is free to download by submitting a simple form at 'tessa.tools'. Further information on the toolkit is also provided via a webinar and published articles. | This is an open and accessible toolkit that provides guidance on low-cost methods for how to evaluate the benefits people receive from nature. | Toolkit can be adapted to the user's circumstances. However, a limited number of ecosystem services are covered in the toolkit. | The toolkit uses existing data, with emphasis on enabling users to collect new field data. | 24 sites have piloted this toolkit. Sites include: Middleton Lakes Nature Reserve in Staffordshire, UK. Wicken Fen National Nature Reserve, UK. Centre Hills on Montserrat. Quarry Curfs, The Netherlands. |
| 9 | **Participatory GIS Tool** | To access the online survey and mapping, a computer with an internet connection is required. The user needs to be familiar with using the internet. | The tool can be accessed here: http://web1.adas.co.uk/pgis/ | The PPGIS method used is not documented openly. | The tool is currently restricted to the Morecambe Bay region in North West England. However, the general principles of PPGIS can be transferred into other locations and contexts. | User opinion is required and further supplementary information is welcomed through adding notes and photographs. | Morecambe Bay region, UK. |

**Table 3.5 - Outcomes of the Tools**

| Tool no. | Tool name | Future alternative states | Evidence outputs | Scalability | Policy and Management |
|---|---|---|---|---|---|
| 1 | Accounting for Biodiversity in Planning (Wales version) | Beyond the scope of this tool. | The toolkit helps local authorities introduce a transparent and auditable framework for accounting for biodiversity and helping them to deliver biodiversity obligations. | Site scale for planning applications. | Helps local authorities to put into place a transparent and auditable framework for accounting for biodiversity, which contributes to them meeting their obligations under the Environment (Wales) Act 2016. The toolkit provides information on how to investigate and implement biodiversity accounting and compensation approach to a '*No Net Loss*' in planning and development. |
| 2 | Co$ting Nature | The tool incorporates scenarios for climate and land-use change. Users can apply scenarios and examine impacts in terms of change in ecosystem services and implications for beneficiaries. | The tool helps to calculate the distribution of ecosystem services, combined with maps of conservation priority, threatened biodiversity and endemism to understand spatial distribution of critical ecosystems. | Landscape scale; local to global. | It provides a means of testing the development and implementation of conservation strategies focused on sustaining and improving ecosystem services and their environmental foundations. The tool calculates the ecosystem service baseline and allows interventions to understand the impact this will have on ecosystem delivery. |
| 3 | EcoServ-GIS | Future alternative states can be examined by re-running the tool boxes with data representing potential future or theoretical scenarios. The outputs can be quantified to see if there is differences result in ecosystem service capacity, demand or flow. | The tool provides maps for nine ecosystem services. These are fine scale and illustrate human demand for ecosystem services, as well as the capacity of the natural environment to provide these services. It provides transparent and holistic information on wide ranging consequences of the way we use our environment. | County to regional scale. | The maps help to assist decisions on the management of sites or nature reserves over a range of scales. The tool contributes towards holistic management of land integrating social, ecological and economic perspectives into environmental valuations and assessments. This enables the identification of where changes in land management can enhance the range of ecosystem services provided, and the amount of people/wildlife they benefit. The tool helps to identify areas where natural services are being compromised/ overwhelmed, where too much human pressure is being put on the natural resource. |
| 4 | Green infrastructure Valuation toolkit | The tool does not incorporate future alternative states and scenarios. | The tool produces broad assessments of monetary, quantitative and qualitative values. | Local scale. | The tool assesses the benefits associated with green assets and proposed green investments. The toolkit provides information to help the stakeholders choose between different green infrastructure approaches. |
| 5 | LUCI | The tool explores how land-use change may be beneficial or examines where existing features should be preserved. | The tool produces maps indicating value and opportunity for change and data tables on ecosystem service changes. | Landscape scale - individual fields through to catchments. | The tool provides decision support at farm and landscape scales. The tool helps to prioritise existing features, preservation and identifying opportunities for landscape change. The tool can help visualise the benefits of nature conservation and designated species. |
| 6 | SENCE | The opportunity mapping uses scenarios based on key policy drivers, and evaluates different land-use options. | The tool produces maps, statistics, diagrams and an interpretative report. A series of ecosystem services maps on stock, opportunities, interactions and multi-benefits are produced. | Local, landscape, regional and national. | The aim of the tool is to help government and industry take an ecosystem approach. The tool has been used to examine how key policy drivers influence decision making and the spatial and temporal distribution of ecosystem services. The outputs created in previous studies illustrate how evidence can be analysed to build a spatial picture of the potential opportunities for sustainable management. |
| 7 | Social values for ecosystem services (SolVES) | Not incorporated in this tool. | The tool generates social-value maps of ecosystem services. | Watershed or landscape scales | Policy makers and researchers can use this tool to evaluate the social values of ecosystem services to facilitate discussions among diverse stakeholders regarding the tradeoffs amongst stakeholders. |

| Tool no. | Tool name | Future alternative states | Evidence outputs | Scalability | Policy and Management |
|---|---|---|---|---|---|
| 8 | TESSA | The toolkit guides users into applying a net benefits framework by applying appropriate methods to examine two alternative states of a site of interest. As part of this, drivers of change are identified, and in combination with knowledge of the local context; local stakeholders help to identify the most plausible alternative state/states of a site. | Although the toolkit is simple, it provides scientifically robust information on ecosystem services and is a helpful first step to guide practitioners on whether more detailed studies are needed and if so, what type of study is most appropriate. It helps to indicate who will be the winners and losers as a result of any change in the state of a site and associated ecosystem service delivery. | Site scale assessments. The outcomes can be scaled up for wider communication. | Information collected at the site scale is valuable for establishing whether there are utilitarian, as well, as intrinsic arguments in support of conserving particular areas. The toolkit can help inform decision makers whether conserving or restoring a site has broader benefits to society. Improves understanding of ecosystem services, promotes consideration of diverse values of nature more widely in national and local decision making. |
| 9 | Participatory GIS Tool | Not incorporated in this tool. | For Morecambe Bay, heat maps were generated by combining survey results with other GIS data to identify areas that provided multiple cultural service values. No further information is provided on the results of the PPGIS survey. | Local, regional scale | The PPGIS method demonstrates how cultural service information could be used to inform land management decisions through disclosing the locations and opinions of locations that are important for cultural services and furthermore human wellbeing. |

**Table 3.6 - SWOT analysis of the tools**

| Tool no. | Tool name | Strengths | Weaknesses | Opportunities | Threats |
|---|---|---|---|---|---|
| 1 | Accounting for Biodiversity in Planning (Wales version) | Accessible quantitative assessment of impacts using a 'biodiversity metric'. The toolkit guides users to conduct appropriate calculations of any necessary compensation from the impacts of development. | Local authority use only. Indicative calculator is useful for getting a feel for the metric but is not suitable for the site specific calculations. | #N/A | #N/A |
| 2 | Co$ting Nature | Low time requirements and can be implemented by non-experts. Rapid analysis of indexed, bundled services, along with conservation priorities. | The application of the tool with own data can take longer to apply due to level of processing, format, consistency of data and whether GIS capability is required. | #N/A | Website being unavailable. |
| 3 | EcoServ-GIS | Simple tool for use within urban/ peri urban areas to produce ecosystem service supply and demand mapping. | Less appropriate for exclusively rural areas. | #N/A | Cost of obtaining and maintaining the proprietary software licence for the tool. Level of GIS expertise needed. |
| 4 | Green infrastructure Valuation toolkit | Easy to use guide which users can work through to value a number of 11 benefits. It is a high level means of communicating green infrastructure benefits in economic contexts. It also makes the benefits of green infrastructure visible to potential funders. | The user needs to use their intuition to select the green infrastructure features relevant to their case study and not to add the other benefits to the assessment. Toolkit does not give guidance on how to deal with uncertainties. | The Toolkit can illustrate where considerable improvement and expansion of the evidence base is needed. Collaboration amongst stakeholders can help to locate sources of improved evidence. | Still ongoing work to do on understanding the relationship between biodiversity, ecosystem functioning and wellbeing. |
| 5 | LUCI | Simple tool designed for transparency and includes a stakeholder engagement process. It illustrates trade-offs between 5 services through the use of novel algorithms. | The tool does not report on uncertainty. No monetary valuation is included in the tool. Mostly focused on an agricultural system. | Enables land managers and other key stakeholder groups to visualise services more effectively. | Level of GIS expertise needed. Data gaps may limit overall tool effectiveness and the outcomes. |
| 6 | SENCE | Tool is supported by an extensive database of scientific literature, and local knowledge is incorporated into rule-base development. Rule-base and mapping are both iterative processes. It has proven application in England, Wales and Scotland for addressing sustainable management of natural resources for decision making. The tool can take into account local biogeographical context of an area that can impact an assessment. | Tool is not open access. The tool does not have economic capability and cannot be used for monetary valuation. Scale of analysis is related to the accuracy of the input data. | Enables land managers and other key stakeholder groups to visualise services, see opportunities for enhancing. | Data gaps and quality of available data may limit overall tool outcomes. |
| 7 | Social values for ecosystem services (SolVES) | Examines socio-cultural values in ecosystem service assessments which many ecosystem services do not do. | It does not state how it handles uncertainty. | #N/A | Level of GIS expertise. Familiarity with statistical analysis and the Maxent Maximum Entropy approach. |

| Tool no. | Tool name | Strengths | Weaknesses | Opportunities | Threats |
|---|---|---|---|---|---|
| 8 | TESSA | Simple yet detailed toolkit that users can use who have limited capacity and resources to measure ecosystem services. | Cannot provide assessments to translate directly to payment for ecosystem service schemes (PES). It does not assess all ecosystem services. It does not provide total economic valuations. No standard blue-print provided for assessments as the toolkit needs to be adapted to the local context. Does not incorporate ecological resilience. | Results can be used to inform other local/regional analytical ecosystem service tools. | #N/A |
| 9 | Participatory GIS Tool | Simple to use tool for a non-expert audience. The PPGIS method is an effective way of incorporating people's opinions and values into the local decision making. | The tool has a limited geographical scope. It currently focuses on three areas in the Morecambe Bay region. There are possibilities of introducing bias with well known areas vs. less well known areas. | This approach could be adopted by decision makers and local authorities to collect socio-cultural values from different sectors across a wide area. PPGIS approach used could be transferred to other geographical locations and tested. The approach could be adapted to focus on biodiversity related concerns. The dataset could be incorporated into further spatial analyses, contributing to the evidence base in development related decisions e.g. in aesthetically important landscapes. | Relies on user participation to generate meaningful data. Cost of development vs. response rate. |

## Key references for the tables

| Tool | Key References |
|---|---|
| Accounting for Biodiversity in Planning (Wales version) | Environment Bank (2016) |
| Co$ting Nature | Bagstad et al. (2013); Howard et al. (2016); Mulligan (2017) |
| EcoServ-GIS | Durham Wildlife Trust (2014);Howard et al (2016); Rouquette and Holt (2016); Southgate (2016); Winn et al. (2013) |
| Green infrastructure Valuation toolkit | Howard et al (2016); Natural Economy Northwest et al. (2010) |
| LUCI | Bagstad et al (2013), Howard et al (2016), Jackson et al. (2013), National Ecosystem Approach Toolkit (2014). |
| SENCE | Environment Systems Ltd (2013); Howard et al (2016), Medcalf et al. (2012), Medcalf et al. (2014a),(Ecosystems Knowledge Network 2016b); Natural Resources Wales (2016); Vorstius and Spray (2015). |
| Social values for ecosystem services (SolVES) | Bagstad et al. (2013); Sherrouse et al. (2014), Sherrouse et al. (2011). |
| TESSA | Birch et al. (2014), Blaen et al. (2016); Blaen et al. (2015); Peh et al. (2013), Peh et al. (2015); Peh et al. (N.D.). |
| Participatory GIS Tool | Davies et al. (2015); Ecosystems Knowledge Network (2016a) |

Sustainable Places Research Institute
Sefydliad Ymchwil Mannau Cynaliadwy

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# Chapter 4.

# The relationship between biodiversity and ecosystem resilience

July 2018

**Biodiversity and the area-based approach in Wales**

**How can the sustainable management of natural resources (SMNR) framework deliver nature recovery?**

# About this report

The Royal Society for the Protection of Birds (RSPB) Cymru commissioned Cardiff University's Sustainable Places Research Institute to develop a report which addressed the question, "how can Area Statements in combination contribute to achievement of biodiversity targets in Wales?"

To tackle this question, literature reviews and meta-analyses were conducted on four key topics – the legislative and policy context in Wales, comparable international approaches, evaluating ecosystem services toolkits for biodiversity/ resilience provision, and the relationship between biodiversity and ecosystem resilience. In addition, the University partnered with Bridgend County Borough Council, REACH and the Ecosystems Knowledge Network to design and host a stakeholder workshop to explore the question on a more local scale.

The report is divided into five chapters, and is accompanied by a 'Summary and Key Findings' document which brings together the conclusions from all five chapters, and demonstrates how it is possible for the Area Statement process to be an effective means of ensuring Wales meets its biodiversity objectives.

# Full report contents



**The full report, its individual chapters and the summary can all be downloaded from** http://bit.ly/SPRIareastatements

**Recommended citation:**

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# Contents



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# 4. The relationship between biodiversity and ecosystem resilience

## 4.1 Context and aims of the work

The purpose of this chapter is to understand the current state of the research on the role that biodiversity plays in achieving resilient ecosystems. Section 6 of the Environment (Wales) Act 2016 introduced an "enhanced biodiversity and resilience of ecosystems duty (the S6 duty)" for public authorities, which requires that they "seek to maintain and enhance biodiversity so far as consistent with the proper exercise of their functions and in so doing promote the resilience of ecosystems". To comply with the S6 duty public authorities "should embed the consideration of biodiversity and ecosystems into their early thinking and business planning… as well as their day to day activities" (see Chapter 1 for more information). In order to do this, it is vital to understand the role that biodiversity plays in promoting more resilient ecosystems.

In this chapter, we present the results of a literature review of the most recent scientific research on the relationship between biodiversity and ecosystem services. In order to identify relevant scientific articles, google scholar was used with search terms "biodiversity and ecosystem resilience". Search results were narrowed to articles published since 2010, with the exception of those cited in the following reviews and meta-analyses: Oliver et al. 2015, Maestre et al. 2012, Loreau and Mazancourt 2013, Hooper and Vitousek 1997, Hooper et al. 2005, and Balvanera et al. 2006. While the role that biodiversity plays in conferring ecosystem resilience has been theorized, scientific understanding of the mechanisms of how biodiversity relates to ecosystem resilience is only just emerging. Therefore, the objective of the review was to synthesize the most current research on this relationship and present this information so that a non-specialist audience could gain a better understanding of dynamics. In this way, information can be used to inform decisions taken by public authorities in meeting the S6 duty.

### *4.1.1 "Biodiversity" – what do we mean?*

In Chapter 1, we present the definition of biodiversity given by the Environment (Wales) Act 2016, which is defined in section 26 of the Act as "*the diversity of living organisms, whether at the genetic, species or ecosystem level*". Box 3.1 in Chapter 3 further defines biodiversity. When discussing the ways in which biodiversity can support resilience, there are many different scales and components of biodiversity to consider, including biodiversity at the molecular and genetic scale, species diversity, and landscape diversity. There are also different types of systems to consider, and none operate in isolation from the other: urban systems, marine systems, soil systems, agricultural systems, woodland systems, and so forth.

For the purposes of this review, we focus on species diversity at the landscape scale, and for agricultural, grassland, woodland and marine landscapes, as these are the most dominant non-urban ecosystems in Wales.

### *4.1.2 "Resilience" as defined in Welsh legislation and policy*

It is also important to define what we mean by "resilience" when using the term ecosystem resilience, as this term can easily be confused with static or resisting change. The term is

firmly embedded in both legislation and policy in Wales, as described in Chapter 1, Section 1.1.1 of this report. In summary:

- The Well-being of Future Generations (Wales) Act, 2015 has seven well-being goals; one of which is to strive for a resilient Wales: *"A nation which 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."*
- The Environment (Wales) Act, 2016 requires public authorities to seek to maintain and enhance biodiversity and in doing so promote the resilience of ecosystems[1]. In a separate section (4) outlining the principles of Sustainable Management of Natural Resources (SMNR), "the resilience of ecosystems" split into five "aspects"'[2].
- Natural Resources Wales (NRW) further develops the concept of ecosystem resilience in the State of Natural Resources Report (SoNaRR) 2016, a statutory report and product of the Environment Act. In Chapter 4 of SoNaRR, NRW defines ecosystem resilience as *"The capacity of ecosystems to deal with disturbances, either by resisting them, recovering from them, or adapting to them, whilst retaining their ability to deliver services and benefits now and in the future."* (pp. 25, Annex of acronyms and glossary; NRW, 2016). It elaborates on the five "aspects" of resilience enshrined in the Environment Act; describing them as "attributes" – indicators for assessing resilience.
- The five attributes of ecosystem resilience are: **diversity**, **extent**, **condition**, **connectivity** and **adaptability**.

Of particular interest for the purposes of this document are the ways in which biodiversity contributes to maintaining and enhancing resilient ecosystems, particularly how biodiversity can strengthen an ecosystems' capacity for providing ecosystem services upon which society depends.

This information may help support management practices and policy development with regards to land use, Area Statements and the progress towards the goals in the Well-being of Future Generations Act.

### 4.2 Ecosystem change – the fate and role of biodiversity

Environmental change is not unusual. Ecosystems have always faced periodic and persistent changes. However, anthropogenic activity (e.g. land use and land cover change, carbon emissions, pollution, nitrogen cycle disruption, species introductions) is increasing both the rate and the intensity of environmental change to previously unprecedented levels (Steffen et al. 2015; Krausmann et al. 2013; Simberloff et al. 2013). Rapid changes to the abiotic environment can alter local and regional species communities by disrupting biotic interactions, which leads to changes in the suites of traits and interactions that affect ecosystem functioning (Diaz et al. 2013).

The Welsh landscape has evolved over time, with woodland clearing occurring many millennia ago. The loss of woodlands led to the creation of new habitat, to which the ecosystem gradually adapted over time. The advent of Green Revolution technologies in the 1950s, however, has led to a rapid shift in the rate of change of land use. Green revolution

[1] Section 6 Biodiversity and resilience of ecosystems duty http://www.legislation.gov.uk/anaw/2016/3/section/6/enacted
[2] Section 4(i) Principles of SMNR http://www.legislation.gov.uk/anaw/2016/3/section/4/enacted

technologies promoted monoculture crop production owing to the viewpoint that fields of single crops led to higher productivity and resulted in the intensification of land use which included not only the elimination of diversity from the system but also the increasing use of synthetic fertilizers and pesticides. At this time, it was theorized within ecology, based on mathematical modelling, that individual species were less stable at higher biodiversity levels (May 1973; Gardner and Ashby, 1970), with very little evidence to the contrary. However, intensified agricultural production has contributed to further habitat loss and degradation, fragmentation and isolation of habitats, excessive nutrient input and other forms of pollution, and over-exploitation and unsustainable use of natural resources such as soil and water, all of which are drivers of further biodiversity loss.

NGOs such as World Wide Fund for Nature and the Royal Society for the Protection of Birds began campaigning for biodiversity conservation as high rates of extinction followed from large-scale land use changes and hunting. Concerns mounted over the global, as well as regional extinction, with flagship species such as the panda and avocet featuring in organisational logos and poster campaigns. In Wales, biodiversity decline over the last 50 years is conservatively estimated at 60% (Burns et al. 2013).

These campaigns, however, were quite separate from concerns that began to be voiced over how biodiversity loss could impact ecosystem functioning (Ehrlich & Ehrlich 1981; Myers 1990;Wilson 1988, 1989). At this time, a book by Schulze & Mooney (1993), and particularly chapters by Swift & Anderson (1993), Vitousek & Hooper (1993), and McNaughton (1993), among others, presented arguments for the hypothesis that greater diversity could lead to increased productivity, greater efficiency in the use of limiting resources, and increased ecosystem stability. Following this, in the late 1990s Loreau et al (2003; Yachi and Loreau 1999) theorized through ecological modelling, that greater biological diversity (i.e. biodiversity) would lead to greater community stability.

By 2001, there was consensus that many species are needed to maintain stability of ecosystem functioning in the face of environmental changes (Loreau et al. 2001). By 2005, there was consensus on some of the underlying mechanisms of how diversity leads to greater ecosystem stability – higher diversity leads to functional complementarity which increases productivity and nutrient retention. Some ecosystem processes are unaffected by initial species loss, due to functional redundancy or relatively weak relationships between those species and their living environment; and sometimes relatively rare species can exert a strong influence on ecosystem functioning (Hooper et al. 2005).

Many of the mechanics were still unclear, but the following two decades saw a plethora of research conducted across terrestrial, aquatic and marine ecosystems, not only to support the theory of the relationship between biodiversity and resilience, but also to expose the mechanics of how biodiversity supports ecosystem resilience. Meta-analyses synthesizing the results of numerous experiments have tested the breadth of applicability, generality, and magnitude of the role and effects of diversity (Cardinale et al. 2006, 2011, 2012; Gross et al. 2013; Balvanera et al. 2006; Stachowicz et al. 2007; Worm et al. 2006).

Ultimately, the debate about whether or not biodiversity is important for ecosystem functioning was resolved by continuous rounds of hundreds of publications of new research on the topic, providing the evidence base for earlier theories. However, despite the plethora of research

conducted on this topic, there remains a great deal left to explore and understand in terms of mechanisms behind this relationship, and to use this work to predict how ecosystems will respond under different future scenarios.

## 4.3 What is ecosystem resilience?

### *4.3.1 Scientific assessments of ecosystem resilience*

In ecology, an initial focus on the stability of ecosystem processes and how quickly they return to equilibrium state following disturbance (recovery or 'engineering resilience'; Pimm 1984) has gradually been replaced as the research has developed, by a broader concept of 'ecological resilience' which recognizes multiple stable states and the system's ability to resist regime shifts and maintain functions, possibly as a result of internal reorganization (i.e., their 'adaptive capacity'; Gunderson et al. 2010). This definition is in line with NRW's SoNaRR definition, combining aspects of both recovery and resistance, although different mechanisms can actually underpin these and in some cases there can be trade-offs between them (MacGillivray et al. 1995). However, some mechanisms can promote both depending on how long the system is observed, e.g. very rapid recovery can look like resistance.

In the seminal work of Holling (1973), resilience is defined as 'the capacity of a system to absorb and utilize or even benefit from perturbations and changes that attain it, and so to persist without a qualitative change in the system's structure' (Holling, 1973). Severe perturbations can potentially trigger a number of reactions across spatial or temporal scales that can bring the system over a threshold, causing it to shift to a new state; small shifts in system functioning, which are not visible, can move system functioning towards a precipice, where additional perturbation creates a systemic change in ecosystem functioning.

Within the resilience perspective, both vulnerability and resilience are seen to be the product of complex interactions between internal and external stressors. Adaptive capacity within the system functions through an adaptive cycle. Systems with high adaptive capacity are seen as more resilient. Adaptive capacity can be both ecological, with respect to system dynamics such as species redundancy and diversity within functional roles and ecological niches, and social, with respect to the management of natural resources and institutional capacity to adapt management to respond to ecosystem changes. Focusing on the adaptive capacity of a system fosters a dialogue in which policy and resource management approaches can play a role in improving resilience of an ecosystem.

This perspective has proved particularly useful in the context of global environmental change and on-going perturbations arising from population growth and globalisation. It serves as an organising principle that is shifting policy away from attempts to control change, to new efforts to manage 'the capacity of socio-ecological systems to cope with, adapt to and shape change' (Folke, 2006: 254).

### *4.3.2 Species diversity and ecosystem resilience*

The species in a community play a vital role in the provision of many ecosystem functions that form the biological foundation of ecosystem services (Mace et al. 2012; Tilman 2014; Durance et al. 2016; www.nerc-DURESS.org). The composition of species in a community does not

need to be stable in order to have resilient ecosystem functions. Turnover in species communities might be the very thing that allows resilient functions. For example, in communities experiencing climatic warming, species adapted to the cold are expected to decline while those species adapted to warmer climates will increase (Devictor et al. 2012).

The decline of cold-adapted species can be limited through management (Oliver et al. 2012), but in many cases their local loss might be inevitable (Thomas et al. 2006). In this example, management at broader regional and supranational scales may be critical to ensure the survival of species adapted to a specific set of environmental conditions. The number of functional groups in a system, which is termed functional diversity, is strongly related to many components of ecosystem functioning (Fornara & Tilman 2008; Hooper & Vitousek 1997; Reich et al. 2004; Tilman et al. 1997; Tilman 2001). If the species that are lost play an important functional role, then ecosystem functions can suffer unless the functional role filled by the lost species is taken up by other species with similar functional roles. This is how diversity of species performing the same function can confer ecosystem resilience.

Biodiversity impacts processes and dynamics at many different levels: population, community, and ecosystem. Analyses of the number of species, along with their identities, involved in different processes show that different suites of species tend to influence different processes. Although there is some overlap in species, the net effect found by Hector & Bagchi (2007) is that in order to maintain multiple types of ecosystem processes, many more species are needed than are demonstrably linked to any given process.

Moreover, their results show that the vital role of high diversity in providing multi-functionality occurs consistently in eight different European sites (Hector and Bagchi, 2007). Measured levels of multiple ecosystem functions (Maestre et al. 2012) and ecosystem services (Gamfeldt et al. 2013) tend to be higher in communities with more species. Furthermore, more diverse communities tend to reliably provide higher levels of multiple ecosystem functions across years, thus providing more stability (Zavaleta et al. 2010). A useful review of studies on multi-functionality is provided elsewhere (Byrnes et al. 2014).

Similar sets of functions might be achieved by very different community structures (Gallagher et al. 2013), thus making it difficult to predict which species confer resilience, or even what combination of species, or at what rate of species loss regime shifts become more likely. While the species composition, or even one keystone species, in an ecosystem is typically the target of conservation, the species composition per se is not the component that refers resilience, but rather it is the ecosystem functions, that need to be resilient if ecosystem services are to be maintained.. However, due to the lack of understanding that remains, despite thousands of studies, around how much diversity is needed to confer resilience, the most appropriate response remains a cautionary one – to preserve biodiversity to the fullest extent possible.

### 4.4 Aligning societal and ecological objectives – win-wins and trade-offs

The uncertainty and cautionary approach described in section 4.3 above needs to be balanced with other landscape-scale societal objectives, e.g. productivity, profitability, and development. Failure to find the right balance and to error too far to the side of productivity,

profitability or development, for example, may result in a trade-off or lose-lose situation which results in the crossing of the tipping points and realizing regime shifts that fail to support some or any of society's objectives.

Not all cases need to be seen as a balance between winners and losers, however. Some cases of win-win scenarios exist where synergies can develop between the short-term performance of ecosystem functions and their longer-term resilience. For example, when species richness leads to higher levels of function under current conditions due to complementarity, such as in the Latin American milpa system (Balvanera et al. 2013) and mixed grasslands in more temperate climates (Mueller et al. 2013). Long-term research in mixed grassland studies shows that the amount of deep root biomass was greater than expected based on observed biomass in single species systems. The increased biomass correlated positively with above ground productivity. Increasing diversity of plants in mixed grasslands also increases the functional diversity of grassland pollinator communities (Orford et al. 2016). In these cases, there exist management practices that can achieve short-term performance objectives and enhance resilience.

Win-wins are not guaranteed however, and there are situations where trade-offs occur in agro-ecosystems. For example, promoting genetic diversity for the resilience of ecosystem functions may conflict with the aim to produce the highest productivity phenotype (e.g. high milk yields in dairy cattle or large seed heads in wheat) (Kettenring et al. 2014). The dominant management regime in intensive agricultural systems often focuses on mono- or low-diversity systems that are highly productive for one species/ crop/ output, but which might have low resilience (Foley 2005).

It is important to note however, that long-term objectives must align themselves with resilient ecosystem functions, which provide the ecosystem services upon which societal objectives depend. When it comes to thinking about ecosystem functions, it is often easier for policy formulation to consider one service in particular, e.g. pollination, or clean water. Yet, ultimately, ecosystem managers need to consider the suite of ecosystem functions supporting essential services in a given location. These are referred to as ecosystem service bundles. Within different systems managed for specific objectives, e.g. agricultural fields managed for productivity, there will be trade-offs in some bundles. Gamfeldt et al. (2013), show how plantings of different tree species can deliver different bundles of ecosystem services and that choices between tree species result in trade-offs. The authors concluded that the higher the diversity of tree species in a forest, the greater the number of ecosystem services delivered by the ecosystem (Gamfeldt et al. 2013).

### 4.5 Ecosystem responses and outcomes

The resilience of ecosystem functions to environmental change is likely determined by a number of factors acting at different scales of biological organization; namely, species, communities, and landscapes (Table 4.1). These scales are interconnected and nested, so that changes at one scale can impact other scales in the same system. For instance, individual species' responses to environmental change dynamically influence changes in the population abundance, which impacts interactions with other species, thus altering community structure and composition and the relationship between the distribution of effect and response

traits (Diaz et al. 2013). These changes can extend to the scale of whole ecosystems but are influenced by the ecosystem context, such as landscape scale heterogeneity or habitat connectivity, to determine the resilience of ecosystem function.

**Table 4.1. Mechanisms underpinning the resistance and recovery of ecosystem functions to environmental perturbation**

| Species (Intraspecific) | Community (Interspecific) | Landscape (Ecosystem Context) |
|---|---|---|
| Sensitivity to environmental change (RES) | Correlation between response and effect traits (RES) | Local environmental heterogeneity (RES) |
| Intrinsic rate of population increase (RES/REC) | Functional redundancy (RES/REC) | Landscape-level functional connectivity (RES/REC) |
| Adaptive phenotypic plasticity (RES/REC) | Network interaction structure (RES) | Potential for alternative stable states (RES/REC) |
| Genetic variability (RES/REC) | – | Area of natural habitat cover at the landscape scale (RES/REC) |
| Allee effects (RES/REC) | – | – |

(Source: Oliver et al. 2015)

Many of the mechanisms presented in **Table 4.1** rely on diversity to confer ecosystem resilience: genetic variation, functional redundancy, network interaction structure and local environmental heterogeneity. **Genetic variation** (i.e. diversity) allows species to respond to perturbations, such as pests or viruses, because the variation may include genes that confer resistance or enable individuals to otherwise resist and adapt to perturbation. **Functional redundancy** leads to increased resistance of an ecosystem function to change because there are multiple species performing similar functions, compared to if those species present responded similarly to environmental perturbations (Mouillot et al. 2013; 2014).
This gives rise to the **'insurance effect'** of biodiversity (Yachi and Loreau, 1999), because if one species is locally eradicated due to perturbation, the function is still performed by other species that are resistant to the specific perturbation. The 'insurance effect' is well supported both empirically (Allen et al. 2011; Downing et al. 2014) and theoretically (Loreau and de Mazancourt, 2013; Morin et al. 2014).

**Network interaction structure** is the diversity of linkages within the network of species interactions, i.e. food webs, where interactions between species (e.g., predation, parasitism, mutualism) can have large influences on community responses to environmental change (Cardinale et al. 2012; Duffy 2002). Loss of highly connected species in interaction networks can cause extinction cascades and reduce network stability (Dunne et al. 2002; Fung et al. 2015; Memmott et al. 2004). In general, highly connected nested networks dominated by generalized interactions are less susceptible to cascading extinction effects (where the loss of one species leads to the loss of others, like a domino-effect) and provide more resistant ecosystem functions, in contrast to networks dominated by strong specialized interactions (Rooney and McCann, 2012; Lever et al. 2014).

Additionally, **local environmental heterogeneity** (promoting beta diversity, i.e. how much difference there is in diversity between local habitats across a landscape) has been shown to increase the stability of ecosystem functions (Wang and Loreau 2014).

Local environmental heterogeneity enhances the resistance of ecosystem functions by:

a) enabling the persistence of individual species after environmental perturbations by providing a range of resources and microclimatic habitat (Kindvall 1996; Godfree et al. 2011; Piha et al. 2007; Oliver et al. 2010);
b) increasing overall species richness (Stein et al. 2014) and, therefore, functional redundancy.

The role that biodiversity plays in providing functional redundancy, and the resultant ecosystem resilience that this confers cannot be stressed enough. As illustrated here, this dynamic occurs in many of the mechanics underlying ecosystem resilience.

Heterogeneity effects can operate at: the fine scale, for example through vegetation structural diversity (Kindvall 1996); the medium scale, for example through topoedaphic diversity (Godfree et al. 2011); or the larger scale, for example, through diversity of land cover types (Piha et al. 2007; Oliver et al. 2010).

### 4.6 Conclusions

Hooper et al. (2012) concluded that their *"analyses clearly show that the ecosystem consequences of local species loss are as quantitatively significant as the direct effects of several global change stressors that have mobilized major international concern and remediation efforts"* (pp. 105).

The other study, by Tilman et al. (2012), stated that "*changes in diversity of the magnitude being imposed by human actions can have at least as great of an effect on primary productivity as anthropogenic changes in atmospheric $CO_2$, the availability of a limiting soil resource, herbivory, fire, and variation in water availability"* (pp. 10,397). It concluded by saying that *"contemporary biodiversity declines are among the dominant drivers of changes in ecosystem functioning"* (pp. 10,397).

Twenty-five years ago, the importance of biodiversity was very little understood. Ecological literature has since addressed this through the rigorous efforts of hundreds of scholars, and biodiversity has now been shown to be of central ecological and societal importance.

The result of this knowledge and understanding is that now, more than ever, the conservation of biodiversity should be a high global priority.

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Sustainable Places Research Institute
Sefydliad Ymchwil Mannau Cynaliadwy

giving nature a home
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# Chapter 5.

# *Naturally Bridgend* stakeholder workshop – local perspectives on SMNR and nature recovery

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Llywodraeth Cymru
Welsh Government

## Biodiversity and the area-based approach in Wales

## How can the sustainable management of natural resources (SMNR) framework deliver nature recovery?

# About this report

The Royal Society for the Protection of Birds (RSPB) Cymru commissioned Cardiff University's Sustainable Places Research Institute to develop a report which addressed the question, "how can Area Statements in combination contribute to achievement of biodiversity targets in Wales?"

To tackle this question, literature reviews and meta-analyses were conducted on four key topics – the legislative and policy context in Wales, comparable international approaches, evaluating ecosystem services toolkits for biodiversity/ resilience provision, and the relationship between biodiversity and ecosystem resilience. In addition, the University partnered with Bridgend County Borough Council, REACH and the Ecosystems Knowledge Network to design and host a stakeholder workshop to explore the question on a more local scale.

The report is divided into five chapters, and is accompanied by a 'Summary and Key Findings' document which brings together the conclusions from all five chapters, and demonstrates how it is possible for the Area Statement process to be an effective means of ensuring Wales meets its biodiversity objectives.

# Full report contents



**The full report, its individual chapters and the summary can all be downloaded from** http://bit.ly/SPRIareastatements

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# 5. *Naturally Bridgend* stakeholder workshop – local perspectives on SMNR and nature recovery

## 5.1 Background, context and methods

### *5.1.1 Background to the workshop*

The *Naturally Bridgend* workshop took place at the Kenfig NNR Visitor Centre on 25 October 2017 in Bridgend County Borough as part of the research project commissioned by RSPB and conducted by Cardiff University to explore the relationship between biodiversity and the area-based approach in Wales and specifically assess how nature recovery can be achieved through the sustainable management of natural resources (SMNR).

SMNR is an approach for managing the natural environment of Wales, introduced in Part 1 of the Environment (Wales) Act, 2016. Implementation of SMNR will have a complex interaction with the pre-existing priorities for the protection and enhancement of biodiversity across Wales (see Chapter 1 for details). Biodiversity at all its levels (genes to landscapes) underpins ecosystem resilience, which is the central objective of SMNR. Depending on how the SMNR approach is expressed locally, opportunities for enhancing biodiversity (and avoiding further loss) could either be taken or missed.

Natural Resources Wales is responsible for preparing Area Statements that will support implementation of SMNR across Wales. Area Statements are an opportunity for everyone with a stake in the natural environment of Wales to find new ways of working together more effectively.

Bridgend County Borough Council has already introduced innovative Supplementary Planning Guidance[1] and a Nature Recovery Plan[2] (Local Biodiversity Action Plan) that is underpinned by a strong evidence base. Organisations across the County Borough can play an important part in informing the preparation of the forthcoming Area Statement for South Central Wales. This Area Statement – one of six covering the entire land area of Wales – will encompass the local authority areas of Bridgend, Cardiff, the Vale of Glamorgan, Rhondda Cynon Taf and Merthyr Tydfil. An additional seventh Area Statement will encompass all Welsh marine areas (to 12 nautical miles).

### *5.1.2 Purpose of the work*

The objective of this chapter was to focus on the geographical area of Bridgend County Borough as a case study of how biodiversity priorities can be integrated into the development of Area Statements at a local level. This was addressed by gathering the views, needs and priorities of local organisations with a stake in the environment of Bridgend County Borough and by linking directly with Natural Resources Wales as it began preparations for the Area Statement for South Central Wales. Through a focus on the County Borough of Bridgend, the aim was to draw learning points for the preparation of the South Central Wales Area Statements and those in other parts of Wales.

[1] http://www1.bridgend.gov.uk/media/227718/final-green-infrastructure-spg-for-web.pdf
[2] http://naturalneighbourhoods.com/community/whats-green-near-me/project/bridgend-county-nature-recovery-plan.aspx

### *5.1.3 Public policy context*

According to the Environment Act (Wales) 2016, the Sustainable Management of Natural Resources is about maintaining and enhancing the resilience of ecosystems and the benefits they provide. The objective is to ensure that the way we manage, use and benefit from our natural resources does not lead to the long-term decline of these resources and supporting ecosystems. The achievement of the Well-being of Future Generations (Wales) Act 2015 goals is central to this.

Section 4 of the Environment Act (Wales) 2016 sets out 9 principles for the Sustainable Management of Natural Resources. These are drawn directly from the 12 principles of the ecosystem approach, the primary framework for action agreed by parties to the international Convention on Biological Diversity.[3] **Table 5.1** lists these and provides an interpretation of their meaning.

**Table 5.1 – Principles for the Sustainable Management of Natural Resources**

| Principle | Legal definition (Section 4 of the Environment Act)[4] |
|---|---|
| Building resilience | Take account of the resilience of ecosystems, in particular the following aspects— (i) diversity between and within ecosystems; (ii) the connections between and within ecosystems; (iii) the scale of ecosystems; (iv) the condition of ecosystems (including their structure and functioning); (v) the adaptability of ecosystems. |
| Evidence | Take account of all relevant evidence and gather evidence in respect of uncertainties. |
| Multiple benefits | Take account of the benefits and intrinsic value of natural resources and ecosystems. |
| Preventative action | Take action to prevent significant damage to ecosystems. |
| Scale | Consider the appropriate spatial scale for action. |
| Long-term | Take account of the short, medium and long term consequences of actions. |
| Adaptive management | Manage adaptively, by planning, monitoring, reviewing and, where appropriate, changing action. |
| Public participation | Make appropriate arrangements for public participation in decision-making. |
| Collaboration and engagement | Promote and engage in collaboration and co-operation. |

### *5.1.4 Workshop process*

1. A shortlist of 50 stakeholders to be invited to the workshop was created. This included a diverse array of sectors whose stakeholders have an interest in the environment, land and water within Bridgend County Borough. The organisations on this list are provided in **Annex 5A**.
2. Invitations to participate in the workshop were sent to named stakeholders on the list. Where invitees were unable to participate, they were encouraged to invite colleagues and partner organisations nominated by invitees. Where possible, provisional views on the workshop topic were obtained by phone and electronic survey. A flyer produced in Welsh and English (**Annex 5B**) was used to inform invitees about the event.

[3] https://www.cbd.int/ecosystem/principles.shtml
[4] https://naturalresources.wales/media/678317/introducing-smnr-booklet-english.pdf

3. An online survey was sent to participants (results shown in **Annex 5C**).
4. An initial review of stakeholder responses to the survey questions was conducted, enabling the workshop content to be tailored to reflect the interests of the stakeholders attending.
5. The workshop was run on 25th October 2017. 27 of invited participants attended (see Table 5**Annex 5D**).
6. The content of group discussions was captured and analysed post-event.

The programme for the day is included in **Annex 5E** and photographs of the workshop feature in **Annex 5F**.

### *5.1.5 Biodiversity priorities for Bridgend County Borough*

The existing legal and policy commitments relating to biodiversity in Bridgend County Borough provide an important context for the expression of the Sustainable Management of Natural Resources (SMNR) in the area.

The legal and policy biodiversity commitments in Bridgend include:

- The designation of three **Special Areas of Conservation** (SACs, protected under European legislation). One of these sites – Kenfig Nature Reserve – is a National Nature Reserve (NNR, designated under the Wildlife and Countryside Act, 1981).
- The designation of 8% of the total area of the County Borough as **Sites of Special Scientific Interest** (SSSIs), mainly due to the biodiversity value. Additionally, there are 170 Local Wildlife Sites; a designation that has no legal implications for landowners but may be taken into account in funding applications for agri-environment scheme grants by Local Authorities in determining planning applications.
- The publication of the **Nature Recovery Plan for Wales** in 2015.[5] This policy has an overarching aim "*to reverse the decline in biodiversity, for its intrinsic value, and to ensure lasting benefits to society*". This is a high-level document that acknowledges the importance of the SMNR and the links between biodiversity conservation and the goals of the Wellbeing and Future Generations (Wales) Act 2015.
- The publication by Bridgend County Borough Council of a **Nature Recovery Plan** in 2014 (also referenced as a Local Biodiversity Action Plan or LBAP)**.**[6] It is based on a detailed evidence base, with maps and descriptions of the key functions of the natural environment, for example, flood risk reduction. Importantly, this document sets out the following information for 15 rural areas and 5 settlements within the County Borough:
    1. The condition of habitats and species
    2. Key ecosystem services
    3. A vision for improving the biodiversity
    4. Actions and opportunities to achieve the vision.

Further details of these commitments are provided in **Annex 5G**.

[5] http://gov.wales/topics/environmentcountryside/consmanagement/conservationbiodiversity/?lang=en
[6] http://naturalneighbourhoods.co.uk/community/whats-green-near-me/project/bridgend-county-nature-recovery-plan.aspx

### *5.1.6 Observations on Bridgend County Borough's biodiversity priorities*

- Due to its geographical position between mountains and coast, Bridgend County Borough contains a diverse array of landscape types and habitats. Many stakeholders in the County Borough work across diverse habitat types, particularly in relation to linear infrastructure and the provision of public services. For this reason, the County Borough is a setting in which the potential for collaboration between stakeholders, from catchment to coast, should be relatively easy to recognise.
- The diversity in habitat types within the County Borough also gives it some degree of ecosystem resilience. Diversity between and within ecosystems is one element of ecosystem resilience according to the Environment (Wales) Act 2016. The LBAP for Bridgend already places emphasis on the importance of networks of habitat types. The vulnerability of different types of habitats to external factors (built development, climate change, invasive species or changes in land management) is, however, not apparent from existing documentation relating to biodiversity in the County Borough.
- The area of land in Bridgend County Borough designated as SAC, SSSI or NNR occupies approximately 10% of the land area of Bridgend County Borough. Nonetheless, the area of some individual habitat types is relatively small. This means that loss of species or habitat due to development pressures, or lack of support for management, is potentially more significant when it comes to building ecological resilience across the County Borough. For example, the nationally rare habitat type, Limestone Pavement, is only present at one or two sites in the County Borough.

## 5.2 Local priorities for the Area Statements

### *5.2.1 Identifying stakeholders*

The Naturally Bridgend workshop involved representatives of 17 organisations that recognise their dependence on the natural environment of the County Borough, including its biodiversity. **Table 5.2** shows the principal categories of stakeholder that were present, together with some key considerations for organisations within each.

A full list of organisations represented at the workshop is provided in **Table 5D.1** in **Annex 5D**. In **Figure 5.1** the principal categories of organisation represented at the workshop are illustrated.

## Table 5.2 – Key categories of stakeholder in Area Statements

| Category | Potential considerations for their work |
|---|---|
| Local authority and public agency with a local focus | Fulfilment of statutory duties, including implementing legislation such as the Well-being and Future Generations Act (Wales) 2015 and Environment (Wales) Act, 2016.<br>Delivery of services to the public, either directly or via partners.<br>Economic regeneration. |
| Rural-based businesses | Ensuring business continuity, resilience and growth.<br>Providing livelihoods for employees and supporting rural communities.<br>Implementing existing and new regulations.<br>Having high speed internet and improved local transport infrastructure. |
| Urban-based businesses | Providing livelihoods for employees and supporting a resilient local economy.<br>Having an environment that is attractive for inward investment and regeneration.<br>Managing risks from flooding or other disruption to business. |
| Third sector conservation & community outcomes | Managing land for a range of benefits, including intrinsic value of biodiversity.<br>Public support and engagement. Supporting the wellbeing of citizens, including volunteers.<br>Working with local communities and employers.<br>Fulfilment of local, national and international policy priorities. |

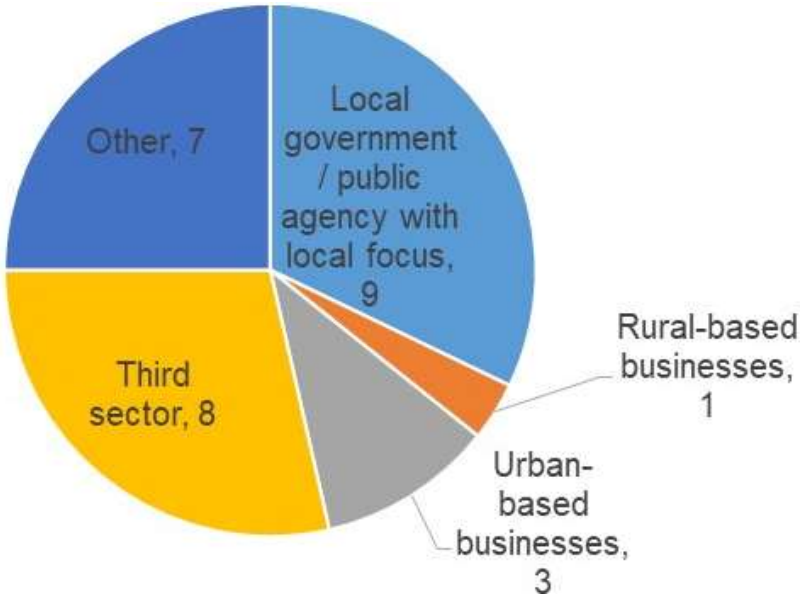



**Figure 5.1 – Categories of external participants in the *Naturally Bridgend* Workshop (number of participants stated after the type of organisation)**

### *5.2.2 Priorities identified through the workshop*

The Naturally Bridgend workshop was structured to facilitate small group discussion of topics from the following two perspectives:

1. **Issue-based topics** – issues applicable across multiple locations in the County Borough.
2. **Place-based topics** – multiple issues relating to particular sites, settlements, and habitat types.

The creation of these two focal areas for the workshop was based on the understanding that some participants had interests that extended throughout the County Borough (and beyond) whereas others were focused on specific localities (such as settlements, or other parcels of land).

Potential issues and places of interest were identified following a review of the participant list and the information provided by invitees and participants before the event. Participants were given the opportunity to modify the scope and identify of the issues and places.

A summary of the small group discussions is provided in **Boxes 5.1 and 5.2** below.

**Box 5.1 – Issues that are local priorities for stakeholders**

*Economy, employment, built infrastructure and housing*

The primary challenge identified by this group was one of planning of economic activity both spatially and over time. The need for a vision for Bridgend that included its environment was identified. “Green growth” was a theme within this.

In the town of Bridgend, the current flood risk is restricting the granting of permission for mixed-use development, including housing. This has knock-on effects on the economy. The group identified two ways in which enhancement of the natural environment could play a bigger part in the local economy and the provision of employment opportunities.

1. Creation of active travel corridors, potentially using existing ‘green’ corridors
2. Upper catchment solutions to flood risk, involving ‘green’ and ‘grey’ infrastructure

In considering the role of biodiversity conservation in these actions, the group felt it was dependent on the resources available and may involve working within and across Area Statement boundaries at a large geographical (landscape/ catchment) scale. For example, the group was unclear as to whether it would be possible to manage peatland in the catchment in order to reduce runoff.

**Box 5.1 (continued)**

*Tourism, recreation and heritage*

The group identified an ongoing conflict between tourism and farming regulations. They also reported that community awareness of how and where to access green spaces for tourism and recreation purposes was low.

During the discussion, the following opportunities were identified:

1. Enhance access to existing sites of recreational or heritage interest through improvements to bus and cycle transport, as well as e-charging points for electric vehicles.
2. 'Green' the existing 'grey' spaces around settlements.

To deliver these opportunities, the group felt that an active travel plan would assist, along with better communication of why areas are being managed to have a more 'natural' appearance. The group identified that reclamation of sites that are disused or poorly used could deliver significant benefits for biodiversity in the County. There is an opportunity to introduce seasonal changes in public access to land so as to protect flora and fauna.

*Health, wellbeing and education*

A major challenge identified by the group is inequality of life expectancy, as well as local communities with an increasing proportion of older people. This is combined with a lack of physical activity. Some outdoor spaces are of low quality due to issues such as anti-social behaviour. The group accepted that the natural environment has an important role to play in addressing health and wellbeing issues. Opportunities were identified relating to specific mechanisms such as social prescribing and inclusion of the natural outdoors in the school curriculum.

To facilitate such actions, there needs to be a greater linking of people and place. Biodiversity conservation was acknowledged as having a key role in ensuring the outdoors plays a full part in health objectives.

*Implementing the Nature Recovery Plan for Wales*

This group had a particular interest in the intrinsic value of nature. It considered implementation of Wales' Nature Recovery Plan at a local level as a key issue for Bridgend County Borough.

The group identified the ongoing challenge of raising awareness of the current Bridgend Nature Recovery Plan, and engaging stakeholders in its value, as well as updating and embedding this work into the refreshed Nature Recovery Action Plan (Part 2 of the overall Nature Recovery Plan).

The group identified that action on key Nature Recovery Plan species could be the focus of actions that deliver a wide range of 'multiple' benefits. For example, action to improve the conservation status of dormouse would deliver hedgerow and woodland connectivity in the farmed environment, and action for otter and water vole would contribute to effective catchment management for flood mitigation. Monitoring of these species, alongside monitoring of the physical environment, would provide the evidence for adaptive management.

Implementation of the Nature Recovery Plan underpinned a range of goals for the County, including health, wellbeing, and economic growth and tackling invasive species.

**Box 5.2 – Places that are focal points for local priorities**

*Coastal*

The group identified three overriding issues for coastal areas:

1. Plastics in the marine environment.
2. Erosion (associated with climate change).
3. Conflicts between multiple uses (grazing, biodiversity, recreation).

It felt that multi-use conflicts could be addressed by the widening of natural areas along the coastline. The group noted an opportunity for landscaping with native plants. The group discussed the opportunity to involve tourists in managing the natural area (clearing scrub, collecting plastic). Dunes were seen as having three core functions: flood defence, tourist appeal and biodiversity provision. A key constraint identified by the group for addressing the above challenges was the lack of alignment between management plans for specific areas along the coast.

*Urban*

The urban group's top three management challenges were:

1. Provision of green infrastructure (delivered through retrofitting)
2. Environmental hazards (invasive species, flooding, landslides, urban heat, litter & fly-tipping)
3. Balancing what people want for urban areas with what can be delivered (especially in relation to housing provision)

It identified the Local Development Plan as a key mechanism for ensuring that improvements to the natural environment address these challenges together. There are immediate opportunities for incentivising new developments to choose greener options, such as green roofs and walls. The UK-wide Grow Wild project, which promotes the planting of wild flowers, was cited as an example of good practice. The group set out a wide range of potential biodiversity benefits from the planting of trees in and around urban areas, as well as more general 'greening' of the urban environment.

*Valley communities, rural areas and rivers*

This group identified its top three management challenges for these places as:

1. Antisocial behaviour
2. Poverty, low employment and poor health
3. Problems of accountability for local issues, especially with constrained public finance

The group emphasised the need to build community cohesion and pride in order to address these challenges together. The importance of creating a culture of valuing the natural environment and biodiversity was acknowledged by the group. A particular way forward is the use of natural corridors and cycle paths to link communities together. Mapping of accessible natural space was identified as an important part of making these connections.

Some participants in this group reported it was difficult to relate targeted biodiversity action to these management challenges. The biodiversity action and benefits seemed to be generic and not tied to priority features (species and habitats).

### *5.2.3 Observations from the workshop discussions*

#### *a) The value of maps and information resources*

Several of the discussion groups highlighted the value of maps to stimulate and inform discussion about opportunities for enhancement of the environment, biodiversity and ecological resilience. These resources can show:

1. How the environment can deliver a range of benefits for the people of the County Borough.
2. The dimensions of ecological resilience, as defined in the Environment (Wales) Act 2016.

A challenge identified in the workshop is how to bring the innovative maps already embedded in paper or electronic reports (such as the Nature Recovery Plan for Bridgend County Borough) to the attention of stakeholders, giving them the chance to explore the natural environment of their area. It is also important that stakeholders understand the relationship between the different types of local policy and management plans that relate to the natural environment.

#### *b) Helping stakeholders to navigate complexity*

The workshop discussions demonstrated that conversations about the application of SMNR principles are inherently complex. Local priorities merge with one another, meaning it is hard to identify start and end points for discussion. Issues have no clear boundaries in terms of who is responsible, how they can be addressed, or their spatial limits. Stakeholders view local issues through different lenses and need time to find opportunities for collaboration.

Stakeholders – and local communities – need to be able to express issues that are of immediate concern to them before being introduced to the more open-ended discussions about the future of Bridgend County Borough's environment as a whole. Ecosystem resilience can be viewed as an abstract concept for those who are outside the nature conservation sector.

#### *c) The need for local leadership and vision for SMNR and biodiversity*

Workshop participants highlighted the importance of buy-in from local leadership relating to wellbeing, prosperity and biodiversity in Bridgend County Borough. A strategic vision for the future of the area could be based on the unique natural resources of the area. Without this, work to implement SMNR in the area may be fragmented and much smaller-scale.

The Area Statement for South Central Wales could provide evidence and case studies to underpin this vision.

The Public Services Board (PSB) for Bridgend has an important role in making efficient use of the capacities of its member public sector organisations to improve wellbeing across the County Borough. There is a need to link the work of the PSB to the capabilities of other stakeholders in Bridgend. The PSB has the opportunity to show leadership, not only among its members, but more broadly across the County Borough.

*d) Understanding the diverse perspectives and capabilities of stakeholders*

The workshop discussions illustrated that stakeholders work at a wide range of spatial and temporal scales. In forming an Area Statement, there is a need to bring together those with very local interests – such as a Town Council – with those who have broader regional, national or even international interests – such as infrastructure businesses.

Stakeholders have differing capabilities to be involved in exploring the link between their work and the natural environment. In particular, small businesses and third sector organisations have limited time and resources to be involved in dialogue that does not offer any clear or immediate outcome for them. There is a need to provide opportunities for those who do not have capacity to participate in engagement meetings in normal working hours. Many of the organisations represented in the Naturally Bridgend workshop are public-facing. Nonetheless, they highlighted the benefits of direct engagement of local communities in the Area Statement process.

*e) Targeted action for biodiversity is not always easy to integrate with local priorities*

The small group dialogue demonstrated that priorities for nature conservation that may be identified and set at a national or regional scale are not readily connected with local priorities of stakeholders. Local stakeholders may have a general interest in promoting 'naturalness' and 'greening'. However, they are not necessarily in a position to direct this action according to wider priorities held by those who understand the importance of biodiversity protection for its intrinsic, cultural or scientific value.

The workshop discussions highlighted the risk that a focus on the multiple functions of biodiversity does not necessarily lead to all values for biodiversity being safeguarded. Existing legal and policy commitments for biodiversity may need to be considered in their own right. When facilitating local action, the definition of the 'multiple benefits' in SMNR – "take account of the benefits and intrinsic value of natural resources and ecosystems" – needs to be considered in full.

*f) Understanding the benefits of Area Statements for biodiversity*

While workshop participants were positive about the idea of multiple benefits from environmental projects and programmes, the discussions revealed that it is hard to determine what the precise advantages of the Area Statement process might be. This is particularly the case in relation to biodiversity.

### 5.3 How to integrate biodiversity priorities into Area Statements

This section identifies the challenges and opportunities of addressing biodiversity priorities for Bridgend County Borough through the formation of an Area Statement for South Central Wales. It synthesises the observations from the workshop, as summarised in the previous section.

### *5.3.1 Turning concepts into practical outcomes*

The link between biodiversity, ecosystem resilience and the multiple benefits that flow from the environment is relatively easy to make at a conceptual level. National policy, such as the Nature Recovery Plan for Wales, describes the general connections that can be made between biodiversity and the multiple benefits flowing from a healthy environment.

The challenge at the local or regional level is to engage stakeholders in finding and acting upon specific links that can be made. These connections are not necessarily obvious at first sight; they require time for deliberation and exploration.

The Naturally Bridgend workshop demonstrated that stakeholders have a broad and positive view of the environment. Turning SMNR concepts into practical outcomes requires long-term dialogue and co-ordination. All stakeholders view the environment through particular lenses, such as concerns about community, the state of business or hazards such as flooding.

The ideas generated in the small group discussions at the workshop can be arranged as follows:

**Challenges → Opportunities → Solutions → Biodiversity benefits**

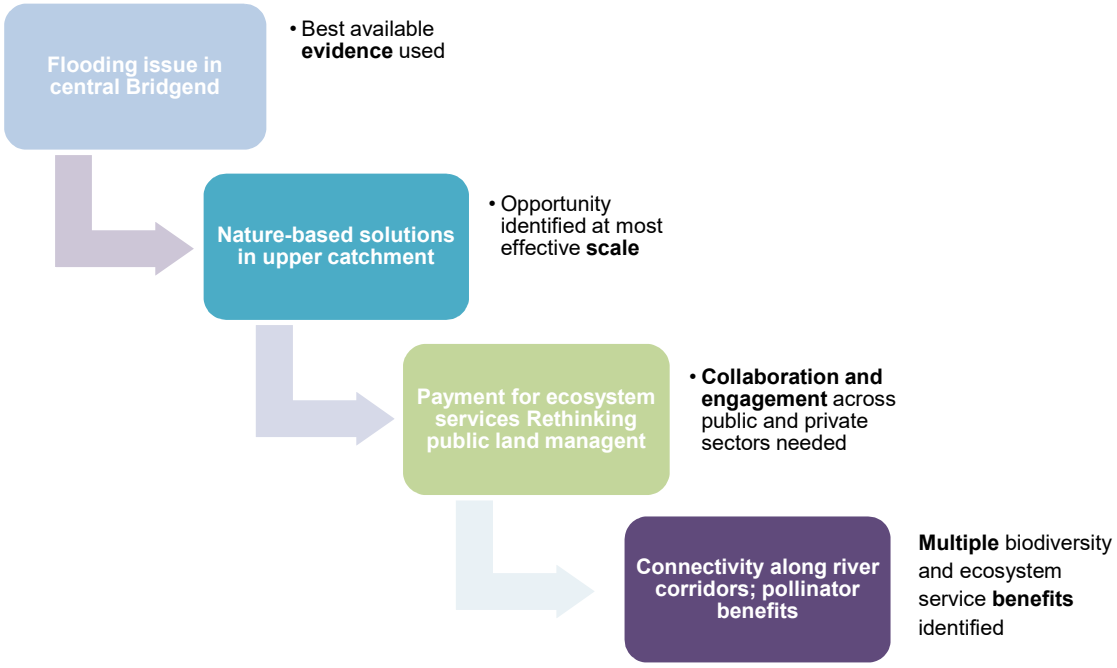
**Figures 5.2 a), b), c) and d)** show the four issues addressed in the workshop discussions arranged in this way. Here it is possible to see the link between SMNR and the fulfilment of biodiversity priorities for the area. This understanding makes it easier to connect stakeholders, so they work together to achieve their own objectives as well as for the benefit of biodiversity. Early identification of the biodiversity implications of addressing a challenge could provide a further motivation for gathering stakeholders to respond to it.

If the process illustrated in Figures 5.2 a) to d) were followed systematically, it would be possible to generate a greater understanding of the net benefit of SMNR (and the Area Statement) for biodiversity in any one part of Wales. Being systematic would mean involving a wider range of stakeholders than were present at the Naturally Bridgend workshop, and over a longer period of time.

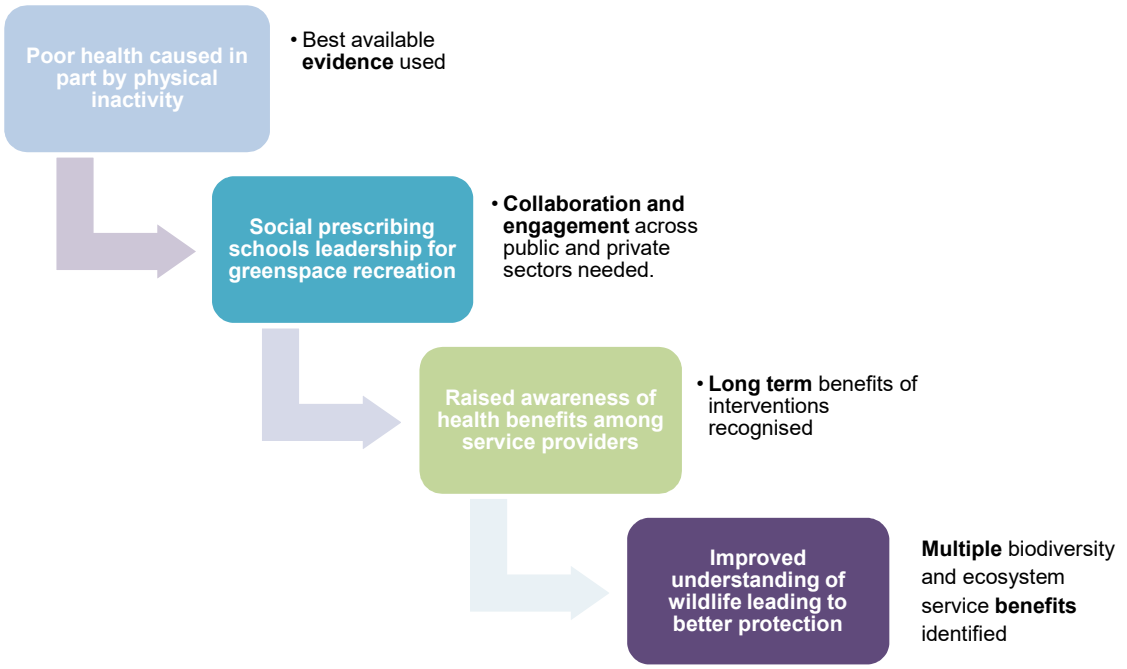
The workshop demonstrated that many of the challenges identified by stakeholders may not be turned into opportunities and solutions due to a lack of staff and financial resources to implement projects and programmes. Participants also identified a need for local leadership for the delivery of SMNR. Bridgend County Borough Council and the Community Councils have a particular role to play providing leadership. They have wide-ranging statutory duties that affect the quality of the environment, and they provide a close interface with local communities.

In addressing any one local challenge through SMNR, there is a need to ensure that the right expertise in ecology is available. This was recognised by many participants as a barrier to implementation of SMNR in ways that support biodiversity. Without access to ecologists, stakeholders may not be able to play their full part in building the ecological resilience that comes through biodiversity protection.

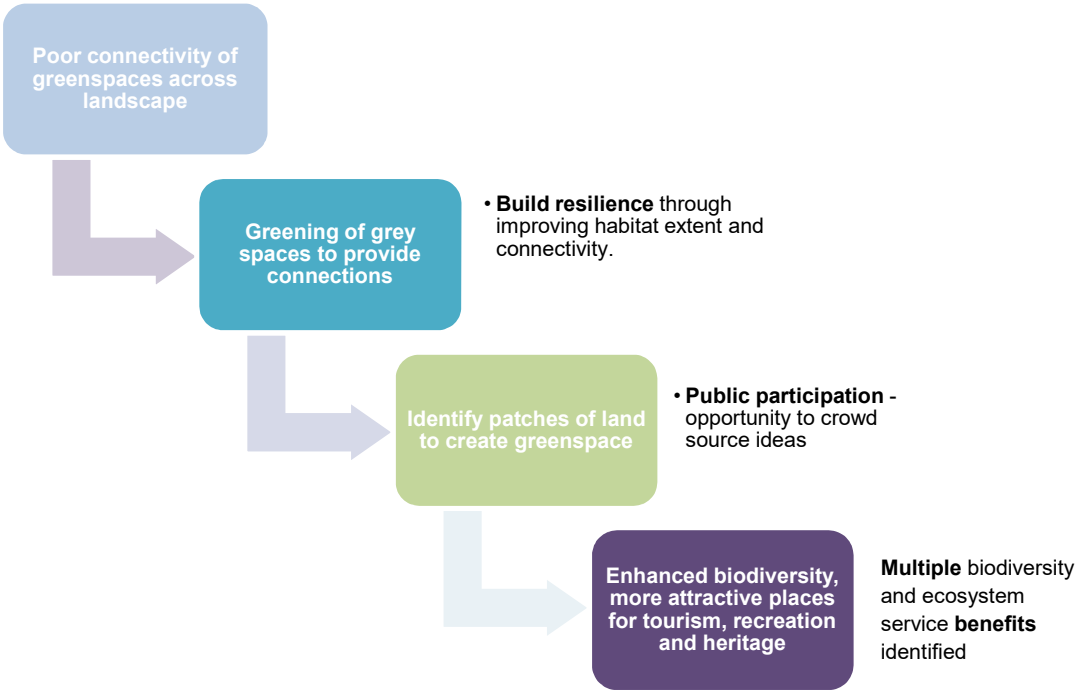
### a) Urban, Infrastructure, Economy and Housing




### b) Health, wellbeing and education



### c) Tourism, recreation and heritage




### d) Implementation of the Nature Recovery Plan

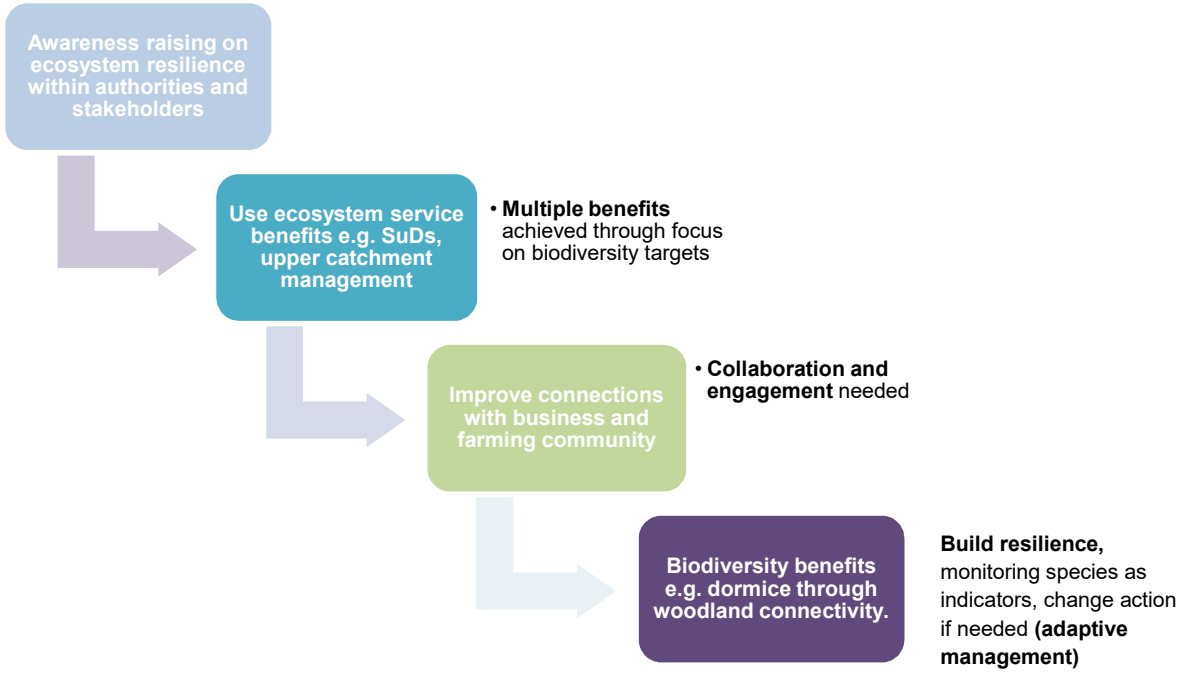



**Figure 5.2 Step-wise approach to addressing challenges for Bridgend**

### *5.3.2 The role of Area Statements in addressing biodiversity priorities*

Area Statements could be a valuable resource to stimulate action that results in biodiversity gains. The workshop discussions demonstrated that it is hard to determine what these benefits might be, especially given that the process of preparing Area Statements is only just beginning. Nonetheless, stakeholders did point out the biodiversity gains that could be achieved through greening of urban areas, and in catchment-based solutions to flood risk.

The Naturally Bridgend workshop showed that Area Statements have the potential to help stakeholders to begin to see their relationship to biodiversity in ways they have not realised before. Organisations that have previously seen themselves in conflict with the biodiversity priorities of government and third sector conservation organisations may be able to identify projects they can be involved in and benefit from, and which will also enhance biodiversity. This includes, for example, infrastructure businesses and new residential developments.

This dialogue around the Area Statement process will require substantial facilitation and co-ordination, not only across local authority areas but the whole geographical area for each Area Statement. For instance, a Community Council in one location will need the resources to liaise with stakeholders around it, as well as ensure that the appropriate ecological and public engagement expertise is available. Unless stakeholders can see specific outcomes from the process, it may be hard for them to engage further. This includes those stakeholders who are concerned with the underpinning role of biodiversity in ecosystem resilience.

## 5.4 Conclusions and recommendations

#### *a) Ensure existing biodiversity priorities are viewed as integral to SMNR*

*Conclusion*

The principles of the Sustainable Management of Natural Resources (SMNR) need to be applied carefully and transparently so that prosperity, wellbeing and underpinning biodiversity are enhanced simultaneously rather than in isolation. The links between ecosystem resilience, prosperity and wellbeing needs to be illustrated in specific ways that can be understood by local stakeholders. It should be recognised that taking intrinsic value of biodiversity into account is part of the principles of SMNR. If co-ordinated, work to improve the status of biodiversity for its own sake will underpin SMNR.

*Recommendation*

Area Statements should contain practical examples of local action that can improve ecological resilience, address biodiversity priorities, and enhance the provision of benefits from the environment such as flood risk reduction and health. They should consider not only current provision of ecosystem services, but also future threats through changes such as increased frequency and intensity of extreme weather events. It is also important that Area Statements highlight the synergy between improving biodiversity and delivering SMNR as a whole, such as is expected to occur through the Spirit of Llynfi Woodland Creation Project.

### b) *Support the delivery of the Nature Recovery Action Plan*

*Conclusion*

The old 'Local Biodiversity Action Plan' process is currently being revised within Welsh Government's new Nature Recovery Action Plan framework. There is considerable potential under the new framework to ensure all areas of Wales have a plan which is a 'living' resource, which stakeholders can engage with and does not become static or consulted infrequently. Ecological expertise needs to be embedded at all levels of implementation for SMNR to function locally. The risk if this is not the case is the separation of biodiversity considerations from other aspects of SMNR. The result of this is likely to be a lowering of the priority of biodiversity conservation in favour of projects that purely favour the functions of natural features.

*Recommendation*

An effective method needs to be found to link Area Statements, the Nature Recovery Plan for Wales and other priorities such as people's well-being. This can occur through the development and implementation of local Nature Recovery Action Plans. Area Statements are also a legally binding means of facilitating delivery of the national Natural Resources Policy – with its key challenge of addressing biodiversity decline and priority theme of building ecosystem resilience. These relationships need to be clearly mapped and communicated in ways that are meaningful and understood by local stakeholders. The involvement of third sector and other organisations with ecological expertise in the Area Statement process will be crucial to make these links.

### c) *Support the delivery of local Well-being Plans and the Well-being and Future Generations (Wales) Act*

*Conclusion*

The interface between the SMNR principles and the Well-being Goals set in the Well-being and Future Generations (Wales) Act is complex. Nonetheless, stakeholders need to be involved in making the connections so that the relationship between SMNR and well-being is understood. Stakeholders with specific issues of concern, such as livelihoods and the well-being of local communities, have limited capacity to engage with national policies and targets relating to SMNR.

*Recommendation*

Area Statements should be prepared so as to provide an interface between local well-being issues and the environment.

### d) *Local leadership needed to catalyse action*

*Conclusion*

If the SMNR framework is to achieve the step change required for strategic sustainable management of Wales' natural resources, there is an urgent need to raise awareness of what ecosystem resilience means in practice at the highest levels of all public bodies named in the Environment Act (Wales) 2016. Vision and leadership on SNMR and biodiversity are required

from all parts of the public sector operating in the area, including local and National Park authorities, town and community councils.

*Recommendation*

Area Statements should provide information on the roles, capabilities and responsibilities of different types of organisations for the delivery of SMNR. In connection with this, there should be regular evaluation and reporting of the actions taken by public bodies to promote ecosystem resilience. Stakeholders need to know this in order to play their part in Area Statements, working alongside public bodies.

### e) *Ensure co-ordination between SMNR and biodiversity specialists*

*Conclusion*

There is a need for oversight of environmental programmes and projects that are stimulated by the presence of Area Statements. This should ensure that there are no missed opportunities for biodiversity enhancement. Another aim will be to ensure that data on the biodiversity outcomes of these activities are available, thus making the case for further action.

*Recommendation*

Biodiversity and ecosystem service data should be collated through existing sources and networks, such as Local Environmental Records Centres. If presented in meaningful ways, it will facilitate creative public participation in the Area Statement process. This includes, for example, how local Nature Recovery Plan information is presented to those within and beyond the environment sector.

### f) *Support the national Natural Resources Policy (NRP)*

*Conclusion*

Projects delivered locally that support the NRP will need careful management to make sure that opportunities for building ecosystem resilience are taken. Co-ordinated and active implementation of policies such as the current Nature Recovery Plan for Bridgend County Borough may provide a way of showing how local action can contribute to the opportunities and challenges identified in the NRP.

*Recommendation*

Area Statements should state specific risks to ecological resilience, including how existing biodiversity priorities fit within this. They should also give specific examples of the benefits of enhancing ecological resilience. To fulfil the NNRP, opportunities to build ecological resilience in Bridgend County Borough should be shown in regularly updated online maps. This could be integrated into the existing Natural Neighbourhoods web portal of Bridgend County Borough Council.[7]

[7] http://naturalneighbourhoods.com

# Annexes

## Annex 5A List of organisations invited to the workshop

- Abertawe Bro Morgannwg Community Health Council
- Abertawe Bro Morgannwg University Health Board
- Andrew James
- Awen Cultural Trust
- Bridgend Association of Voluntary Organisations
- Bridgend Communities First
- Bridgend County Borough Council (Planning, Tourism, Economic Regeneration functions)
- Bridgend Reach (Rural Development Programme) Local Action Group
- Bridgend Tourism Association
- Bridgend Town Council
- CF31 Business Improvement District for Bridgend
- CLA membership in Bridgend (via CLA Wales)
- CLA Wales
- Environment Systems
- Ford Motor Company
- Friends of Maesteg Welfare Park Group
- Groundwork Bridgend & Neath Port Talbot
- Halo Leisure
- HLF Wales
- Llais y Goedwig
- Maseteg Town Council
- National Trust Wales
- Natural Power
- Natural Resources Wales (local and national contacts)
- Network Rail
- NFU Cymru
- Our Welsh Caravan & Camping
- Pencoed Town Council
- PONT (Pori Natur A Threftadaeth) Cymru
- Porthcawl Bike Hire
- Porthcawl Chamber of Trade
- Porthcawl Surf
- Porthcawl Town Council
- South East Wales Biodiversity Records Centre
- Sustrans Cymru
- Swansea University
- The Wildlife Trust of South and West Wales
- Valleys to Coast
- Wales Biodiversity Partnership
- Welsh Government

## Annex 5B Workshop flyer

Ecosystems Knowledge Network

Workshop
25th October, 2017
10:30 am - 4:30 pm
Kenfig Nature Reserve, CF33 4PT


# Naturally Bridgend

Natural Resources Wales is working to prepare Area Statements that will help in the implementation of the Welsh Government's new National Natural Resources Policy.

Area Statements are an opportunity for everyone to find new ways of working together more effectively. All organisations who depend on a good quality environment are invited to get involved, regardless of whether the environment is the primary focus for their work.

Bridgend County is ideally placed to be a leader in informing the preparation of the Area Statement that will include it. The area has already has pioneered with green infrastructure planning guidance, an emerging wellbeing framework and a Nature Recovery Plan. Working together, we can protect and enhance the area's natural environment at the same time as meeting the needs and aspirations of its people.

***What is happening?***

*On 25th October there will be a workshop to bring together people with an interest in what Bridgend County environment can do for its people and its biodiversity. You'll be able to hear the latest about the Area Statement process.*

*We'll have small group discussion focused on specific challenges for the Bridgend County. We are interested to hear all local values and needs in delivering sustainable management of the environment.*

***Why get involved?***

- *Understand the role of the environment in fulfilling the objectives of your organisation.*
- *Help ensure that Area Statements are developed to meet local needs.*

*Event free of charge*

**How do I get involved?** Let us know if you'd like to participate in the event.
Email us at info@ecosystemsknowledge.net. Tel. 0333 240 6990


The workshop is part of a Cardiff University research project commissioned by RSPB Cymru to investigate how the approach and principles of sustainable management of natural resources and development of area statements can effectively deliver biodiversity objectives as well other outputs. Bridgend County Borough Council, as lead body for the Rural Development Programme for Bridgend (reach) is assisting Cardiff University to deliver this 'on the ground' component of the research. Additional support and funding has been provided by Natural Resources Wales.
The workshop organiser is Ecosystem Knowledge Network – http://ecosystemsknowledge.net

rspb yn rhoi cartref i fyd natur giving nature a home

Cardiff University / Prifysgol Caerdydd

Cyngor Bwrdeistref Sirol Pen-y-bont ar Ogwr / Bridgend County Borough Council

reach

Cyfoeth Naturiol Cymru Natural Resources Wales

Llywodraeth Cymru Welsh Government

Ecosystems Knowledge Network

**Gweithdy**
**Dydd Mercher 25 Hydref, 2017**
**10:30 am - 4:30 pm**
**Gwarchodfa Natur Cynffig, CF33 4PT**


# Pen-y-bont ar Ogwr yn Naturiol

Mae Cyfoeth Naturiol Cymru'n gweithio i baratoi Datganiadau Ardal a fydd yn helpu i weithredu Polisi Cenedlaethol newydd Llywodraeth Cymru ar Adnoddau Naturiol.

Mae Datganiadau Ardal yn gyfle i bawb ddod o hyd i ffyrdd newydd o weithio gyda'i gilydd yn fwy effeithiol. Gwahoddir pob sefydliad sy'n dibynnu ar amgylchedd o ansawdd da i gymryd rhan, waeth ai'r amgylchedd yw prif ffocws eu gwaith ai peidio.

Mae Sir Pen-y-bont ar Ogwr mewn sefyllfa dda i arwain y gwaith o lywio'r Datganiad Ardal a fydd yn ei gynnwys. Mae eisoes wedi chwarae rhan arloesol i baratoi ei chanllawiau cynllunio, ei fframwaith lles newydd a Chynllun Adfer Natur. Trwy weithio gyda'n gilydd, gallwn warchod a hybu amgylchedd naturiol yr ardal a diwallu anghenion a dyheadau ei phobl yr un pryd.

***Beth fydd yn digwydd?***

*Ar 25 Hydref cynhelir gweithdy i ddod â phobl sydd â diddordeb yn yr hyn y gall Sir Pen-y-bont ar Ogwr ei wneud dros ei phobl a'i bioamrywiaeth at ei gilydd. Cewch glywed yr wybodaeth ddiweddaraf am y broses Datganiad Ardal. Bydd gennym grŵp trafod bach yn canolbwyntio ar heriau penodol i Sir Pen-y-bont ar Ogwr. Rydym yn awyddus i glywed beth yw'r farn am werthoedd ac anghenion lleol ar gyfer rheoli'r amgylchedd mewn dull cynaliadwy.*

***Pam cymryd rhan?***

- *I ddeall rôl yr amgylchedd wrth gyflawni amcanion eich sefydliad.*
- *Helpu i sicrhau bod Datganiadau Ardal yn cael eu datblygu i ddiwallu anghenion lleol.*

*Digwyddiad am ddim*

**Sut mae cymryd rhan?** Rhowch wybod i ni sut yr hoffech gymryd rhan yn y digwyddiad. E-bostiwch ni ar info@ecosystemsknowledge.net. Tel. 0333 240 6990


Mae'r gweithdy'n rhan o brosiect ymchwil ym Mhrifysgol Caerdydd a gomisiynwyd gan RSPB Cymru i ymchwilio i sut mae ymagwedd ac egwyddorion rheoli adnoddau naturiol mewn ffordd gynaliadwy a datblygu datganiadau ardal yn gallu cyflawni amcanion bioamrywiaeth yn effeithiol yn ogystal ag allbynnau eraill. Mae Cyngor Bwrdeistref Sirol Pen-y-bont ar Ogwr, fel corff arweiniol y Rhaglen Datblygu Gwledig ar gyfer Pen-y-bont ar Ogwr yn helpu Prifysgol Caerdydd i gyflawni'r elfen hon o'r ymchwil ar lawr gwlad. Darparwyd cefnogaeth a chyllid ychwanegol gan Cyfoeth Naturiol Cymru. Trefnir y gweithdy gan Ecosystem Knowledge Network – http://ecosystemsknowledge.net

rspb yn rhoi cartref i fyd natur giving nature a home

Cardiff University Prifysgol Caerdydd

Cyngor Bwrdeistref Sirol Pen-y-bont ar Ogwr Bridgend County Borough Council

reach

Cyfoeth Naturiol Cymru Natural Resources Wales

Llywodraeth Cymru Welsh Government

## Annex 5C Pre-event questionnaire and telephone insights

Questions issued via online survey to all participants who accepted invitations to the workshop. The total number of respondents was 16.

### Question 1 – What types of settings are the focus for your work? (tick all that apply)

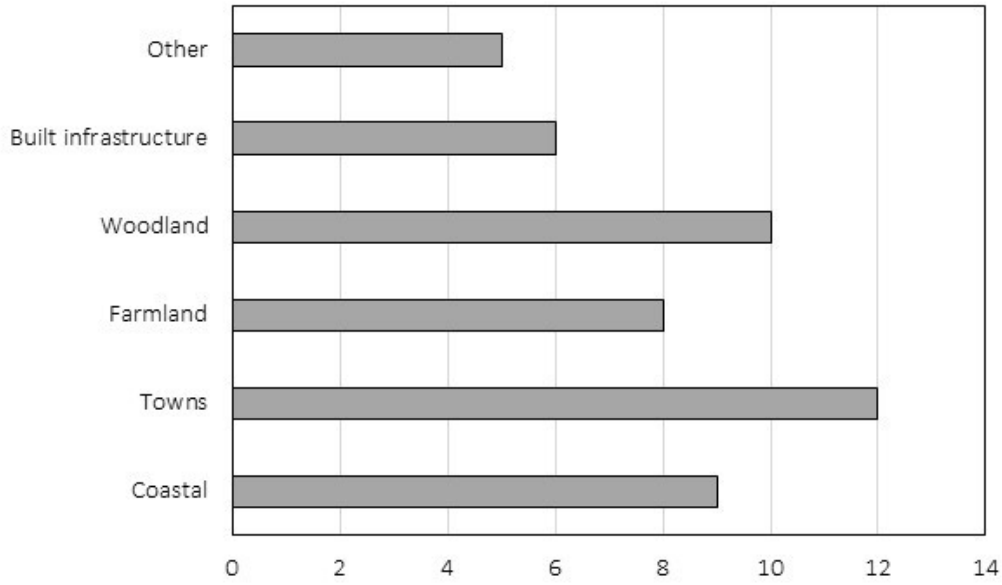



**Figure 5C.1 Frequency of types of work setting as expressed by pre-event questionnaire survey respondents**

### Question 2 – What is the primary goal of your organisation or initiative?

- Public health
- Housing provision
- Ensuring protected sites (heritage) are managed well for future
- Encouraging generation and use of quality biological data
- Destination Management (tourism)
- Promote and monitor biodiversity and ecosystem action
- Town Council
- Reverse biodiversity decline
- Improve the wellbeing of local people
- National policy
- Biodiversity No Net Loss
- Nature conservation
- Environmental consultancy (including planning policy)
- Improve and protect the environment
- Support communities
- Recruit and up skill volunteers
- Support heritage projects
- Ensure that the natural resources of Wales are sustainably maintained, enhanced and used.

### Question 3 – How important are the following in achieving this goal?

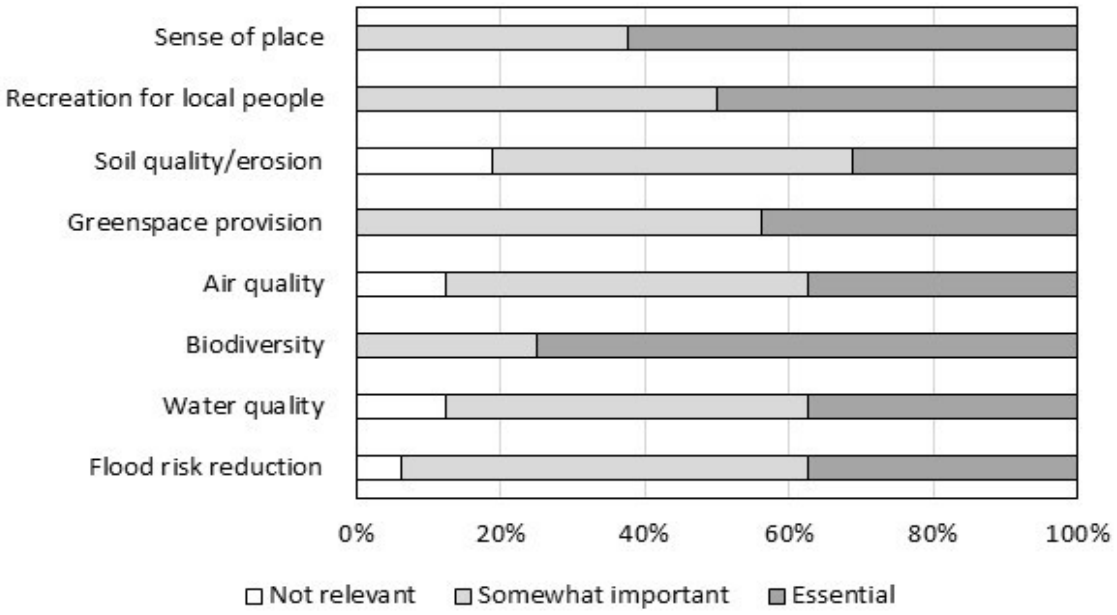



**Figure 5C.2 Relative importance of environmental issues as perceived by pre-event questionnaire survey respondents**

Regarded as essential:

- Invasive species
- Reduction in eutrophication

Other key contributors to organisation's goals:

- Links to cultural and historical assets and collectively [their] role in people's health and wellbeing and community wellbeing and cohesion.
- Opportunities for waste reduction and reuse and sustainable energy and the related opportunities for businesses, employment and developing skills.
- Ecosystem resilience and ecosystem services.
- Habitat maintenance and creation.
- Biodiversity resilience needs to be accounted for as a supporting objective to achieve our goals

**Question 4 – What are the ways in which improvements to the natural environment within Bridgend County could support the work of your organisation or initiative?**

- Mental health: treatment and prevention of issues
- Reduced flood risk
- Better connectivity of a range of natural habitat types.
- Better use of farmland for biodiversity and not production or less production.
- A change in the promotion and education [in] the natural environment.
- Increased biodiversity and awareness would hold council more accountable for decisions that affect it.
- Better access, facilities and information for visitors.
- The Bridgend Nature Recovery Plan supports the local delivery of the Nature Recovery Action Plan for Wales.
- Provide better quality outdoor space for the community that would encourage them to use the space and spend time with their neighbours building a greater sense of community.
- Cleaner and less nutrient rich environments will greatly benefit resident biodiversity.
- Improvements to access and usability for all people, including equality groups, including information and encouraging use.
- Securing current assets for future generations.
- Implement SMNR and S6 duty to take forward Part 1 of the Environment (Wales) Act, 2016.
- Work towards our goal of nature conservation in the County.
- Demonstrating how ecosystem resilience supports sustainable livelihoods is our principle goal in most projects.
- Joint partnership working.
- Taking our volunteers out to work on environmental projects.
- Tree planting.
- Increasing connectivity between natural spaces within the county borough.
- Facilitating access for all to and within natural spaces throughout the [County] Borough.

### Question 5 – In what ways, if any, does biodiversity relate to your work?

(Two respondents were not sure. Three respondents were unspecific, saying it was core to all they did. In two cases, the objective of the organisation was directly related to biodiversity.)

- Recreational value.
- In terms of Bridgend being an attractive and sustainable destination.
- Not directly, but do want to create more spaces in the town where wildlife can thrive. Had meeting earlier this year with BCBC parks dept. to discuss grass cutting schedule and we identified areas that could be allowed to grow longer through the summer months to allow more wildflowers and plants to grow and set seed.
- In our assessment, local people say they really value their natural environment and nature. To protect and develop the benefit they can have from all elements is the basis of part of our Wellbeing Plan. We see the delivery of this through promoting the implementation of the Bridgend Nature Recovery Plan.
- Our goal is to promote and enhance biodiversity on our nature reserves and in the wider countryside.
- We use biodiversity as one of the key factors in understanding ecosystems and their services. By breaking down the different aspects of biodiversity and ecosystem resilience we can analyse data and information which helps us to recommend decisions for land-use management.
- Promoting projects and community involvement to enhance and protect the environment.
- Funding more natural heritage projects is a priority.
- Diversity of tree species, habitat creation and enhancement within a community woodland site.

## Annex 5D Workshop participants

### Table 5D.1 List of workshop participants and the organisation which they represented

| Name | Organisation |
|---|---|
| Helen Hammond | Bridgend County Borough Council |
| Geoff Hobbs | Bridgend County Borough Council |
| Robert Jones | Bridgend County Borough Council |
| Emily Elliot | Bridgend County Borough Council (Development Planning Section) |
| Bruce Howard | Ecosystems Knowledge Network |
| Claire Forrest | Ecosystems Knowledge Network |
| Bill Butcher | eCountability |
| Neil Parker | Environment Systems Ltd. |
| Mark Thomas | Ford Motor Company |
| James Williams | Ford Motor Company |
| Brett James | Ford Motor Company |
| Rachael Price | Groundwork Wales |
| Julie Hughes | Heritage Lottery Fund |
| Sasha Ufnowska | Llais y Goedwig |
| Michael Shewring | Natural Power |
| Holly York | Natural Resources Wales |
| Leila Thornton | Natural Resources Wales |
| Emma Brown | Natural Resources Wales |
| Pippa Sabine | Natural Resources Wales |
| Daron Herbert | Natural Resources Wales |
| Russell De'Ath | Natural Resources Wales (National Team) |
| Christian Servini | Natural Resources Wales (South East Wales Office) |
| Fiona Bussell | Network Rail |
| Emma Douglas | PONT (Pori Natur A Threftadaeth) |
| Cllr Alex Harris | Porthcawl Town Council |
| Heather Galliford | RSPB |
| Chris O'Brien | RSPB |
| Adam Rowe | South East Wales Biodiversity Records Centre |
| Geminie Drinkwater | Spirit of Llynfi Woodland / Natural Resources Wales |
| Angelina Bellamy | The University of Cardiff |
| Rose Revera | The Wildlife Trust of South and West Wales |
| Nigel Ajax-Lewis | The Wildlife Trust of South and West Wales |
| Alice Brown | Bridgend County Borough Council (Regeneration Department) |
| Steve Curry | Valleys to Coast |
| Steve Spode | Welsh Government |

## Annex 5E Workshop programme

| | |
|---|---|
| *10:30am* | *Refreshments and registration* |
| 11:00 | **Introduction**<br>• Welcome – Geoff Hobbs (Bridgend County Borough Council)<br>• Objectives for the day – Bruce Howard (Ecosystems Knowledge Network)<br>• An environment for people and biodiversity – Bill Butcher (eCountability)<br>• Area Statements - the Opportunity – Russell De'Ath and Christian Servini (Natural Resources Wales) |
| 11:30 | Small group introductions<br>**Your priorities for Bridgend County** |
| 11:45 | Small group discussion<br>**Turning challenges for Bridgend County into opportunities**<br>*Discussion of themes and topics that matter to participants (health, tourism, biodiversity conservation etc.) How can our natural environment and our biodiversity support these?* |
| 12.40 | Plenary feedback |
| *1:00 pm* | *Light lunch* |
| 1.50 | Introduction to the afternoon session – Bruce Howard |
| 2:00 | Small group discussion<br>**Working in places within Bridgend County that matter to you**<br>*Discussion of specific environmental and social settings in the County. How can our natural environment support wellbeing, health and prosperity within them? What are the implications for biodiversity?* |
| *3:00* | *Refreshment break* |
| 3.30 | **Plenary discussion and conclusions.**<br>Facilitated by Bruce Howard and Bill Butcher<br>Discussion of:<br>• Bridgend County's contribution to the Welsh National Natural Resources Policy<br>• Evidence and information requirements<br>• Facilitating collaboration across the County |
| 4.15 | Close |

## Annex 5F Workshop photograph

**Above:** Presentation by Russell De'Ath, Natural Resources Wales, on the legislative and policy background to Area Statements

## Annex 5G Biodiversity priorities for Bridgend County Borough

This annex paper presents a brief summary of the existing legal and policy commitments relating to biodiversity in Bridgend County Borough that need to be considered as the Sustainable Management of Natural Resources framework is applied.

Bridgend County Borough's biodiversity can be expressed in terms of sites, habitats and species. While all three of these are under pressure due to land use change and climate change, biodiversity is given a degree of protection under international and national legislation and policy.

### 5G.1 Areas designated for their biodiversity value

*Special Areas of Conservation (SACs)*

SACs are areas designated under the European Habitats Directive (92/43/EEC). Both the Habitats and Birds Directive (79/409/EEC) provide for the creation of a network of protected wildlife areas across the EU, known as "Natura 2000". The designations aim to conserve important or threatened species and habitats and provide these designated features with increased protection and management.

SACs designated in Bridgend County Borough are:

- **Kenfig SAC**. Sand dunes and wetlands on the Bridgend coastline between Porthcawl and Port Talbot, regarded as one of the finest examples of a sand dune habitat in Europe. The SAC was designated specifically for six features which are important in the European context. The habitat features humid dune slacks, dunes with creeping willow, fixed dune grassland and a type of lake which is represented by Kenfig Pool. The two species features are fen orchid and petalwort.
- **Cefn Cnbwr Grasslands SAC**. Grasslands and wet heath west of Bridgend, regarded as one of the best areas of purple moor-grass grassland habitat in the UK.
- **Blackmill Woodlands SAC**. Woodland north-east of Bridgend, designated as the most southerly site of old sessile oak woods in Wales.

Additionally, there is one SAC situated approximately 15 km from the north western Administrative Boundary of Bridgend County Borough and situated in the Vale of Neath. This is known as Coedydd Nedd a Mellte and is recognised for its old sessile oak woodland.

*National Nature Reserves (NNRs)*

NNRs are statutory reserves established for the nation under the Wildlife and Countryside Act, 1981. Kenfig National Nature Reserve, managed jointly by Bridgend County Borough Council and Natural Resources Wales (NRW), comprises the major part of Kenfig SAC. This 513-hectare site is the only NNR in Bridgend County Borough.

*Sites of Special Scientific Interest (SSSIs)*

Biological SSSIs are areas notified under the Wildlife and Countryside Act, 1981, by Natural Resources Wales or its predecessor, the Countryside Council for Wales as being of special interest for particular species and/ or habitat features.

The following SSSIs are found in Bridgend County Borough:

- Blackmill Woodlands
- Bryn–bach, Cefn Cribwr
- Brynna a Wern Tarw
- Caeau Cefn Cribwr
- Coed y Mwstwr Woodland
- Cwm Cyffog
- Cwm Du Woodlands
- Cwm Risca Meadow
- Cynffig-Kenfig
- Daren y Dimbath
- Merthyr Mawr
- Penycastell, Cefn Cribwr
- Stormy Down
- Waun Cimla
- Waun-fawr, Cefn Cribwr

Their total area is 1,954 hectares, 8% of the area of the County Borough.

### *Local Wildlife Sites*

Local Wildlife Sites, also known as Sites of Importance for Nature Conservation (SINCs), are selected as the most important sites for wildlife that fall outside of statutory sites. They protect threatened habitats and species and often form corridors that connect other valuable sites. Local Wildlife Sites have no legal implications for landowners but may be helpful in funding applications for agri-environment scheme grants and can be taken into account by Local Authorities in determining planning applications. Local Wildlife Sites are selected against criteria drawn up by local partners.

Approximately 170 Local Wildlife Sites have been selected in Bridgend County Borough. Information about them is collated and maintained by a range of conservation organisations and the local authority.

## 5G.2 Habitats and species

The 2002 Bridgend Local Biodiversity Action Plan (LBAP) included detailed aims for 16 terrestrial habitats, a statement on the marine environment and 37 species action plans for mammals, birds, insects, plants and amphibians. Many of the habitats and species covered by the LBAP have protected status under international (e.g. Annex 1 of the Birds Directive) and national legislation (e.g. Section 42 of the NERC Act, 2006, now to be replaced by Section 7 of the Environment (Wales) Act, 2016).

These habitats and species are distributed locally across much of the County Borough, within statutory and non-statutory sites, farmland outside of recognised sites and within towns and villages. Some of the habitats, such as ancient hedgerows, and species, such as skylark and pipistrelle bat, are poorly protected by statutory sites.

### 5G.3 Local and national strategy

The **Nature Recovery Plan for Wales**, published in 2015, describes how Welsh Government will respond to commitments the UK Government has made to the international Convention on Biological Diversity (CBD), including the Aichi Biodiversity Targets. It is also intended as a mechanism for implementing the EU Biodiversity Strategy targets.

The Plan's ambitious overarching aim is *"To reverse the decline in biodiversity, for its intrinsic value, and to ensure lasting benefits to society"*. The document acknowledges the importance of the SMNR and the links between biodiversity conservation and the goals of the Wellbeing and Future Generations (Wales) Act 2015.

Implementation of the Plan centres around six high-level objectives that set out general categories of action. While the actions speak of a need to "embed biodiversity into decision making at all levels" (pp.27), it does not provide specific guidance on how this can be achieved.

At a local level, in 2014 Bridgend County Borough Council published a **Local Biodiversity Action Plan**. This is also known as the Bridgend Nature Recovery Plan. It is based on a detailed evidence base that maps and describes the key functions of the natural environment, for example flood risk reduction.

Importantly, the document sets out the following information for 15 rural areas and 5 settlements within the County Borough:

1. The condition of habitats and species
2. Key ecosystem services
3. A vision for improving the biodiversity
4. Actions and opportunities to achieve the vision.

**Table 5G.1** provides an example of how the LBAP does this for woodland in the town of Pyle. In the document, locations are identified where environmental variables are most suited to habitat restoration and where gaps in the existing ecological network can be filled. These are potentially the most effective places for actions to address biodiversity priorities as well as seek wellbeing improvements.

**Table 5G.1 Example of information contained in the Bridgend County Borough Local Biodiversity Action Plan**

| Condition | Ecosystem services | Vision | Actions & opportunities |
|---|---|---|---|
| Several areas of semi-natural native woodland occur in the area, these have some protection as they are important areas for nature conservation. The woodland networks run though the northern part of the town with the presence of tall trees and bushes in gardens. | Biodiversity in the area of the native woodland alongside the river is good. | To maintain and enhance biodiversity within this urban setting and contribute to water regulation, flood mitigation and other ecosystem services where possible. | The woodland and marshy grasslands along the river banks influences clean water provision, through control over infiltration into the groundwater resource |

### 5G.4 Observations on Bridgend County Borough's biodiversity priorities

- Due to its geographical position between mountains and coast, Bridgend County Borough contains a diverse array of landscape types and habitats. Many stakeholders in the County Borough work across diverse habitat types, particularly in relation to linear infrastructure and the provision of public services. For this reason, the County Borough is a setting in which the potential for collaboration between stakeholders, from catchment to coast, should be relatively easy to recognise.
- The diversity in habitat types within the County Borough also give it some degree of ecosystem resilience. Diversity between and within ecosystems is one element of ecosystem resilience according to the Environment (Wales) Act 2016. The LBAP for Bridgend already places emphasis on the importance of networks of habitat types. The vulnerability of different types of habitats to external factors (built development, climate change, invasive species or changes in land management) is, however, not apparent from existing documentation relating to biodiversity in the County Borough.
- The area of land in Bridgend County Borough designated as SAC, SSSI or NNR occupies approximately 10% of the land area of Bridgend County Borough. Nonetheless, the area of some individual habitat types is relatively small. This means that loss of species or habitat due to development pressures, or lack of support for management, is potentially more significant when it comes to building ecological resilience across the County Borough. For example, the nationally rare habitat type, Limestone Pavement, is only present at one or two sites in the County Borough.