

The Second State of Natural Resources Report (SoNaRR2020)

Executive Summary

Natural Resources Wales

Final Report

Mae'r ddogfen hon hefyd ar gael yn Gymraeg
[Adroddiad Crynodeb Gweithredol \(PDF\)](#)

About Natural Resources Wales

Natural Resources Wales's purpose is to pursue sustainable management of natural resources. This means looking after air, land, water, wildlife, plants and soil to improve Wales's well-being, and provide a better future for everyone.

Evidence at Natural Resources Wales

Natural Resources Wales is an evidence-informed organisation. We seek to ensure that our strategy, decisions, operations and advice to Welsh Government and others are underpinned by sound and quality-assured evidence. We recognise that it is critically important to have a good understanding of our changing environment.

We will realise this vision by:

- Maintaining and developing the technical specialist skills of our staff;
- Securing our data and information;
- Having a well resourced proactive programme of evidence work;
- Continuing to review and add to our evidence to ensure it is fit for the challenges facing us; and
- Communicating our evidence in an open and transparent way.

Title: **SoNaRR2020: Executive Summary**

Restrictions: None

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Version 2.0	Full references for van der Ploeg and Reed provided
Version 2.1	Included reference from the Climate Change Committee
Version 2.2	Included reference from the Climate Change Committee

The Second State of Natural Resources Report (SoNaRR2020) contents

This document is one of a group of products that make up the second State of Natural Resources Report (SoNaRR2020). The full suite of products are:

Executive Summary. Foreword, Introduction, Summary and Conclusions. Published as a series of webpages in December 2020

The Natural Resource Registers. Drivers, Pressures, Impacts and Opportunities for Action for eight Broad Ecosystems. Published as a series of PDF documents and as an interactive infographic in December 2020

Assessments against the four Aims of SMNR. Published as a series of PDF documents in December 2020:

SoNaRR2020 Aim 1. Stocks of Natural Resources are Safeguarded and Enhanced

SoNaRR2020 Aim 2. Ecosystems are Resilient to Expected and Unforeseen Change

SoNaRR2020 Aim 3. Wales has Healthy Places for People, Protected from Environmental Risks

SoNaRR2020 Aim 4. Contributing to a Regenerative Economy, Achieving Sustainable Levels of Production and Consumption

The SoNaRR2020 Assessment of Biodiversity. Published in March 2021

Assessments by Broad Ecosystem.. Published as a series of PDF documents in March 2021:

Assessment of the Achievement of SMNR: Coastal Margins

Assessment of the Achievement of SMNR: Enclosed Farmland

Assessment of the Achievement of SMNR: Freshwater

Assessment of the Achievement of SMNR: Marine

Assessment of the Achievement of SMNR: Mountains, Moorlands and Heaths

Assessment of the Achievement of SMNR: Woodlands

Assessment of the Achievement of SMNR: Urban

Assessment of the Achievement of SMNR: Semi-Natural Grassland

Assessments by Cross-cutting theme. Published as a series of PDF documents in March 2021:

Assessment of the Achievement of SMNR: Air Quality

Assessment of the Achievement of SMNR: Climate Change

Assessment of the Achievement of SMNR: Energy Efficiency

Assessment of the Achievement of SMNR: Invasive Non-native Species

Assessment of the Achievement of SMNR: Land use and Soils

Assessment of the Achievement of SMNR: Waste

Assessment of the Achievement of SMNR: Water Efficiency

Updated SoNaRR evidence needs. Published in March 2021

Acronyms and Glossary of terms. Published in December 2020 and updated in March 2021

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Contents

About Natural Resources Wales.....	2
Evidence at Natural Resources Wales.....	2
The Second State of Natural Resources Report (SoNaRR2020) contents	3
Contents	5
Figures.....	7
Foreword.....	8
Introduction to SoNaRR2020	10
A phased publication	10
SoNaRR’s content and purpose is defined in the Environment Act.....	10
Our use of broad ecosystems and cross-cutting themes.....	11
SMNR and the well-being goals	12
The four aims of SMNR.....	13
SoNaRR2020: Bridges to the future	16
‘A fo ben, bid bont’ - ‘He that would lead, let him be a bridge’	16
Action for people and the planet.....	17
A new economic model.....	17
The need for an integrated approach.....	18
People: Responsible levels of production and consumption.....	19
Planet: Space for nature	19
Case Study: Bringing it all together.....	21
A vision for 2050	22
Beyond sustainability.....	23
Adding in the social sphere.....	24
Transforming Wales	27
Transforming the food system	30
Transforming the energy system	32
Transforming the transport system	34
Our method.....	37
Collaborative working.....	38
Our assessment.....	39

SoNaRR2020: Natural resource registers	39
Key pressures, impacts and opportunities for action	39
Aim 1: Stocks of natural resources are safeguarded and enhanced	40
Pressures	40
Opportunities for action.....	40
Aim 2: Ecosystems are resilient to expected and unforeseen change	41
Opportunities for action.....	42
Aim 3: Wales has healthy places for people, protected from environmental risks	43
Opportunities for action.....	43
Aim 4: A regenerative economy	44
Opportunities for Action	45
References	46

Figures

- Figure 1 The doughnut economics of SMNR and well-being 13
- Figure 2 The linkages and cyclical nature of the four aims of SMNR 14
- Figure 3 Bendigeidfran by Margaret Jones 16
- Figure 4 Welsh Economic Doughnut Results 2020 18
- Figure 5 One Planet Cardiff 21
- Figure 6 Beyond Sustainability towards a regenerative economy 23
- Figure 7 A portfolio of actions to reduce loss and restore biodiversity 24
- Figure 8 The three spheres of our socio-ecological system 27
- Figure 9 Ecosystems and production-consumption systems 28
- Figure 10. The energy, mobility and food systems set in the context of SoNaRR's ecosystems and cross-cutting themes 29
- Figure 11. The 20 minute Neighbourhood..... 36
- Figure 12. Evidence flows in SoNaRR2020 37

Foreword

Wales's natural environment is our most precious inheritance, pivotal to our identity as a nation and, as has come into sharp focus over the last year, central to the health and well-being of our people and our economy.

Protecting the environment for future generations is one of the greatest challenges of our time. As we look towards taking a greener pathway out of the global Covid-19 pandemic, we must also seize the opportunity to re-imagine how we use our natural assets to address the dual threats from the climate and nature emergencies.

The publication of the second State of Natural Resources Report (SoNaRR2020) aims to inform that endeavour. It builds on the evidence base in the [first SoNaRR](#), illustrating some of the key challenges, priorities and opportunities for the sustainable management of natural resources (SMNR).

At its heart is the ambition to bridge the gap between where we currently are and where we need to be.

The Environment Act and the Well-being of Future Generations Act provide the firm foundations for Wales to deliver its ambition. As Nikhil Seth, United Nations Assistant Secretary General said;

“What Wales is doing today the world will do tomorrow”.

[The World Health Organisation](#) (2020) and [Welsh Government](#) (2020) have both highlighted the significant role that natural resources will play in our recovery from the pandemic.

The publication of SoNaRR2020 comes at a critical time of challenge and change, on many fronts.

In 2019, the Welsh Government declared a climate emergency and set a target to reach net [zero carbon by 2050](#) (Welsh Government, 2019). We have seen children and young people take to the streets around the world to make a stand over the climate and nature emergencies, placing them front and centre of the global news agenda.

The Covid-19 pandemic has also fundamentally changed our way of life. The importance of being able to enjoy our natural environment, and the health and well-being impacts it brings, has been made clearer than ever as we all adapted to the restrictions put in place to control the virus.

Our collective response to the pandemic represents a once in a generation opportunity to reset our values and priorities, and to realign them with those that will create a more sustainable future.

The green recovery task and finish group, commissioned by the Minister for Environment, Energy and Rural Affairs, Lesley Griffiths and chaired by Sir David Henshaw, has already identified innovative opportunities for us to continue Wales's leading role in the green agenda. Here is the opportunity, amid this globally challenging time, to refocus our

attention towards a truly green recovery and a society that works with nature, not against it.

There is no denying that we are at a pivotal point in human and environmental history. Now is the time for action and to build on the good work implemented since the publication of our first report.

SoNaRR2020 includes the traditional focus on management of natural resources within the eight broad ecosystems. It also proposes a transformational approach using the ecosystem, economic and social spheres as levers to redesign our society and economy. It identifies three areas for transformative change: the food , energy and transport systems.

The global food system has a significant impact on the environment. Land use is identified by the [UN IPBES report](#) (2019) as one of the big drivers of the nature emergency. Emissions of pollutants, depletion of resources, biodiversity loss and ecosystem degradation are consequences of the current system in Wales and beyond.

The global energy system is one of the main drivers of the climate emergency. Wales's current energy production and consumption creates many pressures for ecosystems and public health here and across the planet. Wales needs to increase its use of renewable and sustainable energy sources, reducing the current dependence on harmful fossil fuels.

The transport system has an impact on ecosystems and health. Urban transport contributes to carbon emissions, air and water pollution, noise pollution and the social and economic effects of congestion or lack of transport opportunities.

A transformational approach will move us towards a regenerative economy. Using the well-being goals as our guide, Wales can steer a course to the future. With the right approach, we can surpass expectations for sustainability and resilience. Wales can build in systematic consideration for the environment and achieve a more equal society. This would make Wales a country with abundant natural resources and thriving communities; a Wales that meets its well-being goals.

Wales has made significant progress in response to the global climate emergency and enhancing the natural environment. However, there is still much to do; Wales is not yet meeting the four long-term aims of sustainable management of natural resources, and it is vital that future policy decisions are rooted in this evidence.

SoNaRR2020 sets out a range of opportunities for action to move towards a sustainable future and we hope that it acts as a catalyst for positive change and a green recovery across Wales.

Introduction to SoNaRR2020

This is the second State of Natural Resources Report (SoNaRR), required under the Welsh Environment Act 2016.

In 2016 Natural Resources Wales (NRW) published the [first SoNaRR](#) as our understanding of the implications of the Environment Act were being developed.

Since then the first natural resources policy has been published, as have the [Area Statements](#); the world has recognised the nature and climate emergencies that we face; and the Covid-19 pandemic has brought a new focus on well-being. This report is written within that context.

SoNaRR2020 builds on a number of Welsh, UK and global assessments of the status and trends of natural resources. It looks at the risks those trends pose to our ecosystems and to the long-term social, cultural and economic well-being of Wales, in terms defined by the Well-Being of Future Generations (Wales) Act 2015.

A phased publication

The Environment Act requires SoNaRR2020 to be published by the end of 2020. In these unprecedented times, we have agreed a phased publication with Welsh Government:

Our assessment of the extent to which SMNR is being achieved, our recommendations for progress and the natural resources registers showing pressures, impacts and opportunities for action are published here, in December 2020.

In March 2021 we will publish the full assessments by ecosystem and cross-cutting theme, including biodiversity.

SoNaRR's content and purpose is defined in the Environment Act

NRW must prepare and publish a report containing:

- An assessment of the state of natural resources in Wales.
- An assessment of the extent to which the sustainable management of natural resources is being achieved.
- An assessment of biodiversity to support the biodiversity duty on public bodies under section 6 of the Environment Act. Biodiversity is defined as:
‘the diversity of living organisms, whether at the genetic, species or ecosystem level’.
- What NRW considers to be the main trends and factors that are affecting and are likely to affect the state of natural resources.
- Any aspects about the state of natural resources on which NRW considers it does not have sufficient information to make an assessment.

SoNaRR is an evidence base for Welsh Ministers to use when preparing or revising the [Natural Resources Policy](#), for NRW when preparing [Area Statements](#), and for local

planning authorities when refreshing local development plans. SoNaRR must also be considered in the publishing, adopting or reviewing of national park and area of outstanding natural beauty management plans by relevant authorities.

Our use of broad ecosystems and cross-cutting themes

Natural resources are defined in the Environment Act as:

- Animals, plants and other organisms.
- Air, water and soil.
- Minerals.
- Geological features and processes.
- Physiographical features.
- Climatic features and processes.

These components combine and work together in many ways and at many scales, forming ecosystems from which humans use and obtain benefits. SoNaRR has grouped ecosystems following the system used in the [UK National Ecosystem Assessment of 2011](#).

Using these broad ecosystems allows us to:

- Distinguish and group together the different habitats generally found there.
- Describe the services we get from them and map the benefits to well-being.
- Look at pressures and impacts on the resilience of those ecosystems.
- Identify opportunities for action and design management interventions around the land, water and sea uses that occur there.

In SoNaRR2016 we used these ecosystems as the thread throughout the report. We are still using the broad ecosystems in SoNaRR2020 but have also assessed the sustainable management of natural resources against a number of cross-cutting themes. These are the building blocks of our overall assessment and will be published as full chapters in March 2021.

Broad ecosystems:

- Urban
- Mountain, moorland and heath
- Semi-natural grassland
- Freshwater
- Enclosed farmland
- Woodland
- Coastal margins
- Marine

Cross-cutting themes:

- Biodiversity
- Climate Change

- Land use and soils
- Invasive non-native species
- Air quality
- Water efficiency
- Waste
- Energy efficiency

SMNR and the well-being goals

The Environment Act defines the sustainable management of natural resources as:

“...using natural resources in a way and at a rate that maintains and enhances the resilience of ecosystems and the benefits they provide. In doing so, meeting the needs of current generations without compromising the ability of future generations to meet their needs, and contributing to the achievement of the well-being goals set out in the Well-being of Future Generations Act.”

The objective of SMNR is to build resilient ecosystems which supply ecosystem services and help Wales meet its well-being goals for a sustainable future. To do that we need to transform our socio-economic systems so that they are working more like natural regenerative systems, responding to feedback about environmental capacity and social needs.

The Welsh well-being goal of securing [‘A resilient Wales’](#) is about building healthy functioning ecosystems which support social, economic and ecological resilience. To secure this resilience, we need to focus on building healthy, regenerating systems.

Figure 1 takes the Doughnut economics (Raworth, 2017) model and combines it with the Welsh well-being goals. It shows how SMNR contributes to achieving the well-being goals. This would keep Wales within the safe operating space for humanity while meeting society’s needs.

The four aims of SMNR fit within the safe space for sustainable development and the achievement of the well-being goals; avoiding either a shortfall against delivering the social, economic and cultural well-being goals in the centre of the diagram or overshooting our environmental capacity around the outside.

Going beyond the outer edge of the doughnut means Wales is breaching its fair share of the planet’s environmental capacity. But reducing the environmental impact too far could mean a shortfall with an impact on social and economic well-being.

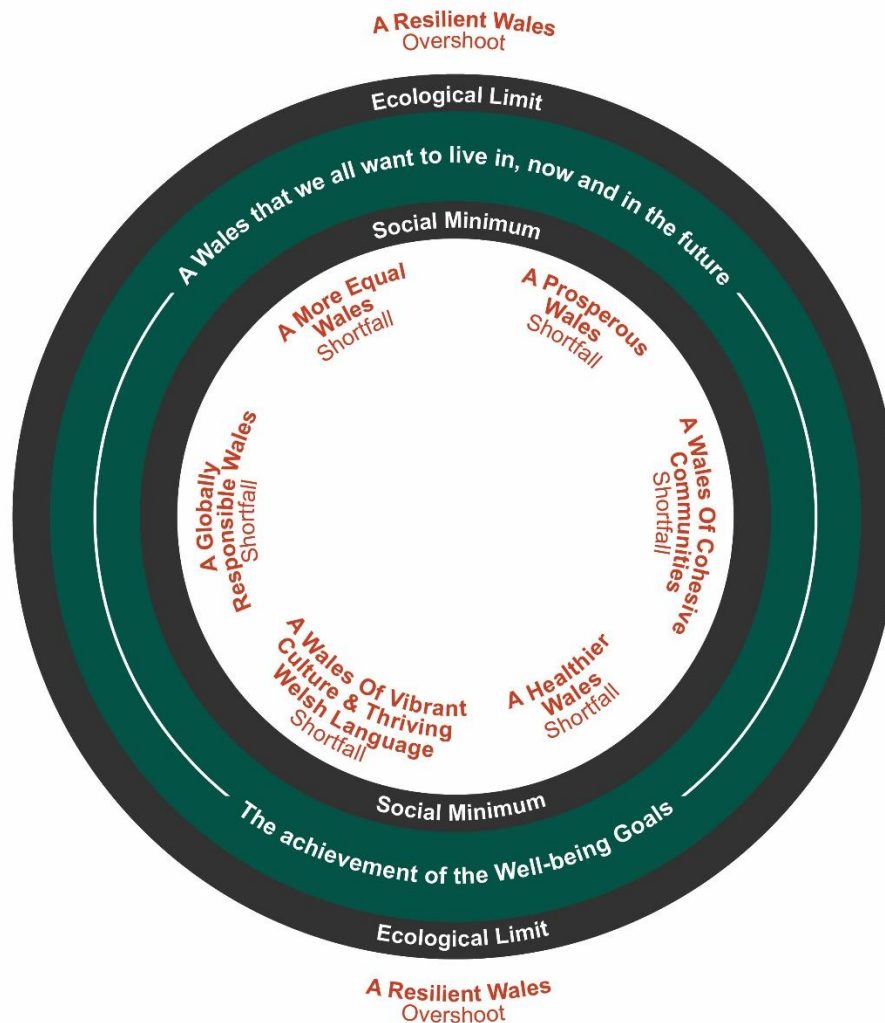


Figure 1 The doughnut economics of SMNR and well-being (NRW)

The four aims of SMNR

Since the publication of SoNaRR2016 the four long-term aims of SMNR have been agreed and they guide the assessments that underpin SoNaRR2020.

Achieving SMNR means having healthy, well-functioning and resilient social, economic and eco-systems, using feedback information to stay in balance with each other as they adapt to change.

SoNaRR2020 assesses Wales's progress towards SMNR individually against the four aims, but it is important to note that they are inseparable and should not be seen in isolation.

Wales cannot work towards healthy places for people without resilient ecosystems and cannot make our ecosystems resilient without safeguarding stocks of natural resources. The regenerative economy safeguards and restores those stocks and is the route to the transformational change needed to achieve SMNR.

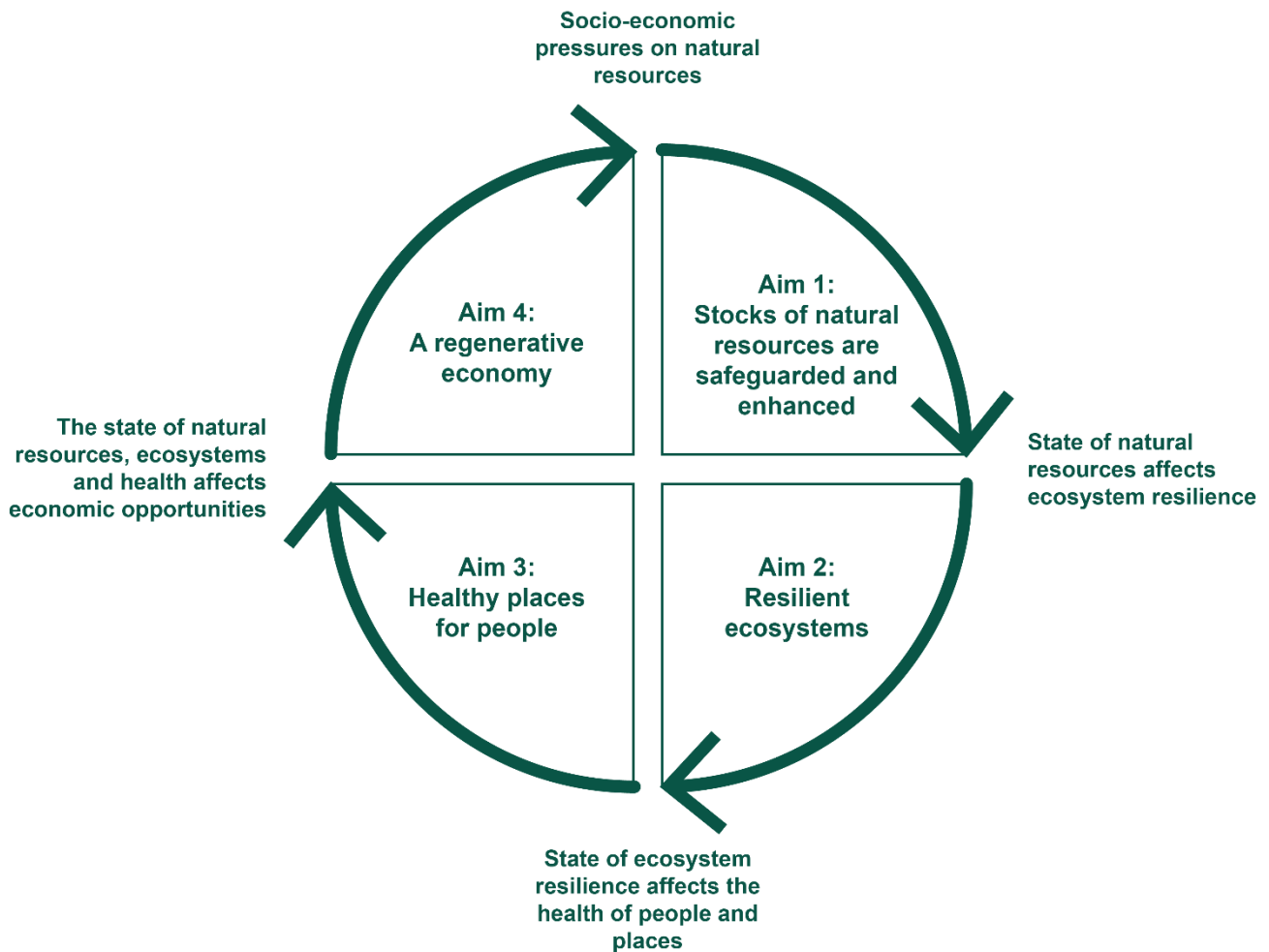


Figure 2 The linkages and cyclical nature of the four aims of SMNR (NRW)

Aim 1. Stocks of natural resources are safeguarded and enhanced

Tackling overexploitation to ensure that natural resources are safeguarded, and where possible enhanced, to meet the needs of current and future generations and to contribute to ecosystem resilience. Non-renewable natural resources (such as, aggregates, fossil fuels) are used in a sustainable manner and, where depletion is unavoidable, substitutes are put in place to meet future needs.

This applies to Wales's use of natural resources; the impact in Wales and globally where natural resources or pollutants and waste are imported and exported.

This aim contributes to the well-being goal 'A Resilient Wales' and in so doing makes contributions across the other goals.

Aim 2. Ecosystems are resilient to expected and unforeseen change

Building ecosystem resilience relies upon safeguarding and enhancing natural resources and ensures the continued provision of ecosystem services which Wales relies upon for its economy and health. Resilience means ecosystems are adaptable and can resist the impacts of habitat change, climate change, pollution, invasive non-native species and other pressures.

This aim contributes in particular to the well-being goal [‘A Resilient Wales’](#) and in so doing makes contributions across the other goals.

Aim 3. Wales has healthy places for people, protected from environmental risks

The environment provides regulating services which protects people from risks including air, water or noise pollution and flooding. Managing those services increases well-being resulting in the provision of a healthy environment for all. Meeting this aim is dependent on having resilient ecosystems and the health and well-being of the nation contributes to our ability to take advantage of the economic opportunities of a regenerative economy.

This aim is relevant to the well-being goals [‘A Healthier Wales’](#), [‘A Wales of Cohesive Communities’](#) and contributes to [‘A Wales of vibrant culture and thriving Welsh language’](#) goal.

Aim 4. Contributing to a regenerative economy, achieving sustainable levels of production and consumption

Reducing the environmental impact of production and consumption and Wales’s global environmental footprint. The aim is for Wales to use no more than its fair share of global resources and for the economy to operate within the regenerative capacity of the Earth’s ecosystems.

This aim is relevant to the well-being goals [‘A Prosperous Wales’](#) and [‘A Globally responsible Wales’](#).

SoNaRR2020: Bridges to the future

Wales can bridge the gap between where it is now and where it needs to be to achieve a sustainable future.

“What Wales is doing today the world will do tomorrow” - Nikhil Seth, United Nations Assistant Secretary General Using its [Well-being of Future Generations Act](#) goals as a guide, Wales can bridge the gap between where it is now and where it needs to be to achieve a sustainable future.

By building in consideration for environmental capacity, at the core of a regenerative economy and a more equal society, Wales could be a country with abundant natural resources. Wales could live within its fair share of the Earth’s capacity and have thriving communities, becoming a Wales which meets its well-being goals.



Figure 3 Bendigeidfran by Margaret Jones - National Library of Wales

‘A fo ben, bid bont’ - ‘He that would lead, let him be a bridge’

In the 12th century tale of King Bendigeidfran, in the Mabinogion, the Welsh came to a river too wide to cross and with no bridge to let them reach the other side. Asked what advice he would give, the giant king said “Only this: he that would lead, let him be a bridge. I will be a bridge”.

Today Wales faces the seemingly unbridgeable obstacle of how to deliver the transformative change needed to meet the challenge of the nature and climate emergencies. Wales led the way in the first industrial revolution and is seeking to lead the way in the transition to sustainability.

In passing the [Well-being of Future Generations \(Wales\) Act](#), Wales is unique in the way it is exploring how to bridge the gap to sustainability. Together with the Welsh Environment and Planning Acts Wales has the legal framework to make transformation change.

As Sir David Attenborough said on the television programme [A Life On Our Planet](#) “We need to learn how to work with nature, rather than against it”. Framing this future as merely sustaining ourselves and making ecosystems resilient to the pressures we place on them

is not an inspiring vision. Humans can do more than just get by. Nature can be given a place where it can do more than just be resilient and cling on.

Action for people and the planet

SoNaRR2020 is an assessment of the extent to which Wales is achieving the sustainable management of natural resources. **The report concludes that Wales is not yet meeting the four long-term aims of SMNR. This is not surprising as sustainable development will not be achieved overnight, but Wales has put the laws and processes in place to achieve its well-being goals for a sustainable future.**

Wales is not maintaining stocks of natural resources, as described in aim 1. Iconic species like curlews are predicted to become extinct in Wales within a couple of decades.

The state of natural resources has an impact on the resilience of our ecosystems. aim 2 finds resilience to be declining in line with global trends. The UN predict that globally, **one million of the eight million species on the planet, will be extinct within 20 years.**

Without stable levels of natural resources and resilient ecosystems, aim 3 will continue to show that people across Wales are not free from environmental hazards and do not all have healthy places to live in.

A regenerative economy, in aim 4, cannot be achieved while economic activity takes place at the expense of the environment.

The [IPBES global assessment of 2019](#) concludes that with the current model of economic development 'We are eroding the very foundations of our economies, livelihoods, food security, health and quality of life worldwide.'

A new economic model

In place of the standard graph of gross domestic product (GDP), showing a seemingly unlimited potential to increase the production of goods and services, [Oxfam have developed the Doughnut economics model.](#)

The outside edge of the Doughnut model shows the physical limits to the functioning of global systems. On our planet there are definite physical limits, as the economist, Kenneth Boulding said, "anyone who believes exponential growth can go on forever in a finite world is either a madman or an economist."

Oxfam have added data from the Welsh Government Well-being of Wales reports to update their Welsh Doughnut report (Oxfam, 2020). The Doughnut shows a failure to stay within the limits of what is sustainable, shown by the green doughnut (Figure 4). Wales is not keeping within our global share of the environment, on the outside of the doughnut, nor meeting its socio-economic goals, on the inside edge:

The Welsh Doughnut (Wales 2020)

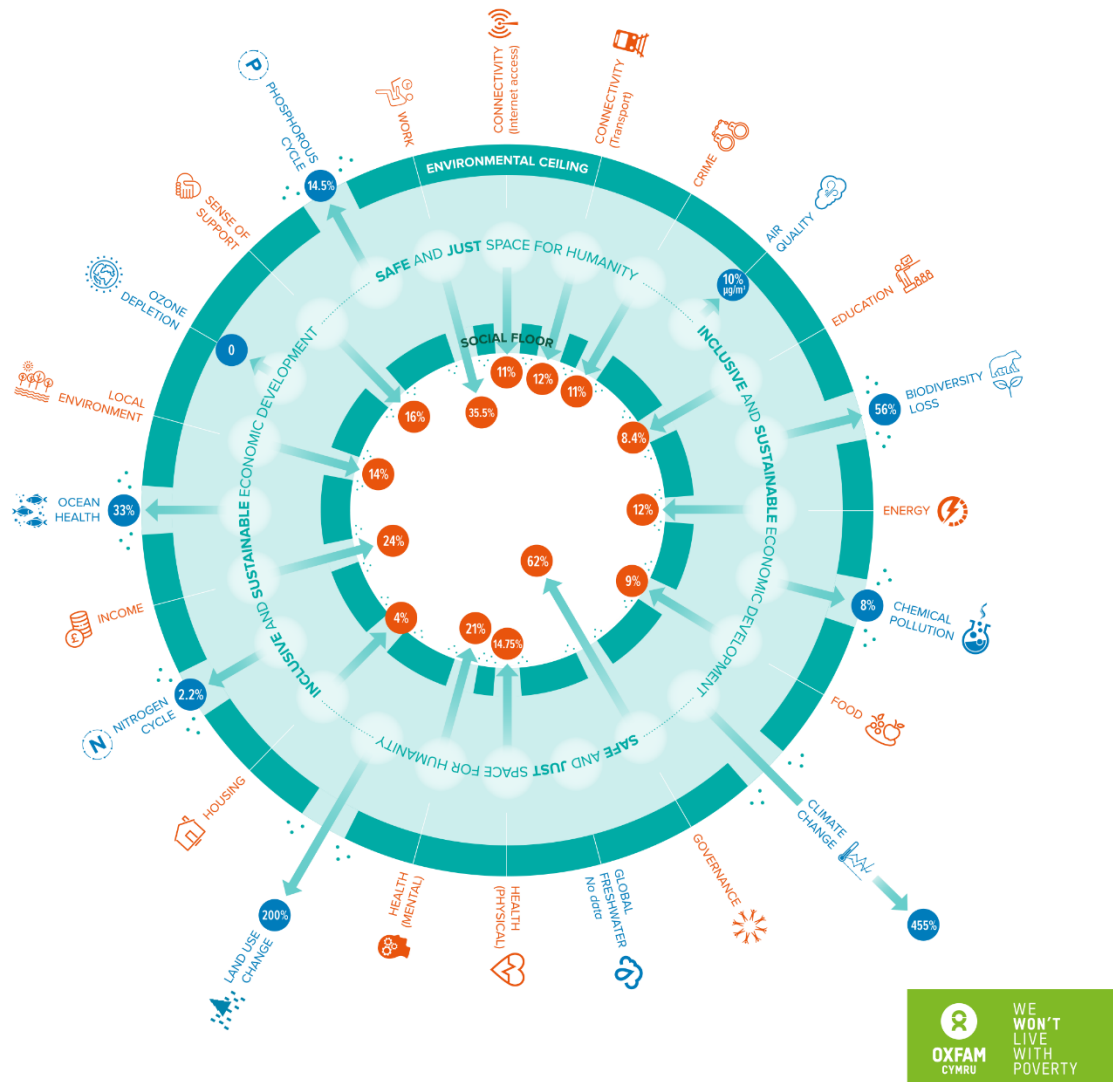


Figure 4 Welsh Economic Doughnut Results 2020 Source: Oxfam Cymru 2020

The options for securing abundance within the planet's physical capacity is the space which a regenerative and circular economy would explore as detailed in aim 4.

The need for an integrated approach

Lifestyles and the way goods are produced and consumed need to change to achieve SMNR. Wales's overall consumption of resources needs to drop if we are to achieve 'one planet living'. As the IPBES says, what is needed is "transformative change, a fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values."

Wales has the framework in place, in the form of the Well-being of Future Generations and Environment Acts, to deliver such change and transition to a sustainable future.

To explore what 'one planet living' or 'life inside the Doughnut' would look like, the Welsh Government has joined the [Wellbeing Economy Alliance](#), a network working towards a well-being economy, delivering human and ecological well-being. This integrated approach, recognising that the well-being of both people and planet are intertwined has to be central to solving the nature and climate emergencies.

People: Responsible levels of production and consumption

Beyond these examples of changes which could be made to three core socio-economic systems, there is a more general need to reduce levels of production and consumption and to do so in a way which does not reduce levels of well-being.

To use the Doughnut economics model, reducing the overshoot beyond the outside edge, cannot come at the expense of contracting the inner edge of the doughnut and squeezing social well-being.

Planet: Space for nature

Setting out how Wales can address the root causes of environmental degradation, still leaves a need to take action on the ground to help with the restoration and enhancement of our broad ecosystems.

Addressing those wider systems challenges, the pressures that the natural environment face around fragmentation, over-exploitation and pollution, as well as climate adaptation, can now be seen as critical features of redesigning how we organise our society and economy.

In the past we have built a regulatory framework in response to the environmental trade-offs caused by growth and unsustainable resource use.

In the future, we can design in regulatory mechanisms that ensure space for biodiversity is built into a regenerative economy. To enable this, we may still require a range of targets or measures to help communicate the investment and resources needed.

One such example is the UN's suggestion that countries should set aside 30% of their area for nature by 2030. [The UK is signed up to protecting 30% of its land for nature by 2030](#), meaning an extra 400,000 hectares, an area quarter the size of Wales (Leaders Pledge, 2020).

Measures such as this should be designed into future systems approaches, and not seen as stand-alone objectives. This is an opportunity to use the SMNR principles to pursue the well-being goals.

Rather than being labelled 'protected areas', protected from humans, perhaps these expanded areas could be re-framed as being 'promoted areas', places where biodiversity is promoted and human activity regulated accordingly (Buscher and Fletcher, 2020).

This would make it clear that nature cannot be protected by being separated from society, but that humans need to engage positively with their environment.

As a former head of the US Nature Conservancy said: it would "demonstrate how the fates of nature and of people are deeply intertwined and then offer new strategies for promoting the health and prosperity of both" (Kareiva et al., 2012).

Meeting the well-being goals and achieving sustainable development, and the sustainable management of natural resources, will depend on Wales achieving healthy, thriving environmental, economic and social systems.

Viewing society and the economy as if they are separate from the environment, has not worked. It has led to people in Wales pursuing lifestyles which cannot be met from Wales's fair share of the Earth's resources.

On the other hand, managing the environment as if it is separate from society has meant that humanity has restricted itself to dealing with the immediate environmental impacts of Welsh lifestyles. More joined up actions have not been taken in the social sphere to address the problems at source, with the problems being viewed as purely environmental.

Case Study: Bringing it all together



Figure 5 One Planet Cardiff © Cardiff Council

As an example of an integrated approach to these issues, Cardiff Council are developing the [One Planet Cardiff](#) strategy to make Cardiff more sustainable and become a carbon neutral city by 2030. The strategy looks at 7 different areas of focus:

- **Energy:** Reduce energy consumption in general, and our reliance on fossil fuels in particular.
- **Built Environment:** Reduce the heat and electricity energy demand of buildings in the city by up to 60%.
- **Green Infrastructure & Biodiversity:** Re-prioritising the city's green infrastructure to increase and connect green spaces.
- **Transport:** Rapidly increasing the use of active travel and public transport; accelerating the use of 'clean' vehicles.
- **Waste:** Boost recycling rates and minimise waste to play our part in making Wales a Zero Waste nation by 2050.
- **Food:** Minimise the impact our food choices make on the environment.
- **Water:** Preparing for extreme weather events such as flooding.

A vision for 2050

NRW has produced SoNaRR2020 as an evidence base for organisations across Wales to make use of in their decision making process.

For example, we expect SoNaRR2020 to be of use to Welsh Government in informing the Natural Resources Policy and to local authorities in writing their Local Development Plans. We hope that it will be of use to other organisations across Wales working to achieve the well-being goals.

NRW itself will use the evidence in SoNaRR2020 to develop a shared vision for 2050 responding to the increasing environmental pressures detailed in our report.

We will stimulate a national conversation to help develop a long-term agenda for the management of natural resources. The result will be a collective vision, which everyone in Wales can help to achieve.

NRW is in a unique position to lead this national conversation, to collaborate with others and to help realise a shared vision. The Vision for 2050 will focus on how current behaviours and practices affecting natural resources need to change to become sustainable.

The conversation around the vision, will be just as important as the final statement itself. NRW will work with a range of organisations from different sectors and places across Wales. We want to enable partners to develop their own long-term plans to deliver a joint vision for Wales.

Collectively, these individual plans will help Wales deliver the shared Vision for 2050. NRW will play a lead role in co-ordinating, developing and realising this vision.

Beyond sustainability

The SoNaRR2020 chapters identify actions that can help Wales achieve the SMNR and bridge the gap between where Wales is today and where we need to be to meet the well-being goals.

The actions focus on ecosystems and economic activity. Specifically, physical management of natural resources in the eight broad ecosystems.

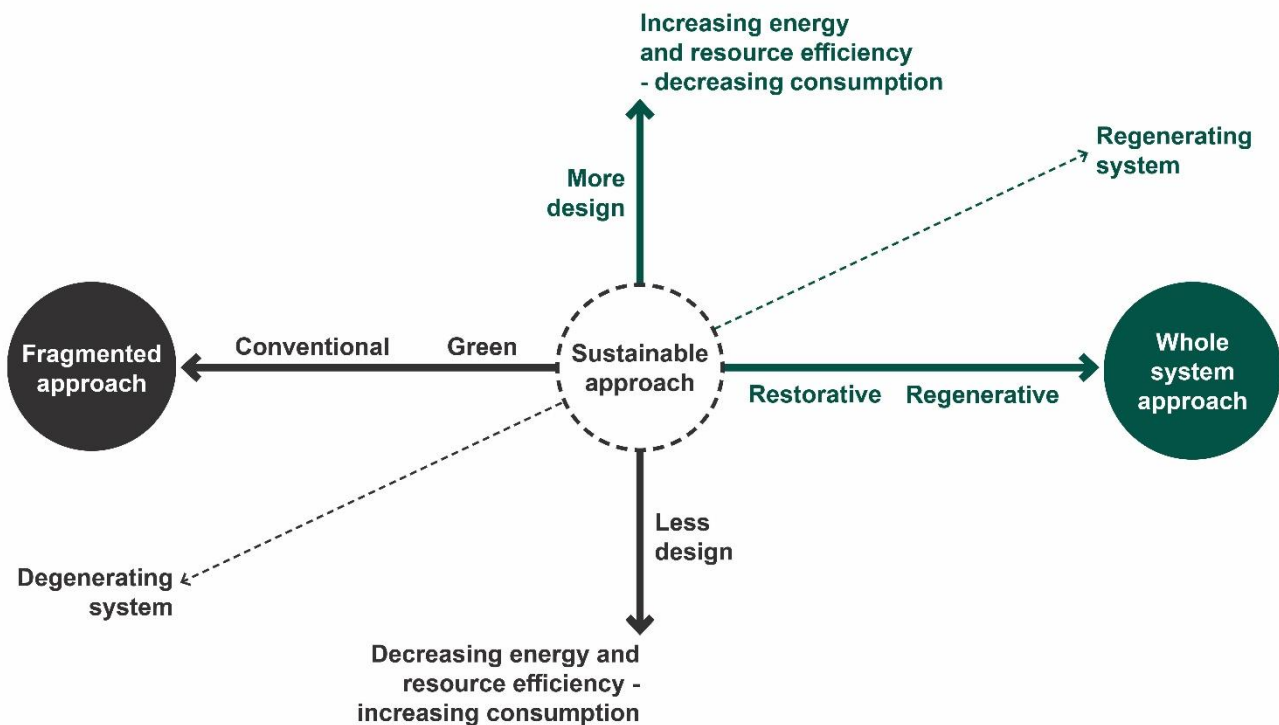


Figure 6 Beyond Sustainability towards a regenerative economy. Adapted from Reed 2007

Traditionally, action to address environmental pressures has focused on influencing the management of the broad ecosystems, using incentives and regulation to influence the use of natural resources and functioning of ecosystems.

There has been a focus on the ecosystem sphere, with direct management of land and sea, and the economic sphere, involving the regulation of economic activity. Responding to the nature and climate emergencies needs to offer something more than this traditional approach.

As the Convention on Biological Diversity (CBD) graph (Secretariat of the Convention on Biological Diversity, 2020) below (Figure 7) shows, the actions to address issues such as the loss of biodiversity, need a range of approaches, taking an ecosystem, economic, social and cultural focus.

Working up from the bottom of the graph, Wales needs to use everything from action for nature conservation to reducing its consumption of natural resources.

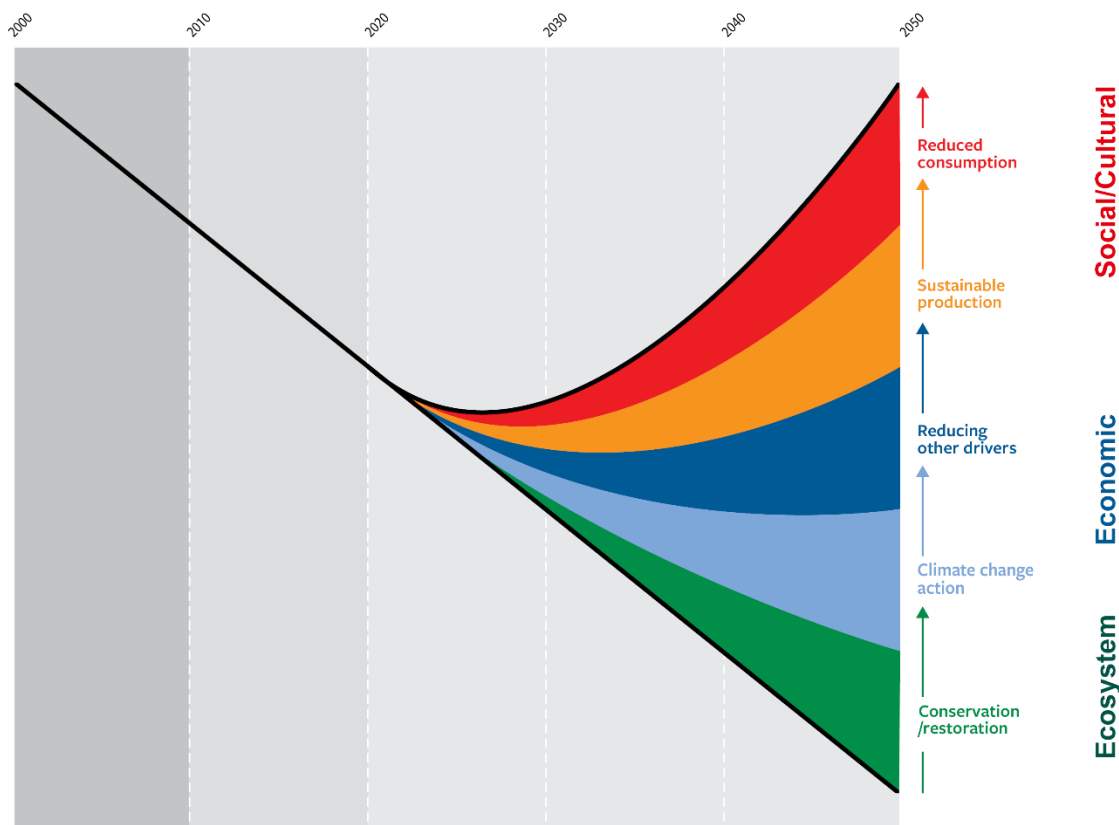


Figure 7 A portfolio of actions to reduce loss and restore biodiversity. © Secretariat of the Convention on Biological Diversity.

Adding in the social sphere

By adding a focus on the social sphere and how we leverage change in society, we can enable an appropriate response to the global environmental issues Wales faces.

Achieving the sustainable management of natural resources is not something which NRW or the Welsh Government can do alone, it is a challenge for the whole of society.

NRW are exploring how the public sector can foster collaborative action with business and civil society. Through Area Statements and Public Service Boards, we are exploring how to best implement the Welsh Government Natural Resources Policy.

To deliver transformative change Wales needs to trial ideas, launch experiments and support innovation. It is only by working across the public, private and third sectors that the ecosystem, economic and social spheres can be used to leverage the change needed to address the nature and climate emergencies.

To deliver change beyond what the public and private sectors have been doing with land management in the ecosystem sphere and regulation in the economic sphere, we need to engage civil society and bring in the social sphere.

Civil society contains a wide array of non-governmental and not for profit organisations, such as voluntary and community organisations, faith groups, trade unions, local and national charities. This range of actors offers a variety of opportunities for delivering change at different scales.

Taking a whole systems approach, means looking at the role business and the voluntary sector can play, together with government, at the local, Wales and UK levels.

“People are responsible for today’s major environmental problems: deforestation, overfishing, ocean plastics, and, of course, climate change. But people are also the solution. Our growing understanding of human behaviour and decision-making holds tremendous promise for inspiring the behaviour change necessary to conserve nature and provide for the communities who depend on it” (Rare, 2019).

Environmental problems have traditionally been addressed at the level of the direct drivers of change, taking the pressures as they appear on the ground, in the ecosystem sphere. For example, solutions to diffuse water pollution from agriculture are sought at the farm scale, with different land management and improved storage of potential pollutants. But taking action at this level cannot change the systems and the behaviours driving the pressures on the environment.

The indirect drivers of pollution within the food system, such as the demand for cheap food and farm incomes squeezed by the retail sector are not addressed by action within the ecosystem sphere. The solution is to transform the food system at a high enough level to design out the pressures at source.

System changes within the social sphere can deliver a wider range of actions focusing on the indirect drivers and changing the way people in Wales live. Including a focus on society in addition to the economic and social spheres, provides a further space to leverage change to the indirect drivers, expanding the focus to include economic, demographic, governance, technological and cultural elements.

Ecosystem, economic and social spheres:

- **The ecosystem sphere**, which looks at direct opportunities to manage natural resources more sustainably.
- **The economic sphere**, where incentives and regulation can address the indirect drivers of change and reduce the pressures on ecosystems.
- **The social sphere**, where changes to the way we live can make more radical impacts, focusing on the indirect drivers and reducing pressures, addressing drivers of environmental change at source.

Options for change in the ecosystem sphere are constrained by the limit to which ecosystems can be modified while retaining their resilience. There is only so much that can be done to change land management on farms to limit diffuse water pollution.

By contrast, there are many more options available to steer the economic sphere in a more sustainable direction. Changing the operating environment the farm is working in, will present more options for land management and less intensive farming systems. But, the options will still be constrained by both the food that consumers are seeking and the price they are prepared to pay.

By far the largest space for change is to be found in the social sphere around the options to change the way people in Wales live. Changing the way society organises the food system will drive change throughout the system.

Looking beyond the regulation of the food system, at the wider public policy outcomes, it has been estimated that for every £1 consumers spend on food, another £1 of costs are borne by society in terms of health impact and water pollution (Fitzpatrick et al., 2017). It is clear that Wales needs to leverage change across all three spheres, taking the relevant opportunities at different levels to make progress towards the well-being goals.

Transforming Wales

Changing the way we all live



Figure 8 The three spheres of our socio-ecological system © European Environment Agency, 2019a

For Welsh public, private and third sectors to leverage change to tackle the nature and climate emergencies, they need to focus on the systems that support everyday life.

The Well-being of Future Generations Act provides the framework to deliver integrated change across society, economy and the environment. To look at how this can be done we have looked at delivering environmental change through the social, economic and ecosystem spheres.

While action in the ecosystem and economic spheres is focused on mitigating the impacts people are having on the planet, it is in the social sphere and in civil society that Wales can address the causes of environmental degradation at their source. That means looking at the way people live so that a range of sectors can leverage social and cultural change and rapidly establish a better fit between humans and the environment.

There are many options available for pursuing a more sustainable course of development within the dynamic and ever-changing social sphere.

Huge societal transformations are happening all around us, all the time. Autonomous vehicles and renewable energy now threaten the established oil, gas, coal and car industries. Global sales of electric cars saw a 40% year-on-year increase during the last year (IEA, 2020). Wales is exploring how to use such technological and social changes, to reduce its impact on the planet.

Analysis of how lifestyles across Europe are driving environmental degradation has concluded that in order to live within environmental limits, profound changes are needed (EEA, 2019a). There is a general need to reduce levels of production and consumption in line with United Nations sustainable development [goal 12](#) to 'ensure sustainable

consumption and production patterns’, in pursuit of a regenerative economy. An obvious starting point is to focus on the core systems that are placing the most pressure on ecosystems. These are based around food, energy and transport (EEA, 2019b).

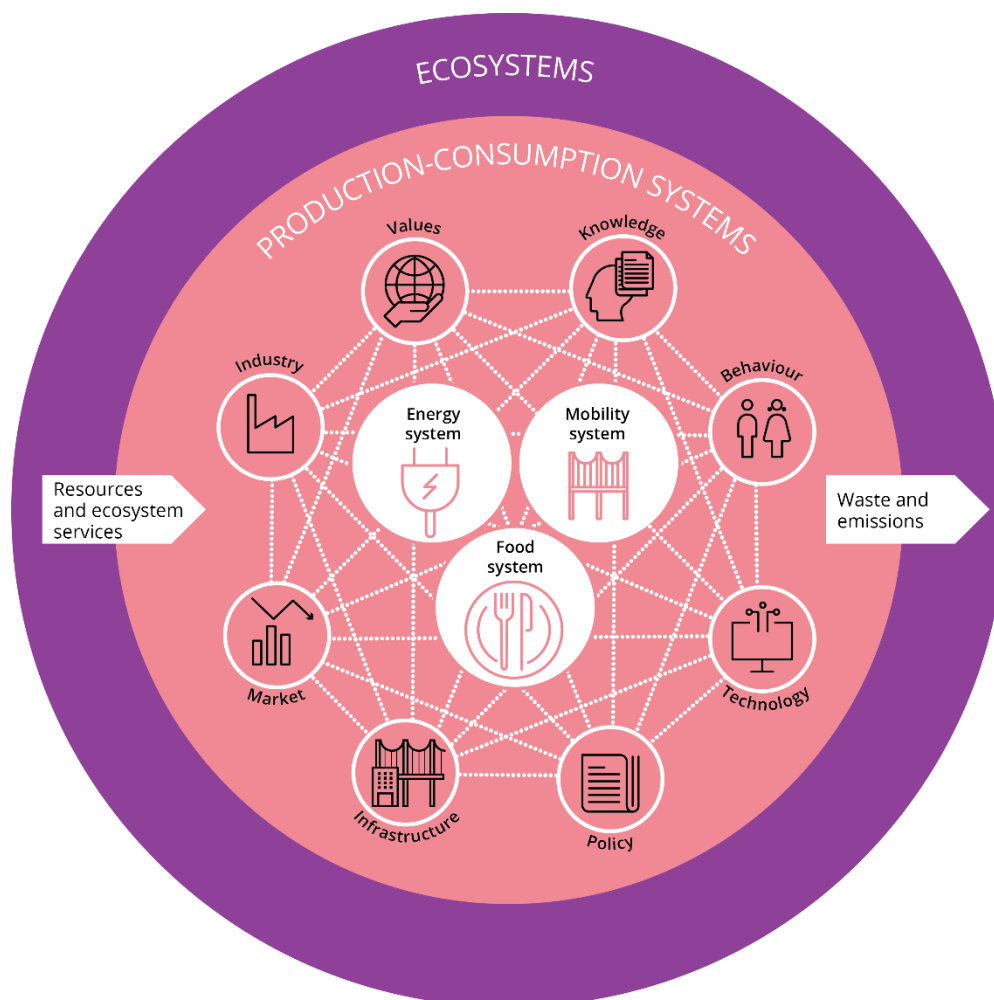


Figure 9 Ecosystems and production-consumption systems © European Environment Agency, 2019a

Looking at the food, energy and transport systems as examples of society’s systems of production and consumption allows a wider range of leverage points than have traditionally been used to regulate the environment. Examples include looking at values, behaviours and different forms of knowledge, in addition to the more traditional focus on technical and economic elements.

At the micro level for example, ‘behavioural insights’ has been used across the public and private sectors to improve understanding of people’s actions, and to achieve better outcomes though influencing human behaviour. This approach provides a scientific understanding of the drivers of human behaviour, especially non-conscious processes such as habits and emotions. It also provides insight into how the social and physical environment can be changed to influence behaviour, for example through changing the ‘default option’ to one that benefits the environment, making pro-environmental behaviours the easiest choice.

At the macro level, cross sectoral policy can be used to help redesign the energy, mobility and food systems, to pull society in line with environmental capacity. Local and national government are co-ordinating the integrated consideration of cross sectoral activities around different places and spaces. Spatial planning considers both rural and urban land use at local, regional and national scales, to look at environmental and socio-economic issues.

Designing better urban systems, bringing together both technical and creative input, will enable a better fit with the natural systems they depend on. It has been suggested that ‘Planners seeking to design resilient urban systems should start by studying the ecology of natural systems’ (Herbert, 2010). Learning from how natural systems adapt to change and recycle material, would help to build a regenerative economy, one which functions within planetary limits.

The IPBES report (2019) concludes that a transition to a sustainable world is technically and economically possible, but it will require collective and individual creativity to re-imagine the way we live.

Setting the energy, mobility and food systems at the centre of SoNaRR’s analysis of the eight broad ecosystems and the pressures on them, demonstrates that they are key leverage points for change.

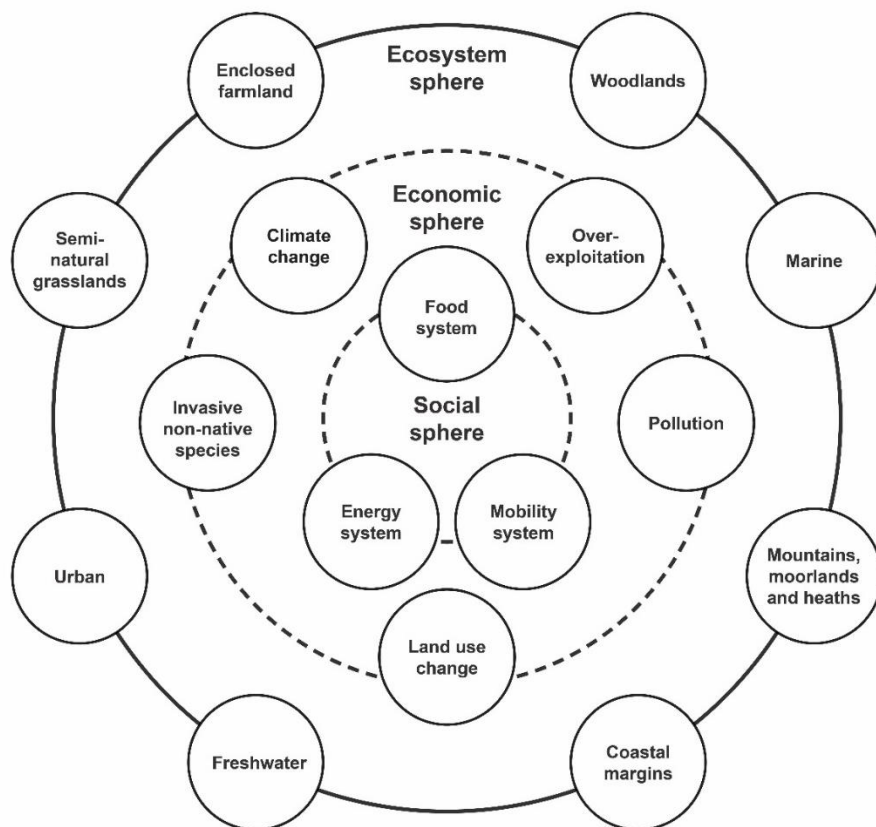


Figure 10. The energy, mobility and food systems set in the context of SoNaRR’s ecosystems and cross-cutting themes (NRW)

Transforming the food system

Globally, land use has been identified by the IPBES (2019) as one of the big drivers of the nature emergency.

The food system, in meeting society's nutritional needs, is responsible for many impacts on the environment. Examples include emissions of pollutants, depletion of resources, loss of biodiversity and degradation of ecosystems in Wales and beyond (EEA, 2019a).

Options for making the existing food system more efficient are limited within the ecosystem and economic spheres. It is in the social sphere, with the broad range of action civil society organisations can take, that Wales has the most options for transforming its food system.

The ecosystem sphere

The starting point for addressing the environmental impact of the food system lies in changing the way land and seas are managed, with the adoption of more sustainable farming, forestry and fishing practices.

Precision farming, agroecological systems, agroforestry, low-impact silvicultural systems and innovative horticultural systems, are options being looked at to change land use.

Promoting sustainable agricultural and agroecological practices that work with nature, will reduce artificial inputs, leading to a reduction in pollution. While the volume of production may also be reduced, profitability for landowners is often improved due to a reduction in costs (van der Ploeg et al., 2019).

Low carbon management practices include:

- Precision farming of crops.
- Preventing soil compaction.
- Applying biochar.
- Anaerobic digestion.
- Controlled release fertilisers.

These will deliver a range of benefits including improved productivity, improved air, water and soil quality, reduced pests and diseases and improved soil structure. Water and energy-smart production systems will become increasingly important as water scarcity increases and as agriculture seeks ways to reduce the emissions of greenhouse gases.

Increased biodiversity-friendly management practices include:

- Introducing flowering legumes to grasslands.
- Leaving fallow crop margins.
- Planting hedgerows.
- Retaining and increasing areas of semi-natural habitat within and around production systems.

Productivity may be positively or negatively affected or be balanced by benefits from improved ecosystem services such as drought tolerance or disease control, depending on the particular agricultural practice.

A refocused food system, and the opportunities for changes agricultural policy post-EU exit, would increase biodiversity in the farmed environment and free up land to expand woodland cover. Similarly, the use of agroforestry and hedgerow expansion, by boosting the numbers of trees and hedges, will sequester carbon and increase ecosystem services, while maintaining the primary purpose of food production.

Action in the economic sphere by both the public and private sectors can help deliver this change.

The economic sphere

A range of incentives and regulatory mechanisms have been used to steer the food system to secure a range of public policy objectives, from agri-environment schemes to Environmental Impact Assessment and fish quotas.

Sustainable farming methods offer huge potential and opportunities for farmers and could provide the basis for the transformation of agricultural policy. Sustainable methods not only provide healthier food but also considerably improve farmers' incomes. Studies show that throughout Europe, systems employing a range of more sustainable farming practices delivered between 10 and 110% increase in farm income (van der Ploeg et al., 2019).

A focus on improving the measurement of natural resources and the ecosystem services they provide is needed. This can help to better balance the improvement of ecosystem health alongside the provision of food, fibre and public benefits. What a 'good' state for the farmed environment looks like needs to be set out, monitored and modelled.

While natural resource modelling and monitoring to steer land management develops, and the EU exit brings new options for agri-environment support, a wider focus on the other components of the food system is also necessary. To totally transform the food system and do so quickly, focused effort within civil society and the social sphere is necessary.

The social sphere

Looking at the food system, from the perspective of the social sphere, encourages civil society to start engaging in redesigning the food system. This wider view of the production and consumption system considers options such as dietary changes and reducing food waste (EEA, 2019a).

Currently farmers and consumers across Europe are targeted by governments and their agencies to deliver change. A wider focus on the social sphere would target other actors in the food industry such as suppliers, retailers and the distribution sector. This could help accelerate progress towards sustainability, as retailers, such as the large supermarkets, have a large influence on the food industry (EEA, 2019b).

Options to enable changing land use practises, mitigating climate change and securing increased woodland cover and biodiversity, include:

- Changing diets.
- Reducing food waste.
- Increasing food production from a smaller area of land.

Society reducing its consumption of carbon-intensive foods, such as reducing meat and dairy consumption, would have a positive impact on the carbon balance (CCC, 2020). Increased plant production can drive a release of land to support more tree planting or bioenergy crops. These measures imply a shift towards meeting healthy eating guidelines that would also have a positive impact on human health (CCC, 2020).

Transforming the energy system

The global energy system is one of the main drivers of the climate emergency. The transition to renewable energy sources is both vital and inevitable for sustainable development. The consistent availability of renewable energy is a central goal of sustainable energy concepts, alongside energy efficiency and sufficiency.

The production and consumption of energy in Wales creates a wide-range of pressures for ecosystems and public health here and across the planet.

The generation of energy (both from fossil fuel and renewable sources) drives a number of local and global pressures such as:

- Consumption of natural resources.
- Production of atmospheric emissions.
- Consumption of water.
- Generation of conventional and nuclear waste.
- Increase in land use.
- The installation of infrastructure.

They all have effects on habitats, and flora and fauna.

The use of fossil fuels causes adverse human health effects and harms crops, forests, water ecosystems, buildings and infrastructures. Nuclear energy, another conventional energy generation source, also entails risks to health and ecosystems.

Renewable energy technologies are also contributing to environmental pressures on land, ecosystems and human health, and depletion of resources. These pressures are greatest when local and regional conditions are not properly addressed during the project design and implementation phases. The import of solid biomass, biofuels and bioliquids, to meet Europe's growing demand for alternative fuels, is associated with significant impacts on biodiversity (EEA, 2019a).

According to the [International Union for Conservation of Nature report of 2008](#), most factors leading to the accelerating loss of biodiversity are linked to the development and increasing use of energy by society. These links are both direct, e.g. fuel use, and indirect, e.g. support for food production and consumption.

The ecosystem sphere

Looking at urban areas as ecosystems allows a systems approach to changing the way society produces and consumes energy.

According to the [Committee on Climate Change report of 2019](#) the UK's legally-binding climate change targets will not be met without the near-complete elimination of greenhouse gas emissions from buildings.

Opportunities for emissions reduction from buildings are primarily energy efficiency, generation of low carbon electricity, and moving to low carbon heating and cooling. Action on these measures requires coordination across urban areas and need to be planned strategically.

Wales has some of the oldest and least thermally efficient housing stock in Europe. The Welsh Government has implemented a number of initiatives to improve the efficiency of the Welsh housing stock and the percentage of dwellings with adequate energy performance. This is a significant improvement but housing stock will need to be made even more efficient and operate at close to zero emissions (Green et al., 2018).

Urban areas can play a significant role in reducing carbon emissions and other environmental impacts of energy generation, through local generation, energy efficiency and demand management. Key opportunities for low carbon electricity in urban areas include solar panels, energy storage and electrification of heating.

Some local impacts can be managed at the ecosystem level, such as improving the energy efficiency of homes. At a more strategic level, looking at the economic and social spheres, more options to change the energy system become available. Options for improving energy efficiency can be taken through the economic sphere. While reducing energy consumption in the social sphere is the cheapest and the most effective way to decarbonise our energy system (IEA, 2019).

The economic sphere

According to the [International Energy Agency report of 2019](#) energy efficiency improvements globally and nationally are slowing down and opportunities to reduce costs and emissions are being lost.

The report concludes that although technological improvements are taking place, they are being slowed down by a mixture of societal and economic trends that are driving more energy use.

Whilst carbon prices and low carbon subsidies raise energy costs for end-users, reducing consumption and improving energy efficiency can reduce energy bills, reduce import dependency, and reduce demand at peak times (CCC, 2017). Cost saving through energy efficiency measures can also boost overall industrial productivity.

Rapid falls in the costs of solar panels and battery storage, combined with the roll out of smart meters, provide the basis of a very different way of producing and consuming energy. This is leading to a greater emphasis on local energy generation leveraging change in the social sphere.

The social sphere

The changing mix of technologies used by Wales to generate its electricity has been largely driven by stricter environmental regulation and growing social concern with carbon emissions and air quality.

Reducing energy consumption, increasing efficiency, renewable energy development and decarbonisation are all necessary. Delivering all of these at the same time poses a significant challenge to the energy sector and will involve a joined up approach between the public and private sectors.

The centralised, 20th century model of energy generation and provision is now transforming itself to become flexible, sustainable and user focused. This transition involves more stakeholders acting across many non-energy specialist sectors. The way energy is used, and the interactions energy users have with the energy system is constantly evolving.

Customers are moving towards a more direct interaction with suppliers and the rise of 'prosumers' highlights one of the most exciting trends in energy transition and renewable energy. Prosumers are energy users who produce energy through, for example, solar panels installed on or around their houses and using innovative equipment such as heat pumps, energy storage devices (such as batteries) and electric vehicles that will interact with the energy market through different pricing mechanisms such as time variable tariffs.

Transforming the transport system

How people and goods are transported generates significant negative impacts on ecosystems and human health. Urban transport contributes to carbon emissions, air, water and noise pollution. It also leads to the social and economic impacts associated with congestion and lack of transport opportunities.

Growth in transport, including rising car ownership rates and the growing transport networks, has led to direct and indirect impacts. These range from the direct impacts on the climate and on air quality, noise pollution and loss of biodiversity, to more indirect impacts such as on quality of life and invasive non-native species entering in the ballast water of ships.

Transport is the third largest source of greenhouse gas emissions in Wales (NAEI, 2020). Road transport creates air pollution in the form of particulate matter and oxides of nitrogen which present a major threat to human health in urban areas (Ricardo Energy and Environment, 2018).

Transport also creates indirect impacts by stimulating demand in a range of other economic sectors, including extraction of raw materials, production of infrastructure and vehicles, electricity generation, petroleum refining, and recycling and disposal of materials (EEA, 2019a).

The ecosystem sphere

Transport represents nearly 80% of UK energy demand, a substantially larger share than in 1990 (BEIS, 2019).

As well as generating carbon dioxide, road transport is the main source of nitric oxide. This air pollution contributes significantly to nitrogen deposition in all ecosystems, especially in upland Wales where the impacts from industrial and transport emissions are often very distant from pollution sources.

Pollution from transport reacts with other pollutants in the presence of sunlight to form ozone, which can further impact the environment through damage to vegetation, including crops. This pollution has direct impacts on human health, causing respiratory and cardiovascular effects.

Since most transport emissions are discharged at street level, often within densely populated cities, improvements in transport efficiency can have a significant impact on air pollution and on human health. Action can be taken to regulate transport within the economic sphere.

The economic sphere

Wales has high rates of car use for commuting and has seen only a small reduction in carbon emissions from transport since 1990 (Welsh Government, 2019). Electrification of trains and road transport is beginning to reduce emissions, as are increases in active travel modes such as walking or cycling to work. Public transport could displace private cars in urban areas if it can be made both more attractive and convenient.

Increasing uptake of Ultra Low Emissions Vehicles, using low carbon technologies, should help achieve significant reductions in transport emissions in the next decade.

Digital technology could bring about radical changes in road transport. The uptake of automated, connected, electric and shared mobility will play a key role in shaping the future of transport. Global connectivity and automation technologies could fundamentally transform how people and goods are moved. These changes are likely to result in transport having a lower environmental impact.

But it is clear that technological innovations alone, like the ones above, will not deliver the pace and scale of change needed to address the transport system's impacts on the environment and people's health. For that we need to look to the social sphere.

The social sphere

Converting current modes of transport to use low carbon fuels is not a sustainable solution. A systemic change is needed to how and why people travel and what is transported. As with the approach for reducing energy use in buildings, Welsh policy is seeking ways to reduce demand for and to decarbonise transport.

A step change is already being sought in Wales to decarbonise public transport through investment in active travel, the introduction of electric buses and an electric vehicle

charging strategy. The Welsh Government’s transport policy is being framed around the contribution it can make to the well-being goals.

Looking at the social sphere and how we live, presents more opportunities to consider other forms of transport and to reduce the need to travel. The Covid-19 pandemic has shown that major societal changes can be achieved, not only in changing transport modes, but in alternatives to commuting and the way we shop.

By starting at the community level, the social sphere allows society to make use of national and local development planning to redesign day to day activities. The planning system can be used to change the way we think about the functioning of ‘urban ecosystems’, designing out the dominance of the car and reducing the length of journeys, whilst also considering lifestyle and the local economy (EEA, 2019a).

The 20 minute neighbourhood concept is about designing an urban society in such a way that residents can meet most of their daily needs within a short walk from home. Safe cycling and local transport options are key to this, as well as high quality public spaces, community services and housing densities that make the provision of local services and transport viable. The 20 minute neighbourhood was pioneered in Melbourne, Australia as a way of guiding the city’s development and transformation to 2050. [Watch the Youtube link to find out more.](#)



Figure 11. The 20 minute Neighbourhood (Victoria State Government)

Our method

How we have assessed the sustainable management of natural resources

The [SoNaRR interim report](#) in December 2019 set out the method we have used to assess Wales's achievement of SMNR. In SoNaRR2020 we applied it through the twin lenses of ecosystems and cross-cutting themes.

The starting point for SoNaRR2020 was the completion of the technical chapters which set out the available information and evidence about the achievement of SMNR relating to both broad ecosystems and cross-cutting themes.

Each chapter documents the drivers, pressures and impacts which are barriers to the achievement of SMNR and recommends opportunities for action to manage them.

That evidence has been carried forward to the natural resource registers and used to make the assessments against the four aims of SMNR with the addition of wider available evidence such as international reports and publications.

The flow of evidence through SoNaRR2020 is shown in Figure 12 below.

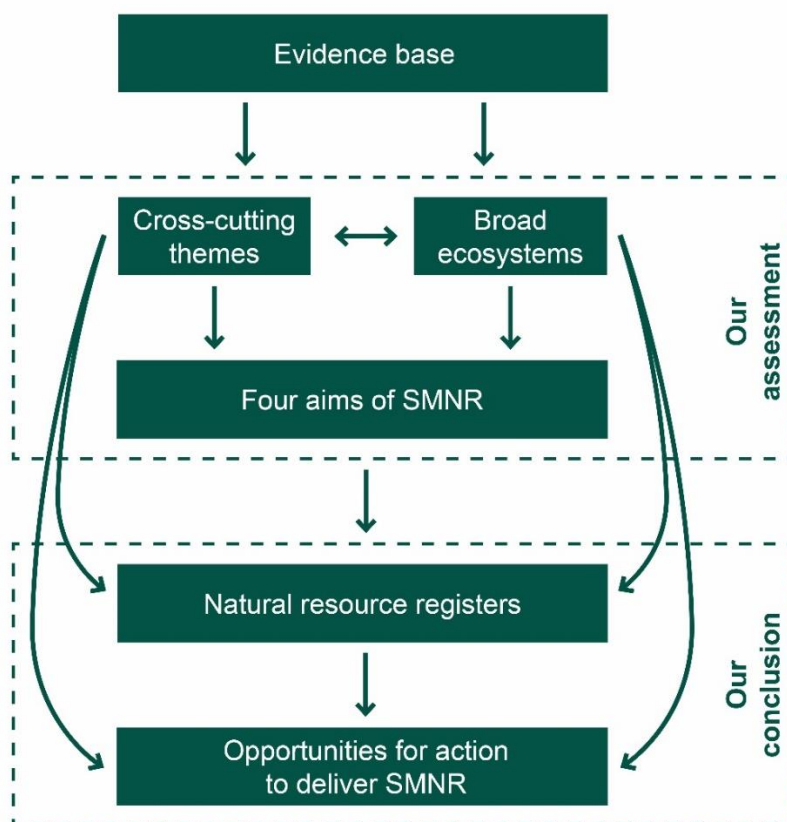


Figure 12. Evidence flows in SoNaRR2020 (NRW)

As in [SoNaRR2016](#), the evidence in SoNaRR2020 continues to follow the internationally recognised [DPSIR approach](#) of driver of change, pressure, state, impact and response.

SoNaRR builds on DPSIR and uses that structure to assess progress towards SMNR and the Welsh well-being goals.

The five step approach taken within SoNaRR is set out below.

It shows how each element of DPSIR is addressed in order to assess the four aims of SMNR.

Step 1: What's needed? The scope of the report

Captures information on how Wales is moving towards sustainable management of natural resources; including identifying the **drivers of change** and what supports sustainable development.

Step 2: State and trends of natural resources and current management, within the broad ecosystems and cross-cutting themes.

Identifies **pressures** and the **state** of natural resources and ecosystems - the most traditional step. Relevant to aims 1 and 2.

Step 3: Resilience: What is the impact of the state of natural resources and their management on the resilience of the ecosystem?

An assessment of ecosystem resilience – using the attributes from the Environment (Wales) Act – alongside spatial modelling of ecological functions, resilience and ecosystem service supply and demand. Relevant to aim 2.

Step 4: Ecosystem services: What is the impact of the state of natural resources and their management on the supply of ecosystem services to people?

An assessment of the links between ecosystem condition and well-being for people in Wales, and the state and condition of natural resources in relation to the derived benefits. This step is the key interface between ecological and socio-economic evidence. Relevant to aims 1, 3 and 4.

Step 5: Opportunities for action for more sustainable management

Using the [Natural Capital Committee's risk register approach](#) to set out the evidence on the **impacts** of the issues identified and the benefits of taking various management options in **response**.

Collaborative working

SoNaRR is about Wales, not NRW, and we needed to ensure that a broad view of the subject is represented. We used national and theme-based workshops, consultations, reviews. There was direct communication with stakeholders in the development of the ecosystem and cross-cutting theme technical chapters to bring in evidence and represent their views.

We have followed our evidence review process throughout. All the ecosystem and cross-cutting theme technical chapters have been through an academic peer review process.

The natural resource registers have been reviewed via a stakeholder workshop and the assessments against the four aims have been reviewed by an external panel, comprised of members of the SoNaRR stakeholder group and including members of NRW's new environment advisory committee.

Our assessment

The 2020 assessment of sustainable management of natural resources in Wales SoNaRR2020 assesses SMNR against the 4 aims, summarises our findings in the natural resource registers and presents the technical detail in the cross-cutting themes and ecosystem chapters.

SoNaRR2020: Natural resource registers

The registers summarise the pressures, impacts, our assessment of SMNR and the opportunities for action across the broad ecosystems.

The natural resource registers are an important part of SoNaRR2020.

The registers set out:

- The pressures and impacts of Wales's use of natural resources, within Wales and globally.
- The SMNR assessments by broad ecosystem.
- The opportunities for action.

An evidence list is provided ahead of the publication of the ecosystem and cross-cutting theme chapters in March 2021.

Key pressures, impacts and opportunities for action

[Explore the interactive infographic on the website and the registers.](#)

Aim 1: Stocks of natural resources are safeguarded and enhanced

Wales relies on the Earth's natural resources for our well-being.

Natural resources form the basis of our economy. All that is sold bought or uses is or was a natural resource.

Natural resources are everything around us including the air we breathe, the water we drink, the rocks and minerals and all living things on our planet including ourselves. They are the basis of healthy, resilient ecosystems.

If everyone on earth consumed the same amount of natural resources as Wales, then two and a half planet Earths would be needed to support us.

Pressures

The SoNaRR natural resource registers summarise the current pressures and impacts on these natural resources, both within and outside Wales.

As our consumption grows, renewable resources such as water and air will continue to come under pressure.

Climate change, pollution and how we use the land affects how much water is available and the quality of the water needed to support life.

Air quality remains an issue for all living things due to the emissions primarily from transport and agriculture.

Peatlands are important as they store carbon but when degraded they release this into the atmosphere which further adds to the problem of a changing climate. They are drying out and eroding as a direct result of climate change.

Wales is using up natural resources at an unsustainable rate and hasn't met the aim of enhancing and safeguarding natural resources.

Opportunities for action

To achieve the SMNR aim of safeguarding and enhancing natural resources, Wales needs to move towards a regenerative economy. We have identified four priority opportunities for action:

Decarbonise

Ensure Wales releases less greenhouse gas into the atmosphere by burning less fossil fuels and retaining, improving and expanding habitats that help to lock in carbon deposits.

Improve land management

Improve sustainability of land use by changing management of agriculture, forestry and development.

Recognise biodiversity as an asset

Recognise that biodiversity is part of Wales's wealth and that it should be safeguarded like other assets.

Address resource use and its impacts

Achieve sustainable levels of production and consumption by improving the efficiency and volume of resource use.

Aim 2: Ecosystems are resilient to expected and unforeseen change

The well-being of humans around the planet is threatened by an ecological and environmental breakdown. Time is running out to respond to this crisis and avoid a catastrophic situation for Wales and the world.

Building the resilience of ecosystems must form the basis of a swift and immediate response.

A resilient ecosystem is:

An environment that can respond to pressures by resisting, recovering or adapting to change; and is able to continue to provide natural resources and benefits to people.

Assessing ecosystem resilience is complex, our assessment has tried to detect patterns emerging across the national landscape by collating expert judgements for each ecosystem. There is no method for quantifying baseline or absolute resilience so ratings of low, medium and high were given to each attribute based on the criteria of diversity, extent, condition and connectivity.

Diversity

Diversity matters at every level and scale, from genes to species, and from habitats to landscapes. It supports the complexity of ecosystem functions and interactions that deliver services and benefits.

Most habitat types have seen a reduction in diversity over the last 100 years, with the rate of decline increasing from the 1970s onwards.

This indicates that ecosystems are not resilient, and many species are not recovering. If diversity continues to be lost, then it may result in the collapse of ecosystems and the services they provide.

Extent

The size of an ecosystem will affect its capacity to adapt, recover or resist disturbance. Fewer species can survive in a smaller area, and the number of species is altered when habitat is lost, leading to species loss and ecosystem decay.

Only 31% of Wales is considered to be semi-natural habitat. At least 40% of Welsh habitats are spread out in such small patches that this implies low resilience.

Condition

The condition of an ecosystem is assessed using biological and environmental factors linked to habitats and species.

Very few Welsh habitats are reported as being in good condition due to a number of pressures. Freshwater habitats, for example, are mainly affected by nutrient enrichment and physical modifications.

Connectivity

Connectivity is the link between and within habitats. For wildlife, it is related to the distance an animal can move to feed, breed and complete life cycles which may need different environments. It can take the form of natural corridors, stepping-stones or patches between the same or related vegetation types.

Environmental factors such as geology, soil type or movement of water affect a landscape's connectivity.

In Wales connectivity is at its lowest in lowland habitats where the landscape has been simplified by the loss of semi-natural habitats and intensively managed land dominates.

Opportunities for action

To achieve the SMNR aim of resilient ecosystems, Wales needs to place nature at the centre of decision making. We have identified five priority opportunities for action:

Develop the assessment of ecosystem resilience

Assessing ecosystem resilience is complex, and there are few relevant published tools or methods available to measure ecosystem resilience at a national scale.

Effective ecosystem management

Ecological resilience can be improved by maintaining and enhancing habitats and species to aid the recovery of biodiversity and restore functionality to ecosystems.

Build on Wales's policy framework

Wales already has the policy framework to promote a healthy and resilient place for people and nature. In implementing the Future Generations, Environment and Planning Acts there are many opportunities to pursue Wales' ambition for sustainable development.

Optimising regulation

The resilience of ecosystems relies upon the regulation of activities that act as pressures on the environment. Controls are in place to regulate these activities, but there is a need to ensure that they are implemented consistently with the objective of sustainable management of natural resources.

Build wider engagement

A commitment to transformative change is needed from all parts of society. This can be achieved by wider engagement and working together on the importance of nature-based solutions, promotion and adoption of good practice, and more integrated policy interventions.

Aim 3: Wales has healthy places for people, protected from environmental risks

The natural environment provides us with the things we need to live and thrive while protecting us against environmental hazards.

Healthy living, working, learning and playing are all enhanced by access to good quality natural environments. Connecting with the natural environment provides mental health benefits.

Resilient ecosystems are needed to achieve healthy lives. Our assessment indicates there is still more to do to make sure that there are healthy places for people, protected from environmental risk across Wales. This is particularly the case in the more deprived communities.

COVID-19 is having a profound effect on daily life in Wales. There are wide-ranging impacts on the health and well-being of the population and many of these impacts are significant and will be lasting.

There is no single assessment which determines if Wales is achieving the aim of healthy places for people protected from environmental risk, but a number of indicators are brought together and discussed in this chapter.

These allow us to draw the conclusion that Wales is not yet meeting the aim, including:

- Average life expectancy in Wales is 78 years for men and 82 years for women, but there are stark differences in life expectancy and healthy life expectancy between Welsh communities.
- Poor air quality is estimated to cause 2,000 deaths annually in Wales, 6% of total deaths.
- Twenty seven percent of people in urban areas of Wales and 18% in rural areas are affected by noise pollution.
- 245,000 Welsh properties are at risk of flooding.

Opportunities for action

To achieve the SMNR aim of healthy places for people, protected from environmental risk across Wales we have identified four priority opportunities for action:

Establish equal and sustainable communities

Provide accessible and affordable amenities and services, good quality housing, education and integrated transport systems. These all contribute to creating and sustaining healthy communities.

Healthy, active, connected communities

Deliver public health approaches for social, economic and environmental benefits, such as safe green spaces and active transport. These have been shown to be cost-effective with potential returns on investment.

Green growth and innovation

Economic growth and development should ensure the sustainable use of our natural resources, through smart and innovative technologies, renewable energy generation, social procurement and nature-based solutions.

Move toward a regenerative economy, with sustainable levels of production and consumption

Manage the life-cycle of natural resources, from extraction through the design and manufacture of products, to using waste as a resource, to build a regenerative economy.

Aim 4: A regenerative economy

Wales was a leading part in the first industrial revolution and still bears the scars, including old mine workings, polluted watercourses, intensive agricultural methods and the loss of biodiversity.

Heading into the fourth industrial revolution Wales needs an economy that regenerates ecosystems and replenishes natural resources.

Such an economy would ensure Wales only uses its fair share of the Earth's resources and meets the well-being goal of ['A Globally Responsible Wales'](#).

If everyone on Earth used natural resources at the same rate as Wales, 2.5 planets would be needed. This over-consumption of natural resources is putting a strain on ecosystems in Wales and world-wide. Our assessment concludes that Wales is someway from achieving a regenerative economy.

Opportunities for Action

To achieve SMNR aim of 'a regenerative economy' Wales needs more sustainable patterns of production and consumption.

The DISRUPT framework (below) can be used to set out the opportunities for action.

Design for the future

A whole systems approach to product life-cycle design, ensures products can be repaired and re-made to extend the use of natural resources.

Incorporate digital technology

Develop the '*internet of things*' to support decarbonisation. Replace the use of physical goods with digital services, such as streaming music.

Sustain and preserve what is already there

Expand and effectively manage the current network of protected areas, including terrestrial, freshwater and marine areas.

Rethink the business model

Encourage sharing, re-use and resale; for example through community fridges and repair cafes. Extend producer responsibility from packaging and electrical goods to other products. Ensure producers fund the full net costs of end of life management and encourage eco-design.

Use waste as a resource

Prioritise regenerative resources

Substitute renewable for non-renewable resources (for example timber for steel, and concrete or bioplastics for petroleum-based plastics).

Team up to create joint value

Work across the public, private and voluntary sectors to reduce material consumption and waste production aligning with Wales's industrial and innovation policies.

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