The Second State of Natural Resources Report (SoNaRR2020)

SoNaRR2020 Register freshwater evidence

Natural Resources Wales

Final Report

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 Register freshwater evidence**

Peer Reviews: Internal and external peer review

Restrictions: None

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

Recommended citation for this section of the report:

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Freshwater
Natural Resource Register
Evidence List

SoNaRR2020

The evidence below has been extracted from the freshwater chapter unless otherwise stated.

If the original piece of evidence is not cited within this document then it can be found in the freshwater chapter or associated chapters, which will be published in March 2021. At that point this document will be superseded.

Contents

Evidence List: Drivers, Pressures and Impacts Table

Climate Change

1. **Changing Weather Patterns**

1.1. **Interference with life cycles, including direct mortality of aquatic organisms**
Crash in salmon numbers is thought to be a result of climate change. All 23 principal salmon rivers in Wales are either ‘At Risk’ or ‘Probably at Risk’ of failing to achieve their management targets until at least 2024. Over two-thirds of our sea

trout stocks are similarly classified with no recovery predicted until at least 2024 (Cefas et al. 2020; NRW 2020).

Climate change is affecting all Welsh freshwater habitats and is a serious threat to freshwaters globally (Reid et al. 2018)

1.2. **From Water Efficiency Chapter**
Inadequate flows to maintain water course biodiversity and river health
Climate change scenario projections show an increased variability of river flows across seasons. Increased average winter flows and reduced spring and summer flows. The Climate Change Summary Report for Wales (2017) identified the need for more action to address potential changes in rivers, reduce pollution, over-abstraction and improve the ecological condition of waterbodies. These issues are being addressed as actions within the EU WFD River Basin Management Plans also in water company Water Resource Management Plans and Drought Plans, and WG Water Strategy for Wales 2015, NRW Restoring Sustainable Abstractions programme.

1.3. **Increased river channel erosion and instability as a result of more frequent and extreme high flow events. Scouring of habitats and wash-out of species.**
Impacts of severe storm events e.g. Storm Callum and Dennis. Do we have some evidence from the internal reviews of these events to demonstrate the significant increase of sediment erosion and deposition caused by these events?

2. **Increased Water Temperature.**

2.1. **Change in population dynamics of species as a result of increased water temperature.**

2.2. **Increased susceptibility to INNS and increased likelihood of establishment of INNS due to temperature increases.** (Masters & Norgrove 2010. IUCN 2017, Hellmann et al 2008, Rahel & Olden 2008).

Pollution

3. **Air Pollution**

3.1. **Acidification of rivers and lakes**
Acidification is the impact of deposition of acid gases, especially sulphur dioxide, released by burning of fossil fuels. These cause low pH episodes in waters with naturally low levels of dissolved minerals. In some of these areas, plantation forestry has aggravated the effects of acidification because the trees trap pollutants from the air.

Acidification affects rivers, streams, lakes and ponds in upland areas. Large areas of Wales are potentially acid sensitive (Hankin et al. 2014). However, there has been a general recovery from acidification over the last two decades (Ormerod & Durance 2009; Shilland et al. 2018; NRW unpublished data) due to measures to reduce sulphur dioxide emissions.

4. **Water Pollution**

4.1. **Excessive nutrient and sediment loadings in rivers and lakes which in turn disrupts ecological processes. Pollution of freshwaters by metals, plastics and anthropogenic compounds (e.g. PFAS and PBDEs) which can bioaccumulate in the food chain to toxic concentrations**.
Impacts to rivers from land management in rural areas include siltation and increased nutrient loading resulting in excessive growth of filamentous algae and other plants. In lakes, algal blooms and deoxygenation are common symptoms of nutrient overload.

Pollution from rural land management is the second most significant Reason for Not Achieving Good Status (WFD) after physical modifications.

The dairy industry was responsible for more than 50% of all agricultural pollution incidents reported to NRW between 2014 and 2019 (Fig. PR4). Beef and farm infrastructure & land management (farmyards, tracks, manure heaps etc) were responsible for smaller but still significant sources of pollution.

7% of Wales' river water bodies do not achieve Good status under WFD due to pollution from abandoned mines. The effects of mine water pollution are occasionally extensive and can be very severe such as the Afon Goch on Anglesey (Environment Agency 2002; NRW unpublished data).

The evidence on both microplastics and Persistent organic pollutants (POPs) suggests that the impact of this type of pollution is significantly underestimated (Windsor et al. 2019a,b). Persistent organic pollutants (POPs originate from a wide range of current and historic sources and although now banned, remain widespread in freshwater food chains, especially in former industrial catchments of South Wales (Lambert & Wagner 2018; Windsor et al. 2019). Studies have shown that a wide range of freshwater species are capable of uptake of plastics (Scherer et al. 2018a). Recent studies demonstrate the bioaccumulation of both metals and the anthropogenic compounds PFAS and PBDEs in otter liver tissue. (O'Rouke 2020abc).

Discharges from foul sewers were responsible for 75% of all water industry-related pollution incidents reported to NRW between 2014 and 2019.

Land Use Change

5. **Physical Modifications**

5.1. **Reduced freshwater ecosystem resilience due to interference with natural physical processes**
Physical modification is the most significant Reason for Not Achieving Good Status (WFD). These modifications have various damaging effects such as introducing barriers to fish and invertebrate migration; interference with sediment transport; increase in scour during floods; increased siltation; disconnection of rivers with floodplains and increased flood risk downstream. Physical modifications damage natural habitat features such as wetlands, boulders and gravels and make freshwaters less resilient to other pressures such as pollution and climate change.

Length and area of rivers has reduced significantly over the last 200 years due to straightening and channelization. Although still occurring, the rate of this change has now reduced (e.g. Hearn & Hatton-Ellis 2018).

Evidence from Aim 2: Resilient Ecosystems Chapter
Upland lakes and rivers, along with rocky habitats and upland heathland are in moderate condition. The freshwater habitats are mainly affected by nutrient enrichment and physical modifications.

5.2. **Obstruction of species movement within river systems (e.g. barriers to fish migration) and interference with sediment movement and supply**.

5.3. **Direct loss of habitat due to physical damage to freshwaters (e.g. dredging, channel straightening, bank/bed reinforcement, culverting).**
Between February 2016 and April 2020, NRW received 400 incident reports of river modifications (channel diversion, bank modification, culverting, damming etc), 55 of which specified gravel removal from rivers. This probably under represents the true total. Between 2017 and 2019 NRW officers carrying out fish habitat surveys in Carmarthenshire alone discovered 16 sites of gravel removal, with hundreds of tonnes removed at some locations. Unconsented gravel removal is a significant issue on many catchments. The removal of large amounts of gravel from a river destroys fish spawning habitat and interferes with geomorphological processes. Consented river modifications are also a problem (see section 6 below).

Evidence from Aim 2: Resilient Ecosystems Chapter
The amount of lowland habitat, especially freshwater, grassland, heathland and peatland, has declined considerably due to hard engineering, water abstraction and changes in management that modify plant communities and change the type of habitat.

5.4. **Loss of connectivity between rivers and flood plains, and between rivers and ponds/lakes, as a result of physical modifications**
Connectivity of floodplains is very poor. 42% of floodplains in England and Wales no longer connected to the river system (Maltby et al., 2011). The loss of floodplain meadow habitat and its associated wetland features is significant in biodiversity, cultural heritage and ecosystems services terms.

Connectivity of ponds has reduced as a result of significant losses in extent. The fragmentation of pond habitat is reflected by declines in common frog and toad populations. Common frog populations have been in decline since the 1970s, and recently published research indicates a 68% decline in populations of the common toad across the UK over the past 30 years (Froglife website, accessed April 2020).

Longitudinal connectivity of rivers is significantly affected on the majority of catchments in Wales by physical factors such as long culverts, weirs and other barriers (Williams et al. 2011). It is estimated that only 1% of the river network in Great Britain is free of artificial barriers (Jones et al. 2019).

Evidence from Aim 2: Resilient Ecosystems Chapter
Connectivity is very important for the functioning of freshwater habitats especially floodplains and lowland rivers. Connectivity has been severely damaged by structural flood protection, river straightening, disconnection of floodplain wetlands, agricultural land-use and urbanisation over the past two centuries.

Evidence from Aim 2: Resilient Ecosystems Chapter
The amount of lowland habitat, especially freshwater, grassland, heathland and peatland, has declined considerably due to hard engineering, water abstraction and changes in management that modify plant communities and change the type of habitat.

6. **Agricultural Intensification**

6.1. **Increased flood risk.**
Agricultural intensification is associated with physical modifications being made catchments such as drainage channels and the removal of vegetation and habitat features to exploit land as much as possible for agricultural purposes. Unconsented modifications to rivers are a widespread problem across Wales. Between February 2016 and April 2020, NRW received 400 incident reports of river modifications (channel diversion, bank modification, culverting, damming, etc), 55 of these specified gravel removal from rivers. Between 2017 and 2019 NRW officers carrying out fish habitat surveys in Carmarthenshire alone discovered 16 sites of gravel removal, with hundreds of tonnes removed at some locations.

6.2. **Increased risk of pollution**
Evidence to be provided

7. **Built Development and Infrastructure**

7.1. **Increased flood risk.**
Numerous examples of developments and infrastructure schemes involving the diversion, culverting and hard engineering of river channels have been constructed since SoNaRR I, and are ongoing. Some of these schemes affect long lengths of water course and multiple rivers. New road schemes are of particular concern, with several causing significant damage to rivers in recent years.

7.2. **Increased risk of pollution (such as, increased sewage load)**
The water and sewage industry makes a large contribution to reported pollution incidents in Wales although this had declined between 2014 and 2019 (see Figure 15 and Figure 16 for examples). For this sector, the most frequent cause of pollution was sewage management, which in total comprised about 75% of all incidents.

Recently published reports (O'Rourke et al. 2020a and 2020b) provide evidence on the bioaccumulation of chemicals in otter tissues in Wales, with 10 different PBDE (Polybrominated diphenyl ethers) compounds and 13 PFAS (per- and polyfluoroalkyl substances) compounds detected between 1995 and 2011. These are toxic, persistent, man-made compounds that enter the freshwater environment via pathways such as landfill sites and sewage treatment works

7.3. **Loss of habitats and species due to physical damage to freshwaters (e.g. drainage of wetlands, loss of riparian corridor, cultivation and development up to water's edge, culverting).**
Ongoing degradation of rivers as a result of development and infrastructure. For example, several developments and road schemes constructed since Sonnar1 have resulted in large scale diversion and culverting of natural river channels.

Floodplains in Wales are in very poor condition, three quarters are heavily modified and poorly connected to their river. More than 75% of floodplains by area is highly developed (intensive agricultural land or urbanised land), with less than 25% being natural habitats (Rothero *et al*. 2018).

About half of the non-developed land on floodplains is broadleaved woodland, with the remainder being meadows, wetlands and other habitats. Most of these are very small. There are no extensive areas of intact natural floodplain habitat in Wales

The area of pond habitat has vastly reduced during recent decades, with up to 90% of lowland ponds in the UK lost in the 20th century through succession or direct infilling (Hayhow et al. 2019). A survey of 126 ponds across Wales found that 13 (10%) marked on current OS maps had been filled in for agricultural cultivation (Shaw 2017).

Water vole populations in Wales have declined by 89% since 1995 (Matthews et al, awaiting publication). The causes of this decline are habitat loss and predation by invasive non-native American mink.

Evidence from Aim 2: Resilient Ecosystems Chapter
The amount of lowland habitat, especially freshwater, grassland, heathland and peatland, has declined considerably due to hard engineering, water abstraction and changes in management that modify plant communities and change the type of habitat.

INNS and Pests and Diseases

8. **INNS**

8.1. **INNS compete for resources, introduce disease and predate on native biodiversity.**
INNS can significantly reduce biodiversity and the abundance of native flora and fauna by competing for resources, predating native species, disrupting trophic levels (IPBES 2019, Seeney et al 2018, Pysek et al 2011, Pysek et al 2017, CABI 2019, Gutierrez 2017) and by acting as a vector for parasites and diseases (Crowl et al 2008, Peeler et al 2011, Kessing et al 2010). For example, signal crayfish have spread crayfish plague which has adversely affected native white clawed crayfish populations (Alderman 1996).

The analysis of INNS records undertaken for SoNaRR indicate that INNS are a significant threat to freshwater ecosystems in Wales. Freshwater ecosystems were shown to have the highest number of different types of INNS of priority to Wales likely to affect them (36% of all INNS) out of all of the SoNaRR ecosystems and the highest percentage of occurrence records of INNS of priority to Wales currently affecting them (40% of all occurrence records).

The heat map of occurrence records of INNS of interest to Wales which impact on freshwater ecosystems shows a close correlation with waterways in Wales and to towns and cities where many of the freshwater INNS are likely to have escaped and spread. There is also a concentration of records in canals and the lower reaches of rivers.

A horizon scanning exercise was undertaken in 2019 to identify INNS which are of highest risk to the UK, 28% of the INNS identified are freshwater species and included American bullfrog *(Lithobates catesbeianus)*, marbled crayfish (*Procambarus fallax*) and watermilfoil (*Myriophyllum heterophyllum*).

The ecological condition of SAC habitats assessed through the EU Habitats Directive Article 17 reporting process (JNCC 2019) were summarised for SoNaRR, this identified that 83% of the different freshwater habitat features are currently affected by INNS. It also identified that the average impact pressure score of INNS affecting freshwater habitats in Wales is medium and the average future threat score is high which indicates that the impact of INNS is likely to increase in future. 80% of all of the different freshwater SAC habitat features were found to be in unfavourable condition in Wales.

8.2. **INNS cause structural instability in river banks, can increase localised flood risk by blocking channels, interfere with navigation and water supply**
INNS can impact hydrology by affecting water flow, by physically blocking waterways or by affecting the structural integrity of river banks. INNS can cause increases in localised flooding, can interfere with navigation, reduce amenity value and affect water supply (Catford 2017, Calder 2001, Charles & Dukes 2007, Strayer 2010, Stromberh et al 2007). This is illustrated by the significant financial implications of floating pennywort in GB both in terms of management and impacts on recreation caused by a reduction in amenity and navigation (Estimated to be at least £25.4 million per annum (Williams et al 2010)). INNS can also affect water quality by increasing the erosion of river banks which leads to increased sediment loading in catchments for example Chinese mitten crabs can lead to a reduction in the sediment stability of banks (Blight and Paterson 2014).

Over-exploitation

9. **Water Demand**

9.1. From Water Efficiency Chapter
Potential for restricted availability of water resources if not managed sustainably.
Water company Water resource management plans (2019) project that if water efficiency measures across all sectors and leakage targets are achieved there should be adequate water resources to 2050.

Table 8. Shows the projected percentage changes to population for each of the Water Resource Zones managed by Dwr Cymru.

Map 3 shows only two areas in Wales likely to have deficit of supply in 2050. The deficit calculations have been based on the projected increase in population for each zone, an overall decline in the demand for water as a result of working with customers to increase water efficiencies and reduce leakage.

9.2. From Water Efficiency Chapter
Inadequate flows to maintain water course biodiversity and river health
Abstraction licences are designed to prevent adverse abstraction impacts by including hands off flows conditions for periods of lower flows, safe guarding the quantity of water required in the watercourse to maintain a resilient ecology.

9.3. **Increased demand for water transfer between catchments, and the resulting impacts this has on the relevant water bodies.**
Customers' water needs must be met in a safe, resilient and efficient way, while protecting the environment and respecting good supply practice and the needs of other water users. This is becoming ever more challenging as water resources face increasing pressures from climate change, population growth, societal expectations and increasing environmental aspirations. The new Regulators' Alliance for Progressing Infrastructure Development (RAPID) will make sure regulation enables strategic schemes to improve resilience of water supplies into the future. These schemes might include transfers between regions in England and Wales and developing joint infrastructure, such as shared reservoirs.

10. **Insufficient Management**

10.1. From Water Efficiency Chapter
Non efficient use of water.
Leakage within the home is a major loss of clean drinking water. The Waterwise summary statement on leaky loos (2019)[70] states that between 5-8% of toilets leaks on average 215-400 litres per day of drinking water, mostly dual flush toilets. Around 400 million litres of water is estimated to leak from UK toilets every day, which is enough water to supply 2.8 million people

10.2. From Water Efficiency Chapter
Cost of treatment of potable water
Using water more efficiently will reduce pressure of abstraction and carbon footprint of pumping and treating potable water.

Evidence List: Opportunities for Action

Aim 4: A Regenerative Economy

Water labelling for water appliances.
Lack of mandatory water efficiency labelling denies customers the opportunity to choose the most effective water saving devices. This impacts on bringing about a wholesale change in water saving behaviour.

Studies (Australia WELS) have shown that mandatory water efficiency labelling is the most effective way to promote water saving appliances. In the UK ideally this would be linked to minimum building standards, reducing the overall water and carbon footprint of buildings.

Reduce non-supply leakage and waste through awareness- raising initiatives.
Water companies are committed to reducing leakage by 2025. Artesia have produced a report for Ofwat (2018) calling for mandatory water labelling of all water appliances to allow customers to choose water saving devices which is estimated to save 3.1 litres per person per day and 55.9 million tonnes of CO_2 over 25 years.

Recycling water where possible will reduce the pressures from abstraction on water bodies and reduce the amount of energy used to treat and pump water.

The UK WESSG and WWEG are taking a collaborative approach to reduce domestic leakage (taps, leaky loos) through national campaigns in 2020.

Encourage off-line storage, Rain Water Harvesting and Grey Water Recycling. For example, on-farm storage of water for irrigation.
There is the opportunity to look at where rainwater harvesting and grey water recycling can be used for activities not requiring treated water. Where this could be carried out at a large scale, e.g. offline water storage, there is the potential to apply incentives such as PES.

Evidence List: Assessment of SMNR

Aim 1: Stocks of Natural Resources are safeguarded and enhanced

Aim 1: Progress towards meeting the aim

1.1 Ormerod & Durance 2009; Shilland et al. 2018; NRW unpublished data

1.2 Evidence Provided in Assessment of SMNR

1.3 Evidence from NRW metal mine strategy website, as referenced in the chapter.

1.4 Evidence from NRW

1.5 Projects range from local projects such as Taclo'r Tywi on the Afon Tywi in South Wales to large catchment scale cross-border projects such as the LIFE Dee River, a European-funded project encompassing a range of interventions to benefit the habitats and species of the river Dee SAC. NRW are currently setting up an Integrated River Restoration Programme to co-ordinate and plan rivers work in Wales.

1.6 Evidence provided in Assessment of SMNR

1.7 Evidence provided in Assessment of SMNR

1.8 Evidence provided in Assessment of SMNR

1.9 Evidence provided in Assessment of SMNR

Aim 1: Obstacles remaining to meeting the aim

1.10 Evidence from the Habitats Directive

1.11 Evidence from Water Framework Directive

1.12 Evidence from NRW, 2016a

1.13 Matthews et al, awaiting publication

1.14 The most important types of pollutant from rural sources are silt, nutrients and pesticides which have impacts in all freshwater habitats. Studies indicate that agricultural land is the major source of sediment losses to rivers in Wales (Anthony

& Collins, 2006; Collins & Anthony, 2008; Collins et al., 2009a,b; Zhang et al., 2014).

1.15 Between February 2016 and April 2020, NRW received 400 incident reports of river modifications (channel diversion, bank modification, culverting, damming etc), 55 of which specified gravel removal from rivers. This probably under-represents the true total. Between 2017 and 2019 NRW officers carrying out fish habitat surveys in Carmarthenshire alone discovered 16 sites of gravel removal, with hundreds of tonnes removed at some locations.

1.16 Between February 2016 and April 2020, NRW received 400 incident reports of river modifications (channel diversion, bank modification, culverting, damming etc) 12% of river water bodies are designated as Heavily Modified Water Bodies (HMWB). This designation applies to rivers which have a high degree of physical modification. Only 18% of these have mitigation measures in place. (NRW 2018 WFD)

1.17 Evidence provided in Assessment of SMNR

1.18 Evidence provided in Assessment of SMNR

1.19 Evidence provided in Assessment of SMNR

1.20 All 23 principal salmon rivers in Wales are either ‘At Risk’ or ‘Probably at Risk’ of failing to achieve their management targets until at least 2024 (Figure R3). Over two-thirds of our sea trout stocks are similarly classified with no recovery predicted until at least 2024 (Figure R4). (Cefas et al. 2020; NRW 2020).

1.21 Evidence Provided in Assessment of SMNR

1.22 Licencing of previously exempt abstractions is underway. Two studies underway to locate and assess abstractions which fall below the de minimus for an abstraction license to identify potential abstraction hot spots and where the ecosystem may be vulnerable. Due to be published 2020.

Cost benefit analysis of RWH and GWR study underway due to be published in 2020

Cost benefit analysis of Welsh Water's Greener Grangetown retro fitting SuDS

Aim 2: Resilient Ecosystems

Aim 2: Progress towards meeting the aim

2.1 Evidence provided in Assessment of SMNR

2.2 Evidence provided in Assessment of SMNR

2.3 Evidence provided in Assessment of SMNR

Aim 2: Obstacles remaining to meeting the aim

2.4 Floodplains occupy approximately 1,100km2 – about 1/20 of the area of Wales. More than 75% of floodplains are highly developed (intensive agricultural land or urbanised land), with less than 25% being natural habitats (Rothero et al. 2018).

2.5 Evidence provided in Assessment of SMNR

2.6 Evidence provided in Assessment of SMNR

2.7 Evidence provided in Assessment of SMNR

2.8 Evidence provided in Assessment of SMNR

Aim 3: Healthy Places for People

Aim 3: Progress towards meeting the aim

3.1 Evidence provided in Assessment of SMNR

3.2 The income generated through angling related tourism is an important contribution to Wales' economy (£148m per annum in 2005 including sea angling). A recent study showed that angling in Welsh rivers supports 700 full-time equivalent jobs and produces an annual household income of about £20 million (Mawle 2018). These figures are based on the 2005 estimates adjusted by indices of changes in angling activity and corrected for inflation. Angling activity for salmon and sea trout is estimated to have fallen by 28 percent since 2005.

3.3 Evidence Provided in Assessment of SMNR

Aim 3: Obstacles remaining to meet the aim

3.4 Evidence to be provided

3.5 Evidence to be provided

Aim 4: A Regenerative Economy

Aim 4: Progress towards meeting the aim

4.1 Table on page 7 of https://gov.wales/sites/default/files/publications/2019-10/energy-generation-in-wales-2018.pdf

4.2 Evidence provided in Assessment of SMNR

4.3 Evidence provided in Assessment of SMNR

4.4 Evidence provided in Assessment of SMNR

4.5 Evidence provided in Assessment of SMNR

Aim 4: Obstacles remaining to meeting the aim

4.6 Evidence to be provided

4.7 Evidence to be provided

4.8 Evidence to be provided

References: Opportunities for Action and Assessment of SMNR

To be provided