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Mobilising Finance for Biodiversity

A policy and institutional review of finance arrangements for biodiversity conservation in Ireland

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March 2020

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Contents

Executive Summary **1**

Introduction **2**

1. Ireland's Biodiversity: Status, Trends and Value **2**

2. Drivers of Biodiversity Loss **2**

2.1. Agricultural Intensification 2

2.2. Development and Land use Change 3

2.3. Peatland Degradation 3

2.4. Afforestation 4

2.5. Marine Degradation 4

2.6. Water Pollution 5

2.7. Invasive Alien Species (IAS) 5

2.8. Continuing Issues 6

3. Dependencies on biodiversity and its economic value **6**

3.1. Terrestrial Services 6

3.2. Marine Services 7

4. Legislation, Policies and Strategies **8**

4.1. Biodiversity Conservation Legislation 8

4.2. International Policies and Plans 9

4.3. National Policies and Plans 10

4.4. Sectoral Polices and Plans 15

5. Finance systems, incentives and mechanisms **22**

5.1. Ireland's National Budgetary System 22

5.2. Key departments, committees and institutions in the budget process 23

5.3. Existing financial mechanisms for biodiversity conservation 24

5.4. Harmful Subsidies 29

5.5. Potential future sources of finance 30

5.6. Overview of finance systems, incentives and mechanisms 33

6. Sectoral Institutions, Capacities and Interactions **33**

6.1. Biodiversity and Environmental Protection 33

6.2. Agriculture 36

6.3. Forestry 37

6.4. Peatlands 38

6.5. Water 40

6.6. Marine 41

6.7. Institutional limitations 42

7. Conclusion and Recommendations **43**

7.1. Ireland biodiversity: trends, drivers and value 43

7.2. Policies and Plans in place to protect Irish biodiversity 43
7.3. Institutions involved and their capacity 44
7.4. Financing biodiversity conservation; the present and future 44
8. References 45
List of Acronyms 50

Executive Summary

This Policy and Institutional Review (PIR) for Ireland is intended to characterise biodiversity spending and the context in which it is made. It examines direct spending and indirect spending in areas of environmental protection. It also looks at the extent to which Government Departments and Agencies consider biodiversity in their core policies, whether the sectors for which they have responsibility are supported by biodiversity and ecosystem services, and whether some of their policies conflict with biodiversity. The PIR complements the national biodiversity expenditure review (NBER) undertaken in 2017 and will inform the financial needs assessment now being undertaken to determine the type of expenditure needed to implement the National Biodiversity Action Plan 2021-2025, along with the question of how to mobilise these resources.

A suite of legislation and policies is in place to protect biodiversity, not least the EU Habitats and Birds Directives, as well as policies at national level. There are measures to protect environmental quality which are of benefit to biodiversity, but also to human health and well-being. Ireland is also a signatory to numerous international conventions and agreements to protect the environment, including shared aspects such as climate, air, seas and migratory species. Irish Government Departments are also improving their integration of biodiversity and environmental protection within sectoral policies.

Within agriculture, financial transfers to farmers are subject to a degree of environmental cross-compliance. Under Pillar II of the Common Agricultural Policy (CAP), there are also opportunities for farmers to join agri-environmental schemes. New, more innovative agri-environmental approaches are also being trialled in the form of results-based or locally led schemes. Nutrient management measures are being implemented to mitigate agriculture's impact on water quality and it is likely that environmental measures now being considered for the new CAP will be rolled out in the near future.

Within forestry, grant supports now require a proportion of native tree species and set aside some of the planted area for open space or biodiversity. Regulations ensure that state-supported afforestation no longer occurs on peat soils and is subject to appropriate assessment procedures in areas designated for nature conservation, although some afforestation may still occur on non-designated farmland of high nature value. Rules are also in place to ensure that trees are set back from water courses and that forestry operations do not impact on water quality.

In the marine sector, strategies have been set out which integrate environmental management with resource use and which manage economic activity on the basis of spatial planning, recognising the value of certain areas for marine biodiversity. Commercial fisheries are increasingly managed according to an ecosystem approach and an increasing number of fish stocks are being brought back towards maximum sustainable yield. Further, steps have been taken to eliminate bycatch and to reduce the incidence of marine litter.

Faced with such an extensive list of Directives, policies, measures and international agreements, it is concerning that recent reports have demonstrated ongoing declines in biodiversity. Eighty-five percent of our habitats are in 'unfavourable status' and exhibit ongoing declines, according to the most recent assessment. Eighteen percent of our breeding bird species are in decline, including once familiar species such as the curlew. Sixteen percent of our wintering birds are in decline. Six out of 20 species of bumblebee are at risk of extinction.

Overt examples of disregard for biodiversity, such as habitat destruction, persecution, oil slicks and extreme pollution of water courses have diminished, even if they still do occur. Much of the impact on biodiversity is now subtle and persistent and takes the form of a gradual loss of pristine sites, continued land use intensification and a progressive decline in water quality. Many of the aforementioned measures and strategies are relatively recent and will take time to be embedded into wider sectoral policy.

However, the context within which these measures and strategies are implemented is one of a continuing strategic focus on increased production and intensification in agriculture, forestry and fisheries. Food Wise 2015 envisages a 65% increase in primary production and a major expansion of dairy production; forest policy is still aiming for a large expansion of the area of forestry based primarily on fast-growing exotic tree species; and a doubling of aquaculture production is proposed despite the importance of the coastal environment for biodiversity, amenity and tourism. Against this background, environmental and biodiversity measures are simply mitigating damage at the edges. This is despite the fact that each of these sectors depends on biodiversity and its associated ecosystem services, including soil productivity, pollination, pest control and the survival of wild fish stocks. These services are aside from the societal benefits from water purification, moderation of run-off and flood mitigation, coastal protection, carbon sequestration, and tourism, amenity and quality of life.

This PIR examines the context within which these decisions are made, the relative influence of Government Departments and outside bodies, the levels and trends in funding for biodiversity, the commitment to environmental protection and the effect of European environmental policy.

Introduction

The preparation of a Policy and Institutional Review (PIR) is aligned to the guidance provided by the Biodiversity Finance Handbook (UNDP, 2018), a suite of incremental research tools and documents designed to characterise biodiversity spending at national level, identify gaps in this spending, and recommend actions to address shortcomings towards meeting agreed international targets for halting biodiversity loss. The PIR presents the initial stages in developing a holistic view of the fiscal, economic, legal, policy and institutional frameworks of this larger assessment. It is designed to provide:

a) a perspective on how sustainable development goals and visions are supported by the management of biodiversity and the ecosystem services that this provides
b) an overview of the institutional and policy landscape driving threats to biodiversity at a national level
c) foundational knowledge of existing biodiversity finance mechanisms in place, including subsidies and sources of revenue.

A comprehensive National Biodiversity Expenditure Review (NBER) has previously been conducted for 2010-2015, using best-available data (Morrison and Bullock, 2018). Additionally, the recently published 6th National Report to the Convention on Biological Diversity (DCHG, 2019) provides a useful contemporary review of Ireland's performance towards achieving the Aichi Biodiversity Targets. The PIR thus builds upon the findings of the NBER and 6th National Report, following five key steps:

1) Identify data sources, consultees and sources of information
2) Review the national strategy for biodiversity conservation
3) Identify drivers of biodiversity loss at a national level
4) Review existing financial mechanisms used to effect conservation
5) Analyse the capacity of institutions involved in biodiversity conservation to achieve their stated conservation aims.

1. Ireland's Biodiversity: Status, Trends and Value

In common with other countries, biodiversity in Ireland is significantly impacted by habitat loss and degradation, overexploitation, changes in land use, pollution, invasive species and climate change. Indeed, according to the most recent Article 17 report on the implementation of the EU Habitats Directive (Directive/92/43/EEC) (EC, 1992) in 2019, 57% of listed species were identified as being in Favourable status, 15% of species were assessed as being in Inadequate status and 15% were assessed as being in Bad status. Although these figures represent an improvement on the previous reporting period, with 17% of species having an improving status, 15% of species have exhibited a declining trend since the 2013 report, the largest set of declining species yet recorded (NPWS, 2013, 2019b).

A review of avian protection as part of the EU Birds Directive (Directive/2009/147/EC) (EC, 2009) found that populations of 19% of breeding species are increasing, though 18% are in decline. Further, 16% of wintering species are thought to be in long-term decline (NPWS, 2015). Of the 202 species of birds in Ireland, 18% are on the Birds of Conservation Concern in Ireland (BoCCI) Red List (highest conservation priority), with 45% on the Amber List (unfavourable status in Europe) (Colhoun and Cummins, 2013). Around 65% of Important Bird Areas (IBAs), as identified by Birdlife International, are regarded as having a very high level of threat (IBAT Alliance, 2018).

With regard to pollinators and the vitally-important ecosystem service they provide, bee species have experienced a decline of 14% nationally (Fitzpatrick *et al.*, 2007), with 6 out of 20 species of bumblebee threatened with extinction from Ireland (NBDC, 2015).

Fundamentally, functioning habitats are key to species survival. However, 85% of listed habitats assessed through Article 17 reporting were in Unfavourable status (NPWS, 2019b), with 46% exhibiting ongoing and accelerating decline since the previous report and only 2% showing improvement. Of particular note are declines in peatlands and grasslands across multiple assessment periods from 2007 onwards, along with several marine and coastal habitats.

2. Drivers of Biodiversity Loss

The following section identifies the underlying drivers of changes in levels and conditions of Irish biodiversity, with reference to institutions involved, notable policies and plans in place and market drivers of change.

2.1. Agricultural Intensification

Agriculture is the dominant land-use in Ireland and continues to shape the landscape and the biodiversity it supports. Out of a total land area of 6.9 million ha in the Republic, 63% (4.3 million ha) is devoted to agriculture, mostly pasture for beef and dairy but with around 15% under tillage or other crops. Forestry accounts for a further 11%. Increases in farm productivity, driven by increased fertiliser use, mechanisation and intensification, have continued in Ireland over the past 30 years. This transition in agriculture has been linked to declines in biodiversity, particularly populations of formerly common farmland bird and pollinator species and the loss

of many semi-natural habitats, such as small wetlands, species-rich grasslands, hay meadows, and hedgerows. Conversely, areas that are less agriculturally advantaged often retain lower intensity practices and therefore areas of semi-natural farm habitat.

These changes have had a major impact on species dependent on lower intensity or mixed farming, especially birds such as the corncrake (*Crex crex*), corn bunting (*Emberiza calandra*) and grey partridge (*Perdix perdix*) which are now very localised or lost from Ireland (Ó hUallacháin *et al.*, 2015). The decline of these species is indicative of changes in agricultural practice and a nationwide reduction in mixed farming with small-scale cereal growing, moving instead to specialisation in livestock production. The decline of once familiar breeding bird species such as curlew (*Numenius arquata*) and lapwing (*Vanellus vanellus*), and many flowering plants, are indicative of long-term trends in the drainage of wetlands and wet grasslands and the conversion of meadows into agriculturally productive grassland.

Biodiversity in the wider landscape has also been impacted in recent decades by trends towards intensive, highly productive, land use and a loss of low intensity mixed land uses, particularly in the agricultural sector. This has resulted in the deliberate removal of important habitats, for example hedgerows and wetlands, or the degradation of others, including semi-natural habitats such as hay meadows (NPWS, 2019b). Although regulations associated with single-farm payments have reduced the incidence of habitat removal, EIA is also required for the development of uncultivated land or the removal of field boundaries. Although the thresholds for mandatory EIA are quite high (i.e. 50ha for uncultivated land or 4km for field boundaries), DAFM screening is required for smaller areas (5ha, 500m). Degradation of existing habitats is now the major issue as fewer productive or financial reasons remain for their management. These habitats often have an ecosystem services value in that they are important for pollinators and slow the flow on run-off or moderate the effect of nutrients on water quality.

There have also been significant local losses of insects, including bees and butterflies, largely resulting from the drive to higher levels of productivity characterised by an increase in the use of herbicides, insecticides, artificial fertiliser and a loss or neglect of hedgerows, farmland edges and scrub. Applications of both organic and inorganic fertiliser to maintain more intensive systems have, in turn, had a deleterious effect on aquatic biodiversity, contributing an estimated 53% of water pollution as excessive levels of nitrogen and phosphorous have spread into watercourses (EPA, 2018).

However, agriculture, forestry and aquaculture are all aiming for significant target increases in output, or output value, under the Food Wise 2025 strategy (DAFM, 2015). Agricultural market forces, lobbying strength and policy continue to push farmers towards more capital-intensive systems or intensive use of land, with associated deleterious effects on terrestrial species and habitats. Further, this national plan for expansion of agricultural output, including a 50% increase in milk production, will place additional pressures on water quality in areas where nutrient levels are already elevated (EPA, 2016c). Although in principle, these growth strategies contain safeguards for biodiversity, water quality and carbon emissions, it is often unclear how these will be applied at producer level.

2.2. Development and Land use Change

The building of houses and other developments which convert natural, semi-natural or agricultural land have impacted the Irish environment for centuries. Larger infrastructural development is now obliged to demonstrate that valuable biodiversity is protected or that impacts are mitigated through the application of Environmental Impact Assessments (EIAs) and, where these developments impinge on Natura 2000 sites or where thresholds for EIA are not met, Appropriate Assessment (AA). At a broader level, Strategic Environmental Assessment (SEA) is also required where plans and programmes, including county development plans, sectoral plans and infrastructure development decisions may result in broader scale regional change. However, there continues to be a loss of ecosystem quality due to suburban and single house development. Development has often involved the loss of habitats of local or regional conservation value that lack protected status or has impacted the mobility of species and the interconnectivity of remaining habitat fragments, affecting small mammal movements, bird foraging or natural water courses.

Together with pollution from agriculture, dispersed housing has resulted in a gradual decline in water quality (EPA, 2018). Applications for single rural houses have resumed following the 2008-12 recession, but the siting of new housing in poor percolation areas is subject to tighter controls, notably with regard to wastewater. Sensitive areas have now been mapped and modern septic tanks are now required, but maintenance is inconsistent and inspection rates have poor coverage (EPA, 2016d).

2.3. Peatland Degradation

Ireland holds Europe's largest area of active raised bog, as well as a significant area of blanket bog. However, almost all of these peatlands have been affected by cutting for peat fuel, drainage, overgrazing, burning and afforestation. Only two-thirds of the original area of raised bog remains, of which around 2.4% is classified as intact and less than 1% is thought to be actively peat forming (Fernandez *et al.*, 2014). Despite this loss, degraded bog retains sufficient nature value to be classed as an Annex I protected status along with active bog (EC, 1992).

In particular, the industrial mining of peat for electricity generation, household fuel and horticultural products has impacted severely on the larger raised bogs, while private cutting for domestic fuel has increasingly become the domain of contractors using machinery. As these peatlands are drained prior to extraction they contribute substantial quantities of atmospheric carbon through oxidation and

cease to fix further carbon, a vital ecosystem service in the context of climate change. The semi-state peat company, Bord na Móna, has signalled its intention to withdraw from commercial peat production before 2030 and has begun to experiment with peatland rehabilitation. In the past, much cut-away or non-productive bog was planted with exotic conifer trees as bogs became commercially non-viable, although limited efforts are now underway to remove plantations and return areas of raised bog to their former state, either through State-led programmes or through EU LIFE programmes. These changes will have a significant benefit for biodiversity, for maintaining the carbon store that these peatlands represent and the continued carbon sequestration that active bog provides. Most recently, under the acknowledgement that extant active peatland represents a vast store of carbon and that active bog (particularly raised bog) is important for carbon fixation, a peatland restoration fund has been committed by the government in Budget 2020, amounting to €7 million, of which €5 million is to be derived from the carbon tax under the Just Transition category (DPER, 2020a). Further research is required into how Ireland's changing climate, and associated changes in the hydrology of peatlands, will affect these carbon offset benefits.

2.4. Afforestation

Ireland has the second highest rate of afforestation in Europe, increasing by 2% between 1990 and 2015 (DAFM, 2019). Annual rates have slowed considerably in this century. However, direct state expenditure on forestry has fallen continuously since 2008 and the majority of afforestation is now proceeding through private investment supported by government grants and premia (DAFM, 2019). State planting is now negligible, with no public afforestation since 2015.

Despite this growth, Ireland remains one of the least forested countries in Europe (along with the Netherlands and Malta), although the area of forest has been increasing rapidly to cover 770,000ha or 11% of total land area. The current forest estate contains a high proportion (68%) of commercial plantation, much of which (85%) is comprised of single-age, non-native conifer species, of which 51% is fast-growing Sitka spruce (*Picea sitchensis*) (DAFM, 2019). This species grows rapidly in the damp Irish climate, although the softwood produced is typically used for low value products. Between 2007-2018, over 65% of grant-aided afforestation was dedicated to this species alone.

Afforestation has a significant impact on biodiversity. This focus on low-value softwood, in place of higher value hardwood species, has substantial impacts on biodiversity as the dense planting prevents natural understorey growth, rich species assemblages fail to develop in the shortened cycle of plantation and, because soils fail to buffer, acidification results in changes to watercourse chemistry (DAFM, 2014). Much of this planting previously occurred on cut-away bogs or in the uplands and, while the conditions of planting have been tightened to avoid protected areas of biodiversity value, including areas of value to hen harrier (*Circus cyaneus*), curlew or red grouse (*Lagopus lagopus*), there is still no working definition of 'high nature value' farming to guide where planting should or should not occur. Upland planting is likely to have contributed to losses of these species, with the curlew having experienced an 96% decline in its breeding population since the 1980s (O'Donoghue, 2018). These areas were planted at a time when more limited environmental criteria applied and were deemed of low biodiversity value. Grant-aided planting also occurred on raised or blanket bog that was itself of biodiversity value, even though the plantations had poor productivity as a result of their location. Planting on protected habitat is no longer supported, but most forestry is replacing low intensity grassland and scrub of high ecological value, especially at a landscape level, although this often goes unquantified. Though Grant Premium Categories (GPCs) now cover a wider suite of broadleaf natives, under the Forestry Programme 2014-2020 (DAFM, 2014) the majority (74%) of grant-aid is still targeted at Sitka spruce-dominated plantations (DAFM, 2019). To date, 14% of Ireland's forest cover consists of native species, while only 40% of the targets for native afforestation as part of the Forestry Programme 2014-2020 have been met (DAFM, 2014).

Changes to grant support have encouraged the set aside of a proportion of planted areas to biodiversity or open space and a minimum proportion of native broadleaf planting. Regulations to protect waterways, differential thinning techniques and dedicated grant premium categories for higher biodiversity value species, have been introduced including the Felling and Reforestation Policy (2017) and the Forest Service's Native Woodland Scheme (2015). Coillte, the state-owned commercial forestry company, who currently own 54% of the national forest estate (DAFM, 2019), have designated forest areas for biodiversity or amenity and are supporting forest enhancement by means of corporate offsetting ventures through Natural Capital Partners, Microsoft and the private company Green Belt have provided supplementary capacity.

2.5. Marine Degradation

Ireland has an extensive marine resource. However, a prolonged period of over-use and ecological damage has had a severe impact on biodiversity, including of commercial fisheries. Only very limited catches of former staples such as cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*) and herring (*Clupea harengus*) are now permitted, while the populations of 22% of commercial species remain below that allowing 'maximum sustainable yield' (MI, 2018). The use or location of nursery and feeding habitats is still little understood and many benthic habitats, including reefs, are thought to have been severely damaged by bottom dredging fishing gear. In addition to this historical legacy, climate change may be inducing changes in the distribution, breeding or migration of birds, cetaceans and fish species and is a probable factor in the decline of charismatic species such as puffin (*Fratercula arctica*), while there has been a northward shift in warm water zooplankton species by 10° over the past 50 years (EPA, 2012; MI, 2018).

The main pressures facing Ireland's marine biodiversity are selective over-extraction of species, abrasion of the seabed, smothering with silt around port areas, substrate loss and nutrient/organic enrichment due to fishing and aquaculture, along with the effects of marine shipping, extractive industries and land-based activities such as agriculture run-off. Further, abrasive fishing techniques is known to have impacted on reefs and maërl beds (NPWS, 2019b).

On top of these more common threats, bycatch, both in working nets or traps and discarded fishing gear, has impacted birds, cetaceans and seals and presents a serious threat to some endangered bottom-living or deep water species, including the Porbeagle Shark (*Lamna nasus*), Portuguese Dogfish (*Centroscymnus coelolepis*) and even the Common Skate (*Dipturus batis*), despite a ban on commercial catches of all three species. Marine litter, principally discarded fishing gear, fish farm materials and single use consumer plastics, is a continuing problem. This litter presents a mortality risk to wildlife through entanglement and ingestion. Indeed, the OSPAR Convention uses ingestion of plastic litter by fulmars (*Fulmaris glacialis*) as an indicator of the problem. Acoustic survey work could be having an as-yet undefined impact on marine mammals.

Aquaculture has been implicated in various adverse impacts on marine and transitional waters. For example, the original importation of the Pacific Gigas oyster (*Crassostrea gigas*), which was thought to be unable to spawn in cold Irish waters, has resulted in feral populations that, along with associated pathogens, has placed pressure on the native oyster population (*Ostrea edulis*).

Nutrient and organic pollution within the aquaculture sector is a significant problem and steps have been taken to improve the planning, location and licensing of fish farms, to protect habitats and wildlife, minimise the release of nutrients and to reduce the density of caged fish which have been implicated in the spread of disease and lice to migratory fish such as salmon (*Salmo salar*). A substantial appraisal system for licensing is now in place. Despite this, a doubling of aquaculture production is proposed under the Food Wise policy targets (DAFM, 2015). Additionally, as much of this aquaculture activity occurs within protected areas, and is subject to appropriate assessment procedures, the proposed expansion could place further pressure on biodiversity, including areas where remnant native oyster populations survive.

Overall, despite good water chemistry assessments (EPA, 2019b), many coastal habitats are assessed as being of inadequate or bad conservation status (NPWS, 2019b), mostly due to pollution. Management of aquaculture may have improved and bycatch addressed, but significant pressures continue from over-extraction and other legacy pressures. Furthermore, new exclusions on large fishing vessels (>18 m) within the 6-mile limit have come into effect on 1st January 2020 (Directive 1/2019) and should alleviate some pressure on highly diverse coastal ecosystems.

2.6. Water Pollution

Although great effort has been employed in improving the water quality of Irish water bodies, a recently published EPA report shows continuing decline in the status of our water bodies, in contravention of our Water Framework Directive (WFD) and Marine Strategy Framework Directive (MSFD) obligations (EPA, 2019b).

In the terrestrial realm, 52.8% of surface water bodies are in satisfactory ecological health, compared to 55.4% in the previous assessment period (2010-2015). Although Ireland was historically renowned for its fishing lakes, almost half of lakes surveyed are in moderate, poor or bad ecological condition, with over 28% of lakes showing increases in phosphorous loading. The overriding source of pollution is excessive diffuse nutrient run-off from agriculture (53%), mainly due to more intensive agricultural practices, increasing phosphorous and nitrogen loads that result in eutrophic conditions. More intensive land use also results in increased sediment loads in water courses, changing the water ecology and smothering fish spawning beds (DHPLG, 2019b). Additionally, a high proportion of Ireland's rural population live in single rural properties and non-point pollution from poorly performing domestic septic tanks are a significant contributor of pollution (13%), although a process of assessment and upgrades is ongoing as noted above. Point pollution also originates from urban areas with no/limited wastewater treatment or poor capacity to deal with storm water (34%). Although capital investment in improved wastewater treatment is being made, there has been substantial lack of historical investment in urban wastewater treatment.

In the coastal environment, urban wastewater is a principal source of nutrient/organic pollution, followed by aquaculture and pollution from shipping, albeit restricted to inshore coastal and estuarine areas. However, wastewater discharges to sensitive coastal waters have reduced in response to investment in new wastewater treatment plants in coastal locations. Compliance with EU standards has risen to 24% from 14%, although this level is still below the EU average. Unfortunately, nutrient run-off into rivers and consequently into estuarine and near-shore systems, mainly originating from agriculture and forestry, has increased dramatically since previous assessments in 2014, reflected in 16% and 31% increases in nitrogen and phosphorus loads in estuaries.

In January 2019, Ireland was issued with a Letter of Formal Notice of infringement from the European Commission for a number of instances of non-conformity and shortcomings in Ireland's transposition of the Water Framework Directive.

2.7. Invasive Alien Species (IAS)

The introduction and proliferation of invasive non-native/alien species of plants and animals is a significant threat to native Irish biodiversity, by active competition for resources, displacement or predation. An upward trend in IAS introductions has continued in

Ireland, affecting all environments, but especially the aquatic environment (21%) and the marine (12%) (Caffrey *et al.*, 2014). The greatest number of high impact invasive species is found in the freshwater environment where management of IAS is especially challenging. The invasive zebra mussel (*Dreissena polymorpha*) is continuing to spread and populate lakes across Ireland in huge numbers, sometimes causing improvement in water quality, but with as yet uncertain or mixed consequences for native species. Fungal spores from the introduction of the North American red-clawed signal crayfish (*Pacifastacus leniusculus*) are currently having a dramatic impact on native crayfish in five Irish rivers where the mortality has been near 100%. Some plant species, such as rhododendron (*R. ponticum*), Giant rhubarb (*Gunnera manicata*), Japanese knotweed (*Fallopia japonica*) and Himalayan Balsam (*Impatiens glandulifera*), now almost completely dominate regions of the Irish countryside, drastically altering ecosystems and exposing soil to erosion. The principal pathways of introduction have been the horticultural, nursery, pet and aquaria trades, live food imports, and careless introductions due to agriculture, forestry, hull fouling and anglers or boat-owners failing to disinfect equipment. There are also instances of deliberate introductions of non-native fish by coarse fishers. Some plant diseases, such as Ash Dieback (*Chalara fraxinea*), may also have arrived by natural means following the spread of IAS in Britain and continental Europe, although importation of infected stock is also likely to have been a cause.

Ireland received a Letter of Formal Notice of infringement from the European Commission in January 2019 due to its inaction and failure to notify the Commission about penalties and lists of invasive alien species. This was escalated to a Reasoned Opinion in November 2019 and is likely to be referred to the Court of Justice of the EU in 2020. Legislation to address this deficiency is currently being drafted.

2.8. Continuing Issues

There has been an inadequate mainstreaming of biodiversity as a cross-cutting concern, impacting a variety of sectors either economically or socially. Although rhetoric has increased in recent years, it is unclear if the greater consideration being given to sustainability and biodiversity in sectoral policy is sufficient to reverse the continuing degradation of habitats and species populations, and the threats to key ecosystem services they provide. This lack of recognition is exemplified by the continued occurrence of subsidies that evidently contribute to loss of biodiversity (notably in the agriculture and marine sectors) without concurrent funding to ameliorate impacts on ecosystem services. A firmer focus on nature-based solutions to environmental challenges should be encouraged. Although recent commitments to restore peatland are welcomed for their role in addressing climate change, a greater awareness of the relationship between economic sustainability and both climate and biodiversity is required to avoid fines and prosecution and to conserve our natural heritage.

3. Dependencies on biodiversity and its economic value

Ironically, while biodiversity has been impacted in the sectors outlined above, it has an essential role in providing the ecosystem services that sustain the output and product quality of these sectors. In particular, biodiversity is central to soil productivity and stability, pollination, pest control, water retention, water filtration and the maintenance of commercial fisheries. In each of these areas there is an opportunity to realise market premia and transfer greater added value to those who manage their production using methods that protect natural capital and therefore maintain the services provided by healthy ecosystems.

3.1. Terrestrial Services

In some respects, agriculture and forestry, and associated livelihoods, appear to be less dependent on ecosystem services than might be the case in less-developed nations. In Ireland, farm incomes are heavily supported by transfer payments under the EC Common Agricultural Policy. Irish agriculture is largely grass based (3.6m ha) and rain-fed with a smaller area of tillage (270,000 ha), predominantly barley, oats and wheat. There are areas of oilseed rape, fruit and vegetables that do have a high reliance on pollination, but these account for modest land areas. Most pasture consists of sown rye grass that does not depend on insect pollination, has poor biodiversity value and is reliant on intensive application of fertiliser (organic or artificial). A more diverse and nutritious grass sward containing pollination-dependent clovers and herbs could be supported by the adoption of a more sustainable system of agriculture and would aid soil fertility through nitrogen fixation. Ultimately, agriculture and forestry rely on good soil fertility and this depends on the vital ecosystem services provided by soil biodiversity from soil bacteria, fungi, rotifers and earthworms (Bullock, Kretsch and Candon, 2008). The accurate valuation of the majority of these ecosystem services remains complex. That said, it is estimated that up to €3.9 million is gained annually in Ireland through insect pollination of the 10,000ha of oilseed rape grown here (Stanley, Gunning and Stout, 2013; CSO, 2019a), even though this crop can self-seed. Overall it is estimated that pollinators contribute €53 million to the Irish economy (NBDC, 2015). Despite this, a trend continues, supported by current policy, towards more intensive farming (DAFM, 2015), contributing to a decline in pollinating insects and a gradual loss of soil fauna and organic matter through deteriorating soil stability and associated erosion. This has further consequences for the siltation of water courses and estuaries.

Ireland's population is dependent on clean water and while most drinking water is treated, the level and cost of treatment of both potable water and wastewater is heavily reliant on the regulating services provided by rivers and their associated fauna and flora

(EPA, 2016b). Rivers and lakes are not so polluted as to place an undue burden on treatment for drinking, although investment in more intensive wastewater treatment has been required to ensure no further deterioration. The use of integrated wetlands as part of wastewater treatment has been proposed as these are potentially of high nature value and require lower capital investment, although only limited interest in these nature-based solutions to water treatment is apparent. While costs associated with water treatment are related to the quality of water being treated, most investment is currently aimed at adhering to WFD limits. One exception to this is the incidence of *Cryptosporidium* which has a relationship with the erosion of bogs.

While agricultural policy no longer finances new arterial drainage, exploitation of peatlands and self-directed farm drainage has further reduced the soakage capacity of the environment which, together with urban development, has transferred flood risk to downstream locations. Conventional hard engineering is often used as mitigation against downstream flooding, discounting the attenuation provided by biodiverse surface vegetation, especially wetlands, further upstream (EPA, 2016a). Broader catchment approaches to management are being proposed, including the SuDS model (Sustainable Urban Drainage Systems), and have the potential to reduce downstream pressures on rivers and encourage new local habitats (Dawson *et al.*, 2011).

Ireland's coastal population is protected from storms by coastal vegetation such as dunes and saltmarsh (EPA, 2016a). With the imminent threat of sea-level rise through global warming, the importance of dune and wetland systems for coastal protection is being realised. Despite their importance, this set of habitats is in an inadequate-to-bad condition and vulnerable to coastal squeeze due to rising sea levels (NPWS, 2019b). Moreover, construction of artificial coastal protection infrastructure has impacted negatively on biodiversity (NPWS, 2019a). Thus, there is a priority for a nature-based solution to coastal adaptation through preservation and restoration of habitats.

Given that Ireland is now the third highest emitter of greenhouse gases per capita in the EU (CSO, 2019b), and that a disproportionate share is attributed to agriculture (33% in 2017), more realisation of the potential for biodiversity to sequester carbon is needed. The recent allocation of budgetary funding for peatland restoration shows partial commitment to this ecosystem service. The sequestration potential of plantation forestry has been identified in Ireland for some time (Byrne and Black, 2003), though the impacts of this on biodiversity (and hence on other ecosystem services) renders this counterproductive if not carefully planned. Further, it has been found that planting forestry on peatlands may act as a net emitter of carbon by consuming peat carbon sequestered thousands of years ago (Byrne and Milne, 2006).

Finally, quality of life for many people in Ireland is greatly enhanced by outdoor recreation and leisure, particularly the cultural ecosystem services performed by urban green space, coastal areas and diverse rural settings containing hedgerows, bogs, woods and forest, or uplands (Bullock, Kretsch and Candon, 2008; Douglas, Lennon and Scott, 2017). For example, it is estimated that native woodlands in Ireland are worth €35 million annually in amenity use (Bullock and Hawe, 2014). The concept of green infrastructure is now increasingly mainstreamed within policy discourse, to include human health and wellbeing linked to functioning ecosystems (Scott, Lennon and Douglas, 2019).

3.2. Marine Services

Although no ecosystem services in Ireland have collapsed, some are degraded considerably. The prime example of this is the harvesting of species provided by independently functioning marine ecosystems. Ireland's catch of fish reached a peak of 407,000 tonnes in 1995 compared with 20,000 tonnes in 1963. Although the situation has been improving, only 35% of biomass is above MSY while the of populations of 21% of commercial species remain below MSY (NPWS, 2019b). Larger vessels and more efficient technology have resulted in over-fishing and ecosystem damage, but neither is a new phenomenon. Catches of several species are still unsustainable and longer-term damage has been done to ecosystems by indiscriminate harvesting and bottom trawling. Landings of wild fish and shellfish in 2018 were 316,852 tonnes. This total catch represents a continuing reduction since 2015 and, though per-weight value increased in 2016, the 2018 figure of €343m represents a decrease of almost 8% in value since 2016 (SFPA, 2018). Previous increases in value would have helped to maintain the viability of the Irish fishing sector without a need for higher fishing quotas. These recent declines in value, despite high catch size, may have the opposite effect.

Finally, the oxygen-rich cold waters around Ireland provide excellent conditions for aquaculture production, an industry which has steadily increased since 2010 with a present annual turn-over of €176 million (SEMRU, 2019). However, aquaculture presents a further threat to the ecosystem services provided by coastal and estuarine regions. The Government has targets to significantly expand the aquaculture sector (DAFM, 2015), even though many farms are located in or beside coastal Protected Areas. In principle, EU and State funding provides major leverage to ensure good environmental management, although slow licence determination of fish farms is seen as a major threat to the growth of the sector (DAFM, 2015).

4. Legislation, Policies and Strategies

4.1. Biodiversity Conservation Legislation

4.1.1. International conservation conventions

Ireland is a signatory, or has ratified, a number of UN international conventions relevant to biodiversity. Where Ireland is a signatory to an international treaty it has signalised its intention to abide by its conditions, but legal obligation depends on ratification by the national parliament. The UN 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) is one such convention for which a National Implementation Plan was drawn up in 2018. Other UN conventions relevant to biodiversity include the Convention on Biological Diversity, the Convention on International Trade in Endangered Species (CITES) which is legally binding, the Ballast Water Convention (reducing risk of IAS being deposited in ballast water discharges) to which Ireland is a signatory, the Bonn Convention on the Conservation of Migratory Species to which Ireland is a signatory, and the UN Convention on the Law of the Sea (UNCLOS) which Ireland ratified in 1996. In addition, Ireland has ratified the Ramsar Convention on the conservation of wetlands of international importance. Further, Ireland is a signatory to the OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic which principally aims to eliminate pollution of the marine environment, including from oil and plastic waste and to establish Marine Protected Areas (MPAs).

4.1.2. EU Directives & Regulations

The EU Habitats Directive of 1992 (92/43/EEC) targets the preservation of a network of key habitats across Europe and various important species of plants and animals therein. Ireland currently holds just over 430 Special Areas of Conservation (SACs) under this Directive, covering 13,500 km^2, over half of which is terrestrial. There is an obligation under Article 17 of this to review the status of habitats and species on a recurrent basis. Owing to Ireland's delays in finalising the designation of SACs and composing site-specific conservation objectives, the EU Court of Justice has issued Ireland with an additional Reasoned Opinion. Without action to remediate this, Ireland will be referred to the Court of Justice of the EU.

The EU Birds Directive (2009/147/EC) specifically targets the protection of all wild birds in Europe, including nests, eggs and habitats. This necessitates the designation of Special Protection Areas (SPAs) particularly important to birds, of which Ireland hosts 154. Reporting on the status of these species and associated areas is required under Article 12 of this Directive.

As a result of the transposition of the above two Directives into Irish law, 14% of Ireland's land area is now designated as SPA, SAC or both, collectively referred to as Natura 2000 sites. Any plan or project deemed to have a detrimental effect on Natura 2000 sites are subject to Appropriate Assessment under EU and Irish law. A review of both these Directives in 2017, has confirmed that they are fit for purpose, but that implementation, funding (and mobilisation thereof) should be improved (EU, 2017).

The EU Environmental Impact Assessment (EIA) Directive (2011/92/EU) requires EU Member states to consider the environmental effects of key public and private infrastructural projects – including roads, railways, power plants, waste treatment, etc. – in the planning stage. This has been further amended (Directive 2014/52/EU) to streamline this process and include more contemporary considerations such as climate change and disaster prevention. Owing to inadequate action by the Irish State in adhering to this regulation, specifically in relation to EIAs required for the extraction of peat, Ireland has been issued with a Letter of Formal Notice of infringement from the European Commission (July 2019).

The EU Strategic Environmental Assessment (SEA) Directive (2001/42/EU) approaches environmental concerns from a broader strategic perspective, necessitating sectoral, regional or national planning to include a wider consideration of environmental impacts. This includes consideration of the sustainable development of key sectors relating to the environment (agriculture, forestry, fisheries, energy, etc.), plans or programmes for which consideration of the Habitats Directive is required, along with overarching plans which are not covered by EIA obligations.

The EU Water Framework Directive (WFD) (2000/60/EC) focuses on establishing more ecologically coherent water conservation strategies and improving chemical standards, notably through its obligation to establish River Basin Districts (RBDs) and associated Management Plans (RBMPs). As this Directive mainly centres on water quality, it has important linkages to the support of biodiversity in Ireland's rivers, lakes and estuaries, although it retains a strong focus on human health. Currently Ireland is within its 2nd Cycle River Basin Management Plan (2018-2021) as part of the WFD. Additionally, Article 17 of the WFD led to the Groundwater Directive (2006/118/EC), although this has little impact on biodiversity conservation. Following recent reviewing, the eight RBDs of Ireland have been merged into a single management unit (EPA, 2016c).

The EU Marine Strategy Framework Directive (MSFD) (2008/56/EC) was established with the aim of achieving "good environmental status" (GEV) of the EU's marine waters by 2020, specifically stating that "biodiversity is maintained by 2020". The MSFD is the first EU marine legislation that specifically addresses biodiversity. An ecosystem approach is an important component of the sustainable exploitation of marine resources and the Directive has created four marine regions, with Irish waters lying in the North-East Atlantic region. Article 19 of this Directive requires periodic reporting, the most recent of which for Ireland was returned in 2013. This is complimented by the EU Marine Spatial Planning Directive (MSP) of 2014 (2014/89/EU), which requires each Member State to

develop a spatial plan of marine resources and human activities, focusing on ecological, economic and social objectives. This is under development by the Marine Institute, building on the findings of the National Marine Planning Framework consultation draft (DHPLG, 2019a).

The EU Environmental Liability Directive (2004/35/EC) aims to make accountable those damaging the environment. This Directive applies to contamination of land presenting a risk to public health, impacts on water bodies affecting their quality status in relation to the WFD and any impacts affecting the status of sites and species protected under the Birds and Habitats Directives. Importantly, this Directive includes impacts associated with long-term loss of value including human amenity value, necessitating primary remediation on-site, complimentary remediation if any broader impacts result, and compensatory remediation until losses are restored. Given that this acknowledges impacts outside of Natura 2000 sites which may affect species or habitats contained therein, this Directive has the potential to result in much broader regulation of the landscape outside of protected areas.

The EU Invasive Species Regulation (1143/2014), which came into force in Ireland in 2016, requires Member States to prevent, minimise and mitigate the adverse impacts of the introduction and spread, both intentional and unintentional, of 'invasive alien species' (IAS), implement early warning and eradication strategies, as well as controls on the importation and spread of IAS. This regulation has cross-cutting application under various EU Directives. Invasive aquatic species are a particular problem, requiring cooperation between various agencies including Inland Fisheries Ireland (IFI) and the cross-border organisations Waterways Ireland and the Loughs Agency. For example, the IFI has succeeded in eradicating chub (*Leuciscus cephalus*) and yellow water primrose (*Ludwigia spp.*) and is working with local organisations on a catchment basis to eradicate other invasive plants which spread along watercourses, while the OPW has predominantly focused on the control of Japanese knotweed & Himalayan balsam, the two most common riparian invasive plant species encountered during arterial drainage maintenance operations. Of particular concern at present is the spread of crayfish plague (*Aphanomyces astaci*), which could result in the extinction of the native white-clawed crayfish (*Austropotamobius pallipes*), following similar localised extinctions in Europe. A dedicated Invasive Species Group has been established for RBMPs under the WFD. Despite this, owing to inadequate action by the Irish State in adhering to this regulation, Ireland has been issued with a Letter of Formal Notice of infringement from the European Commission by failing to notify the Commission about penalties and lists of IAS. This was escalated to a Reasoned Opinion in November 2019 and is likely to be referred to the Court of Justice of the EU in 2020. Draft legislation is currently in final stages of development to remedy this situation.

4.1.3. Wildlife Act 1976 (& Amendments 2000, 2010, 2012)

The principal national legislation underpinning biodiversity and nature conservation in Ireland is the Wildlife Act 1976 (39/1976), with amendments in 2000 (38/2000), 2010 (19/2000) and 2012 (29/2012) which have several new measures including the extension of basic protection to the majority of species and improving the protection of Special Areas of Conservation (SACs). Statutory protection is also provided for Natural Heritage Areas (NHAs), legally designated sites of ecological importance under the Wildlife Amendment Act (2000) consisting mainly of raised and blanket bog sites. Additionally, there are currently 630 proposed NHAs, which are afforded limited protection, in various stages of formal designation. Since its inception in 1976, the Wildlife Act has been greatly strengthened by the ratification and transposition into Irish law of various EU Directives and associated Regulations.

4.2. International Policies and Plans

4.2.1. EU Biodiversity Strategy to 2020

Following on from the EUs biodiversity targets set in March 2010, the EU Biodiversity Strategy to 2020 aims to halt biodiversity loss and degradation of ecosystem services in the EU by 2020, through six time-bound mutually supportive targets and associated actions. Notably for this review, this Strategy also includes an action to "Ensure adequate financing of Natura 2000 sites" under Target 1: Fully Implement the Birds and Habitats Directives. This Strategy also aims, by 2050, to protect, value and appropriately restore ecosystems and biodiversity in the EU and the natural capital this represents.

4.2.2. The European Green Deal (2020)

Announced in January 2020, this major restructuring of EU environmental policy targets the just transition to a carbon-neutral EU economy by 2050 by doubling the commitments previously made in the Paris Climate Accord, mainstreaming climate considerations in a much wider suite of existing EU policies, transitioning industry and agriculture to an environmentally sustainable path. This will involve a projected investment of €1 trillion, much of which is to be generated through financial leveraging of the European Investment Bank and through green bonds (EU, 2020). Given that the detrimental impact of climate change on biodiversity is already becoming evident across Europe, and the acknowledgement that biodiversity can reduce net carbon emissions, this plan is likely to positively impact biodiversity if these co-benefits are mainstreamed across EU sectoral activities (OECD, 2013). The required scale of funding could, however, be threatened and/or delayed by the cost of the COVID-19 pandemic.

Effectiveness: International & EU policy

At international level, the various UN Conventions to which Ireland is a party, are reliant on the ratification of Member States. When ratified, there is no obligation to transpose these Conventions into State law. For example, the USA, China and other large economies regularly do not ratify conventions on biodiversity conservation, instead assuring the international community that measures will be imposed at a national level outside of international agreements. For example, the USA is not a party to the Convention on Biological Diversity.

At EU level, the wide array of Directives is intended to provide a network of cross-sectoral coverage, with interdependent reporting structures in place (for example, between the Habitats, Birds and MSF Directives). Gaps in this system are apparent. Directives do lead to within-state measures, although the complicated nature of oversight means that enforcement from an EU level is slow and does not effectively deter non-compliance. The burden of reporting and administration for each of these Directives could also be streamlined.

A recent "fitness check" of the Birds and Habitats Directives has confirmed that they are fit for purpose and progressively effective. However, significant limitations still exist, notably in the funding available for actions at MS level and the mobilisation of resources (EU, 2017). Positive changes have been witnessed in the past number of years and ambitious targets are being set by the EU, especially in relation to carbon emissions and through increased adherence to Natura regulations, supported through the submission of Prioritised Action Frameworks (PAFs) and financing estimates. However, the power to implement Directives, especially in cross-border ecosystems, remains challenging, while the mainstreaming of biodiversity concerns in EU policy (in contrast to that of climate action) is limited, owing to a combination of economic and societal drivers. At an Irish level, greater top-down enforcement of EU directives is required, shown by the ongoing sanctions taken by the EU in instances of non-compliance.

4.3. National Policies and Plans

4.3.1. National Biodiversity Action Plan 2017-2021

Under the Convention on Biological Diversity's Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets, each party is required to provide a coherent National Biodiversity Strategy or Action Plan. Thus, through its 7 strategic objectives and 119 targeted actions, Ireland's third National Biodiversity Action Plan (NBAP) 2017-2021 has been prepared by the National Parks and Wildlife Service (NPWS) to protect and enhance Ireland's biodiversity (Figure 1). Overall, the NBAP proposes that this will be achieved by ensuring conservation in the wider countryside and the marine environment, expanding and improving the management of protected areas and species, strengthening the knowledge base, raising public awareness, and mainstreaming biodiversity actions with the cooperation of other Government Departments and agencies.

The NBAP also includes actions to implement a strategy for Invasive Alien Species, including continued identification and monitoring of high-risk IAS, the development of biosecurity plans and the coordination of IAS surveillance and monitoring data.

The NBAP has been approved (though not adopted) by the Oireachtas (parliament), with the Department of Culture, Heritage and the Gaeltacht (DCHG) responsible for oversight of the implementation of the Plan and for coordinating with other Public Authorities, NGOs and private sector organisations. An action to monitor the implementation of the Plan through a Biodiversity Working Group (BWG) and the Biodiversity Forum of external stakeholder links with Aichi Biodiversity Target 17: *develop, adopt and commence implementation of a participatory national biodiversity strategy and action plan*.

An interim review of the NBAP was produced in early 2020 by the Biodiversity Working Group, recounting the progress towards achieving the targeted actions of the plan, the key bodies involved and the performance indicators showing this achievement (BWG, 2020). By late 2019, of the 119 targeted actions, 8 had been implemented, 98 were ongoing and 13 required further action. It was noted that 88 of these actions are open-ended in nature; that is, based on continuing activities rather than a defined results-based endpoint. This renders the implementation of some targets difficult to ascertain and may hinder any future costing exercise.



Figure 1: The 7 objectives of the National Biodiversity Action Plan, with associated Targets. 119 targeted actions are associated with these objectives. From: 6th National Report to the Convention on Biological Diversity (DCHG, 2019)

4.3.2. The Protected Area network of Ireland

Ireland is required under the EU Habitats and Birds Directives to secure the protection of a representative range of ecosystems and to maintain and enhance native flora and fauna through a suite of international and national Protected Areas. Of the 818 protected areas in Ireland, 539 are SACs and SPAs which together make up the Natura 2000 network. Since 2010, the NPWS has taken action to further expand the Natura 2000 network through the designation of 7 new marine SACs, 9 new Raised Bog SACs and 11 new SPA sites, resulting in an 18% increase in the area protected. The Natura 2000 network is managed through the development of sites-specific conservation objectives (SSCOs) and management plans (SSMPs) which aim to maximise the contribution they make to the conservation of target habitats and species. Each Natura 2000 site requires an individual Statutory Instrument (SI) for its protection. Although Ireland has been slow at providing these for sites, SIs are now in place for 61% of Natura 2000 sites. SPAs have almost complete formal designation (96%) while SIs for SACs stands at 48%.

Alongside Ireland's Natura 2000 designated sites, there are a series of national designations including Natural Heritage Areas (NHAs), National Parks and National Nature Reserves. The network of NHAs includes 75 raised bogs and 73 blanket bog sites, with an additional 630 proposed NHAs at various stages of progression towards designation. In 2016, 46 of these NHAs and pNHAs were de-designated with the aim of better focusing the protection of a re-configured network of sites, resulting in an overall increase in protected area. Two of Ireland's National Parks have also recently been expanded. In 2017, the state purchased land to expand Wicklow National Park by 4,900 ha, whilst a 50% increase in the area of Ballycroy National Park was achieved through the transfer of forest lands from Coillte to the NPWS. The NPWS has particularly focused on improving the condition of raised bog SACs and NHAs, publishing SSCOs for all 53 raised bog SACs (DCHG, 2017b), extending the cessation of turf cutting and compensation to include additional raised bog in NHAs, and through the commissioning of 53 site specific restoration plans for raised bog SAC sites.

4.3.3. Species Action Plans

Threat-response plans for species have been devised that provide detailed information on range, distribution and habitat, and identify the particular threats facing each species and the measures required to address these threats over a three-year time frame. Between 2010 and 2018, species threat response plans have been produced by the NPWS for a multitude of species and taxa, including the red grouse, cetaceans, otter and the Kerry slug (*Geomalacus maculosus*), while a plan for the hen harrier is currently being drafted (NPWS, 2020). The NGO BirdWatch Ireland (BWI) have also produced Group Action Plans for assemblages of birds associated with particular habitats, such as their Action Plan for Upland Birds (BWI, 2010). These reports help inform the development of NPWS species action plans and provide an additional layer of non-statutory scientific guidance for planning and conservation.

To aid in the development of species action plans, the NPWS, in collaboration with taxa experts, have produced 13 Red Lists of threatened groups of species to date, ranging from stoneflies (#13: 2020) and vascular plants (#10: 2016), to bryophytes (#8: 2012) and butterflies (#4: 2010). Further, BWI and the Royal Society for the Protection for Birds (RSPB) produce the Birds of Conservation

Concern in Ireland (BoCCI) list every 3-4 years. Both these lists provide important ecological data and conservation priorities at a national level.

4.3.4. National Landscape Strategy

The National Landscape Strategy 2015-2020, published in 2015 by the DAHG (DAHG, 2015b), provides a platform for thinking more holistically at a landscape scale about the coherence and connectivity of Protected Areas within Ireland. It is in partial compliance with the European Landscape Convention (a.k.a. The Florence Convention; 2000). This will be achieved by integrating landscape planning into sustainable development and acknowledging the interactions between human society and natural environments, including reference to biodiversity and the challenges of climate change mitigation. The steps proposed to achieve these objectives include the recognition of landscapes in Irish law, developing a national landscape character assessment, increasing landscape awareness and strengthening public participation through education, research and training.

4.3.5. Ireland's National Strategy for Plant Conservation

In response to the Global Plant Conservation Strategy, a working group of state, semi-state and NGO experts led by the National Botanic Gardens of Ireland (NBG), developed Ireland's National Strategy for Plant Conservation (OPW, 2019). Containing 16 key targets, this report assessed the likelihood of achieving these targets by the end of 2020. In overlapping with targets from multiple other national plans, such as those of the NBAP and Natura 2000 reporting obligations, this plan offers additional reporting coverage and encourages inter-departmental collaboration. Of the 16 targets in this strategy, it was established that current efforts are on track to achieve 13 of these by 2020, with the remaining 3 exhibiting insufficient progress, notably with regard to plant conservation on agricultural land and action around IAS management plans (OPW, 2019).

4.3.6. All-Ireland Pollinator Plan

Ireland is one of the first European countries to have a strategy to protect the vital ecosystem service of pollination, through the All-Ireland Pollinator Plan 2015-2020, managed by the NBDC (NBDC, 2015). Since the plan's publication, 90 government and non-government organisations have signed up to make their lands or products more pollinator friendly. A GIS-mapping tool has been set up to identify the 600 areas that are benefiting, to identify actions taken and to track progress. In terms of distinct benefits, progress will depend on transforming awareness into evidence of improving bee and pollinator populations due to changes in a high proportion of Ireland's land managed by farmers, businesses, gardeners, and local authorities. This plan has made particular strides in awareness-raising among gardeners, communities and farmers. While the term "ecosystem service" is understood largely by those working professionally within the natural environment sector, the importance of pollination is well-understood by the wider public. A total of 140 individual communities have now entered the special pollinator award. A survey in 2018 by the market research agency iReach found that 88% of people now believe that more needs to be done to protect Ireland's bees and other pollinators.

4.3.7. National Genetic Conservation Strategy

A National Genetic Conservation Strategy for animal genetic resources was published in 2013. The strategy provides recommendations to ensure the conservation and use of animal genetic resources; that is, the diversity of livestock breeds in Ireland, seven of which are endangered (McParland, 2013). Although not directly targeting native biodiversity, this strategy promotes the conservation of breeds more suited to semi-natural habitats in Ireland (e.g. the Kerry Cow; one of the oldest breeds in Europe), thereby reducing the necessity to convert areas to improved pasture. An equivalent strategy document was produced for plant genetic resources in 2014, with 40 recommendations, 7 of which were subsequently prioritised for Genetic Resources Grant Aid Scheme funding.

4.3.8. Peatland Conservation Strategies and Plans

Given the historical and current extent of peat soils and existing peatlands, various plans and strategies have been published in recent years aimed at conserving our peatlands, phasing out peat extraction and reducing degradation from overgrazing and land-use change. Recognition of the importance of peatlands, their ecological uniqueness, high representation in Ireland and importance as carbon sinks, resulted in a **National Peatlands Strategy** published in 2015 by the NPWS, which brought together stakeholders from various Government Departments and Agencies and knowledge gained through prior research projects such as the Boglands EPA STRIVE project (EPA, 2011). Key actions include restoration of the peatland network, management of IAS on these sites and the mapping of ecosystem service benefits. Coillte have already restored over 3,000 ha in partnership with an EU LIFE Project (LIFE09 NAT/IE/000222), by removing conifers and damming drains. LIFE and other funding has been available to community groups wishing to protect or restore their local peatlands. For example, peatlands at Killaun and Abbeyleix have been adopted by communities for their wildlife, heritage and amenity benefits. However, there are a large number of bogs which were purchased by private contractors since the nineties on which peat extraction had continued due to new works falling below the former 50 ha threshold required for environmental impact assessment. The EPA's interpretation of the new EIA Directive 2014/52/EU has recently led to suspension of some peat workings where the contractor extracts peat from sites in excess of 30ha pending new applications for planning permission being backed by an EIS. The Department of Housing, Planning and Local Government (DHPLG) is currently developing a regulatory regime for these works that provides compliance with the Habitats Directive.

Several actions of the National Peatland Strategy have been implemented, including recognition of peatlands within agricultural and forestry policy, given that the Strategy's scope covers all peat soils including those currently used for agriculture and forestry. For example, forestry grants are no longer being awarded for planting on peatlands, although unsupported planting may proceed subject to planning. Most recently, funding was announced for the Restoring Active Raised Bog LIFE project (LIFE14 NAT/IE/000032) that will, until the end of 2020, engage communities in the vicinity 12 SAC bogs, while restoring 752 ha of former raised bog and improving the status of a further 2,649 ha. Further, a LIFE Integrated Project focussing on the network of Natura 2000 blanket bog sites in the west of Ireland (LIFE18 IPE/IE/000002) was recently awarded and will run until 2028. With a total budget of €20.6 million this is the largest project of its kind to date.

Significant efforts have been made by the State to resolve issues with the protection of raised bog SACs within the framework of the Habitats Directive. This has included intense and on-going engagement with turbary (peat cutting) interests, the farming community, NGOs and the EC. The NPWS, in conjunction with the National Peatland Strategy Implementation Group, have worked to protect the integrity of raised bog SACs by prohibiting household cutting on the best remaining examples of raised bog SAC and NHA sites in exchange for compensation, including relocation where feasible, through the **Cessation of Turf Cutting Compensation Scheme** (CTCCS). In 2014, the NPWS extended the CTCCS to an additional 36 raised bog NHAs. Thus far, the CTCCS has had over 2,000 applications and paid out over €32 million in compensation payments between 2010 and 2018 to prevent further damage. These compensation arrangements can be viewed in the context of the relative size and consistent fall in the budget of NPWS, amounting to €13.7 million in Budget 2020 (a 47% reduction since 2010). Turbary cutting is regarded as a right in rural Ireland and its suspension, even if applied only to protected sites, is politically controversial and so perceived to require compensation. However, suspension of peat cutting will not prevent the oxidation of peat unless an at least equivalent amount is spent on the blocking of drains and restoration. While investment in restoration under the umbrella of LIFE has commenced, partly in response to the need to be seen to address climate change, much more investment is needed to restore peatland ecosystem services.

In 2016 Bord na Móna, the semi-state peatland company, produced their **2nd Biodiversity Action Plan 2016-2021** (BnM, 2016). The company proposes to move out of peat production before 2030, in light of the cessation of government PSO payments for milled peat as a fuel (see section 6.4) and the potential revenue from wind energy installations on their sites. To this end, co-firing with biomass is being pursued at its Edenderry power plant and at other plants that were traditionally fuelled by peat alone. This move also takes account of Government policy to reduce dependence on carbon-based fuels in energy production. The company is required to rewet its worked bogs and has already restored 1,000 ha of raised bog and contributed to the rehabilitation of around 15% of its original 80,000 ha landholding, with input from NPWS, NGOs and community groups. Although the exact nature of this rehabilitation remains unclear (options include full restoration, biomass production and wind energy), the restoration of appropriate hydrology through the blocking of drains and the removal of encroaching scrub seem to be the predominant remediation conducted (BnM, 2016). Through parliamentary debate in November 2019, it was stated by the Minister for Communications, Climate Action and the Environment that a revised ring-fenced PSO will be put in place obliging "the enhanced rehabilitation of BnM bogs over and above what Bord na Móna is obliged to do under its EPA licences" (Oireachtais, 2019).

The **National Raised Bog SAC Management Plan** sets out a comprehensive programme of restoration of raised bog SACs and NHAs from 2017-2022 (DCHG, 2017b). Under the plan, the NPWS has published 53 site-specific conservation objectives for raised bog SACs and commissioned 55 site restoration plans (53 raised bog SACs plus 2 sites proposed for designation). Both of these measures are requisites of the Habitats Directive.

Finally, in addition to the above, **Ireland's Peatland Conservation Action Plan 2020** was published by the Irish Peatland Conservation Council (IPCC) in 2009 and supplements ecological and spatial knowledge of Ireland's extant peat soils (IPCC, 2009), and proposes conservation actions which largely overlap with the above plans.

4.3.9. Climate Action Plan 2019

Under our EU obligations to contribute to a carbon net zero EU economy by 2050, Ireland produced the Climate Action Plan in 2019. The plan is ambitious, aiming to meet the EU mandated emissions target which, at present, is likely to be exceeded by 25%. This plan identified key sectors contributing to Ireland's emissions which are substantially higher than other MS, including from agriculture, transportation and electricity generation. Despite reference to the Climate and Biodiversity Emergency declared by Dáil Éireann in May 2019, this plan to reduce Ireland's emissions is in line with internationally-agreed targets, but does not acknowledge in detail the important role of biodiversity in achieving these targets, aside from "planting for biodiversity" (DCCAE, 2019). The plan does make reference to the necessity to conserve species and habitats as a nature-based solution to climate change, notably by accounting for the significant carbon storage and sequestration potential of peatlands, although limited reference is made to the specific biodiversity required to deliver such services. Thus, increased recognition of the co-benefits between the biodiversity targets within the NBAP and those of the Climate Action Plan are required, as highlighted by a recent OECD study (OECD, 2013).

4.3.10. Biodiversity Climate Change Sectoral Adaptation Plan

Published in November 2019 by the DCHG under the National Adaptation Framework, this plan coalesces many existing goals set out in the Climate Action Plan 2019, the NBAP and the IAS plan. It feeds on expert opinion from the Biodiversity Working Group and the Biodiversity Forum and includes participation from various stakeholder groups. The Plan recognises the interlinkages and

interdependencies between climate change adaptation / mitigation and ecosystem-based approaches (EbA) to adaption, originating from the cost-effective ecosystem services provided by biodiversity. Its development has, however, revealed challenges relating to adaptation planning in the biodiversity sector. These include a) shortages of data on the impacts and consequences of past extreme events and climate variability, b) inadequate monitoring of biodiversity and exposure to climate risk, c) the need for a detailed vulnerability assessment for the sector, and most critically d) the fact that biodiversity is a cross-cutting issue where responsibility for protection, management and restoration spans multiple government departments as well as local authorities and non-state actors. It is stated that the NPWS is not empowered or resourced to implement actions or oversee the actions of other sectors. This poses unique challenges to the further development and implementation of the plan, although it provides the foundations for broader interdepartmental planning.

4.3.11. National Planning Framework – Project Ireland 2040

The National Planning Framework (NPF) is the Government of Ireland's high-level strategic plan for shaping Ireland's future growth and development to the year 2040 (GoI, 2018b). This is in line with increasing global challenges such as climate change, biodiversity loss and associated impacts on sustainable development of human society. The plan guides future public and private spending in dealing with these challenges at a national level. This report makes prominent reference to the importance of the natural environment. Of the 75 Objectives outlined in Project Ireland 2040, 12 of these relate directly to the natural environment, including pressure imposed on it and the benefits of ensuring it continued functioning. Objective 59 specifically calls for enhanced conservation of Protected Areas and species. This plan further advises on the development of **Regional Spatial and Economic Strategies** (RSES) for each Regional Assembly, of which there are three. Each of these RSES reports includes environmental concerns, including biodiversity and natural heritage, in their regional planning frameworks.

Effectiveness: National Policy and Plans

Although there has been an increase in the number and area of Irish Protected Areas, notably SACs and SPAs, the conservation status of the majority (85%) of protected habitats listed under the Habitats Directive is judged to be "unfavourable". Only 2% of habitats demonstrate an improving trend compared to 46% with a declining trend, while 53% were stable (NPWS, 2019b). Compared to 41 other European states, Ireland has the 5th lowest protected area Connectedness Index and is in the bottom 15% of European countries (BIP, 2019). Generally, more species are in favourable conservation status than is the case for habitats, but there is a dependence of these same species on quality habitats (NPWS, 2019b). There has been progress on the formal designation of Natura 2000 sites through the implementation of Statutory Instruments, although many SACs remain of "proposed" status, meaning that formal boundaries remain undefined, although they are legally protected from when they are proposed. The continuing loss of higher quality rivers and wetlands has clearly had an impact on the status of some aquatic species, noting also that freshwater habitats are under-represented amongst Protected Areas and that the decline in water quality nationally is continuing (EPA, 2019b). There is also a continuing loss of species with a degree of dependence on farmland, despite the improved targeting of agri-environmental schemes. Reports of the unfavourable conservation status of many Protected Areas were reinforced by Birdlife International who found that 65% of Important Bird Areas in Ireland have a very high level of threat to their qualifying species or a species population in very unfavourable or unfavourable condition (BI, 2019). Given that areas outside of the PA network support a decreasing amount of birdlife (e.g. agricultural land), their high status is increasingly important.

Resources have been directed particularly at the preparation of conservation or restoration plans for raised bog SACs, many of which needed urgent protection from past drainage and peat extraction. The CTCCS, in combination with projects such as the EU Raised Bog LIFE (1 and 2) and the Living Bog LIFE project, are working to protect and restore raised bog habitats across Ireland. The IPCC has a long-standing programme of bog restoration and protection to try to reverse trends in peatland degradation and fragmentation. Despite these measures, mechanised cutting of peatlands continues in SACs. However, the Just Transition away from peat-burning power stations will have marked positive effects on biodiversity.

There exists a comprehensive suite of national-level plans aimed at the conservation of plants, pollinators, landscapes, genetic diversity and peatlands, amongst others. Whilst these are encouraging and serve to coordinate efforts across departments and sectors, it is unclear to what extent some of these plans are effective at guiding actions at a stakeholder-level. It appears that the production of some plans goes little further than complying with EU conventions and directives. Sectoral policies do consider sustainability and often include measures to support biodiversity. However, it would not yet be true to say that biodiversity has been adequately integrated into development strategies and measures to support biodiversity typically remain peripheral to core departmental policies in most cases. Recognition of ecosystem services remains poor even in those sectors with high dependency on these services and biodiversity measures generally involve mitigation of mainstream activities, often in response to EU Directives.

The situation in spatial planning is somewhat better as County Development Plans include an environment chapter with varying consideration given to biodiversity. However, rather few Local Authorities possess a Biodiversity Officer.

4.4. Sectoral Polices and Plans

4.4.1. Agriculture

Agricultural policy is moving towards improved environmental management within the requirements of core farm transfer payments. Over 13% of Irish farmland is subject to agri-environmental schemes (AES) where farmers receive payments to protect features of environmental and biodiversity value. These represent the best example of Payment for Ecosystem Services (PES) in Ireland, although they also have social objectives in supporting the incomes of farmers on more marginal lands. In addition, there is a positive move towards locally led and results-based AES where farmers have more say in the design of projects and are paid by conservation results, not simply measures taken. This trend has been underpinned by various EU LIFE projects and a new round of European Innovation Projects (EIPs) to support specific habitats and species. That said, the change from Rural Environmental Protection Scheme (REPS) to the AEOS (Agri-Environment Options Scheme) led to a sharp reduction in uptake, although the current GLAS (Green Low-Carbon Agri-Environment Scheme has attenuated this trend somewhat. Overall, the effectiveness of AES is improving, though if the resources spent do not match previous years then a continued decline in agricultural biodiversity is likely. Details on specific programme are outlined below.

Common Agricultural Policy

Funding for agricultural production, farm incomes and the agri-environment come under the Common Agricultural Policy (CAP) for which reform is proposed for the next cycle of 2021-2027, notably with regard to single farm payments and an increasingly results-based model. The EU CAP Pillar I supports farmers through direct payments, principally the Basic Payment Scheme (BPS) which supports farmers' incomes, but also requires that holdings are kept in good agricultural and environmental condition, for instance through the maintenance of landscape features such as hedgerows. Although this requirement can benefit biodiversity, the BPS does not have specific biodiversity objectives. 'Greening' payments are currently available for the maintenance of 'Ecological Focus Areas' (areas beneficial to climate or environment: e.g. field margins, green cover, buffer strips, etc.). The scheme includes priority actions targeted at vulnerable habitats and commonage, threatened farmland species and also measures which have wider biodiversity benefits. In addition, it includes a focus on water quality and climate actions such as minimum tillage for soil carbon retention with added benefits for ecosystem services. However, BPS Greening Payments have been largely criticised by European assessors as being largely ineffectual at causing positive management change (AE, 2017), while the Irish Farmers Association state that it rarely necessitates changes to practices. This rare alignment in views accentuates their inadequacy. It is expected that the new CAP will contain more environmental measures, although the nature of these is currently unknown.

Rural Development Programme

Of more significance for biodiversity is the Rural Development Programme (CAP Pillar II). DAFM has proposed substantial national funding to the RDP 2014-2020, bringing the total budget to over €4bn including the €2.2bn received from the EU. The RDP provides additional supports including a variety of schemes from compensatory allowances for disadvantaged areas to AES. The principal national AES is the Green Low Carbon Agri-environment Scheme (GLAS) which provides financial incentives for farmers to sensitively manage important habitats and water quality and supports 49,000 farmers to manage lands of conservation value. Applicants to GLAS are scored on a tiering system based on the expected environmental benefit. More recently, GLAS has become more targeted at water quality, climate and biodiversity.

NPWS Farm Plan Scheme

Payments are supplemented for farmers with holdings in Natura 2000 areas or who have signed up the NPWS Farm Plan Scheme (FPS), which is directed at areas of High Nature Value, thus contributing to the conservation of protected species on agricultural land. Over 650 individual farm plans were implemented between 2006 and 2018. Funded by the national exchequer, this scheme operates through the creation of bespoke farm plans to assist farmers to go beyond their legal obligations and implement targeted habitat improvement for specific species (DCHG, 2017a). Although now operating at a reduced scale, this scheme has enabled the NPWS to address important High Nature Value farmland and provided a testing ground for bespoke species conservation measures which have been rolled out through national AES under the Rural Development Programmes (RDP) 2007-2013 and 2014-2020.

Outcomes: Agricultural Policy

In common with findings across the EU, evaluations of AES indicate improved environmental awareness and practice, but less progress towards a pro-active culture of biodiversity management. The focus on biodiversity within the former Rural Environmental Protection Scheme (REPS) increased towards its closure in 2010. Its successor, the Agri-Environmental Options Scheme (AEOS) was more targeted and included conservation and biodiversity as one of its three principal objectives. However, although these schemes helped to protect farm habitats, reduce pesticide use and support balanced nutrient management, there was little evidence of tangible beneficial outcomes for biodiversity prior to 2010 (Finn and O hUallachain, 2012) and take-up was low in more intensively farmed areas or in higher value sectors such as dairy.

Nevertheless, environmental quality within AES landholdings is likely to have improved due, for example, to reduced over-grazing and leaching of nutrients (Renou-Wilson *et al.*, 2011; Batáry *et al.*, 2015). In common with some other EU national schemes, evaluations of the Rural Development Programme (RDP) indicate a need for more biodiversity training/advice, better targeting of measures, and a move away from an emphasis on quantitative outcomes (e.g. length of hedgerow) towards quality (e.g. numbers of species present). In response to these recent evaluations, relevant stakeholders including DAFM, DCHG, Teagasc and the Heritage Council are implementing new AESs with the objective of achieving gains in biodiversity. This has manifested itself in an increase in site-specific and area management payments.

Recent analysis of GLAS reveals that the most popular measures were maintenance of low-input permanent pasture, protection of watercourses from cattle, and traditional hay meadows. Most land in the scheme is under cattle or mixed livestock. At this stage, there is not yet firm evidence of the extent of positive biodiversity outcomes, although early indications based on a small sample of 30 farms, are that results may be more positive for biodiversity than former schemes. There is therefore reason to believe that GLAS is having a positive environmental impact, although this has still to be confirmed by monitoring. However, landholdings not in GLAS account for 79% of the farm area and are subject to rather mild environmental constraints and greening measures. There remain only a handful of schemes to attract dairy or tillage farmers in more productive parts of the country where biodiversity clings onto remnant habitats but has the potential to be enhanced. Approximately 7% of this farm area is made up exclusively of wildlife habitat. While most AES farms are located in less productive parts of the north and west of Ireland. intensive dairy and arable farms in the south and east have often chosen to remain outside AES so as to preserve their options to manage without restriction. Thus many habitats in these areas are vulnerable to removal or to the implications of the national policy objective of major increases in farm production (DAFM, 2015). Initiatives for these farms and stronger environmental criteria in relation to the BPS would help to arrest the continuing decline in farmland wildlife in the wider countryside. AES are voluntary, and so any improvements fall short of the landscape approach needed for net environmental gains. New Results-based Agri-environmental Payment Scheme (RBAPS) and locally led approaches, including (European Innovation Programme (EIP)-funded projects are being piloted and could overcome these criticisms by taking a less prescriptive approach and instead rewarding farmers for positive outcomes. Early indications (based on consultation) are that the RBAPS approach is having clear benefits for biodiversity.

Wider trends towards excessive fertiliser application and the loss of meadows, scrub and hedgerows has been moderated (but not eliminated) for farms outside of AES. The drainage of wetlands has reduced, but existing arterial drains continue to be maintained. There is still a continuing loss of bird and insect species associated with less intensive agriculture, including pollinators and birds, while significant losses of calcareous grassland, *Molinea* grassland and hay meadows of over 27% have also occurred between 2007-2012 (Martin, O'Neill and Daly, 2018).

4.4.2. Forest Policy

Most of the area under forest cover in Ireland comprises commercial conifer plantations of a relatively low biodiversity value. Native tree species now comprise 27% of the forest estate and have higher biodiversity value and 16% of the forest area can be described as native woodland (>80% native species). Only 20,000 ha is considered to be ancient woodland of the highest biodiversity value. Around 15% of the estate managed by Coillte is managed specifically for biodiversity. However, forest policy is improving with more restrictions on the type and location of planting, including a requirement that 15% of planted area should comprise native broadleaf species. In addition, various schemes are now available to support the planting of broadleaf woodland, including native species woodland or the rehabilitation of existing woodlands. However, commercial forestry depends primarily on commercial coniferous species and most demand for planting continues to be for less productive grazing land, some of which could be of biodiversity value. Also, planted conifer forests in upland areas have been implicated in the poor breeding performance of red-listed species such as hen harrier and curlew due to loss of moorland habitat and by providing refuges for predators such as foxes. Further, inappropriately sited forests and poorly managed forest operations can have a significant impact on freshwater and the freshwater pearl mussel. The following section gives an overview of programmes for forestry change and outlines their effectiveness.

Forestry Act 2014 and the Forestry Programme 2014-2020

The Forestry Act entered into law in 2014. This sets out the specific role for the Minister in safeguarding the environment and attaching conditions to new planting, includes overarching provisions for the protection of the environment and integration with the requirements of the EU Habitats and Birds Directives. Associated with this, and in line with EU guidelines for forestry, the DAFM published the Forestry Programme 2014-2020 in 2014 (DAFM, 2014). Given its broad nature, the Programme was subject to Strategic Environmental Assessment (SEA) which concluded that it would have a net positive impact for water quality and wildlife (Davies and Image, 2014). This assessment examined the environmental requirements placed on recipients of all forestry grants. Among various recommendations and mitigation, it noted the need to take account of recent research findings, to implement Sustainable Forest Management and to promote producer groups who can coordinate forestry planting to achieve environmental benefits at a landscape scale. Key measures introduced in recent years include the Land Types for Afforestation Procedure (March 2016) and the Environmental Requirements for Afforestation (Dec. 2016). In summary, all sites presented to the DAFM for afforestation must meet these requirements, which effectively rule out land use change to forestry for a wide range of habitats and water-sensitive landscapes.

The application of the above measures is intended to accelerate the ongoing diversification of forests and the promotion of native woodlands (through afforestation, restoration and conversion) at a landscape scale, to reverse habitat fragmentation and to protect water. Having a greater area of broadleaf woodland will inevitably benefit biodiversity, although established mature native woodlands have a far higher biodiversity value due to their age and species diversity, ground flora and abundance of deadwood. Even forests of commercial conifers can have biodiversity value when not too dense or dominated by single species (Irwin *et al.*, 2014). Previous deforestation, combined with Ireland's geographical separation, has meant that Ireland has few woodland bird and animal species compared with Britain and the European continent. The rapid natural spread of common buzzard (*Buteo buteo*) and great spotted woodpecker (*Dendrocopos major*) in Ireland (both absent until recently) is likely to have been encouraged by the presence of broadleaf woodlands, as is also the case for the reintroduced red kite (*Milvus milvus*). Native species such as red squirrel (*Sciurus vulgaris*) and pine marten (*Martes martes*) also appear to have benefitted, the former partly due to the predation of invasive grey squirrel (*Sciurus griseus*) by the latter. Conifer plantations may have contributed to a lower degree, although this is species-specific.

Native Woodland Scheme

A key biodiversity-focused measure of the Forestry Programme 2014-2020 is the Native Woodland Scheme (NWS). The NWS is focused primarily on promoting biodiversity, along with co-benefits such as the protection of water and aquatic ecosystems, habitat connectivity at a landscape level, and sustainable wood and non-wood production. Two key elements comprise this scheme: Conservation (existing semi-native woodlands) and Establishment (new native plantations). New planting of native broadleaf trees under the NWS totalled 2,281 ha since 2000, although the Conservation element was briefly curtailed during the economic recession post-2008. This scheme is being further supplemented by investment from private entities as part of their carbon offsetting objectives (e.g. Microsoft).

Felling and Reforestation Policy, 2017

The Felling and Reforestation Policy, introduced in 2017, includes new Reforestation Objectives which provide the basis for forest harvest and restructuring post-clearfell. These incorporate protective buffers, open spaces and setback from watercourses. Planting is being supported by policies which are providing for more sustainable forestry. These include measures to ensure that planting cannot take place within Natura sites unless agreed by NPWS. Other measures set aside areas for biodiversity enhancement, provide buffer zones to protect watercourses, protect against the spread of IAS, and ensure that forestry does not compromise protected habitats or species, including hen harrier and freshwater pearl mussel. A programme of grant-aided forest removal is also in place.

Afforestation Grant and Premium Scheme

The principal Afforestation Scheme of the Forest Service (FS) offers higher grants and premiums for broadleaves and agroforestry. While the grants themselves reflect the higher cost of establishing broadleaves, they also provide a real incentive to plant broad-leaves relative to conifers. Twelve different Grant Premium Categories (or GPCs) are currently offered, with a minimum mandatory broadleaf requirement per forest plantation of 15%. Individual sites can also comprise up to 15% open space to protect and enhance biodiversity, water and other environmental receptors.

Other FS schemes that are not necessarily directed at native tree species, but which have value for biodiversity, include the Agro-Forestry Scheme, the Reconstitution (*Charlara*) Scheme, the Seed Stand and Seed Orchard Scheme, the Neighbourwood Scheme (for restoration and amenity), and Deer Tree Shelters and Deer/Hare Fencing Scheme.

Outcomes: Forest Policy

Although in principle, the Forestry Programme contains safeguards for biodiversity, water quality and carbon emissions, it is often unclear what how these will be applied at producer level. Productive forestry is predominantly based on the high-volume timber from exotic species, rather than native broadleaves. Broadleaf woodlands, and in particular native species woodland, remains vulnerable to browsing by deer, invasive understorey plant species, and now also a disease (*Chalara*) introduced through commercial forestry which threatens ash trees, the most prevalent native tree species in the wider Irish countryside. Thus, the commercial viability of broadleaf plantations, even after the inclusion of grant aid, is threatened. The small area (circa. 100,000 ha) of remaining native woodland is at particular risk from neglect and degradation.

There is strong evidence of increases in the area of broadleaf afforestation and biodiversity improvements due to the Forestry Programme 2014-2020: the proportion of broad-leaf planting under the programme was 21% in 2017. This is below the NBAP target figure of 30%, although this level was exceeded in seven counties. The area of forest that is comprised of native and mixed species has increased by 3% since 2012 and now amounts to 31.7% (DAFM, 2019). There is also a gradual increase in area, but also a decrease in "other wooded land" such as scrub. Funding for the NWS was heavily impacted by financial constraints introduced during and after the 2007-2011 economic recession. Spending under the Establishment element is now recovering, with the scheme having funded an increase in planting year-on-year amounting to 1,140 ha over the past six years. Overall, this has contributed to an increase in the area planted with native tree species to 179,000 ha or 29% of the forest estate.

Inappropriately located forestry was identified as a significant pressure for peatlands in the Habitats Directive Article 17 report (NPWS, 2019b) and on water quality, soils and biodiversity in the EPA State of Environment Report (EPA, 2016c). Forestry is listed as a significant pressure on at-risk waterbodies under Ireland's RBMP, and as the main pressure within 'at risk' high status waterbodies. Over time, more sustainable management requirements should reduce these adverse effects and provide a larger area of native species or habitat. Although the amount of broadleaf planting is increasing, native oak and alluvial woodlands are of bad status and the majority of the planted area is likely to remain under non-native conifers.

Overall, forestry policy is improving in terms of measures to protect biodiversity, although distinct outputs in terms of species recovery and water quality will take time to realise. The principal considerations are the suitability for planting of less intensively farmed areas of possible biodiversity value and the 73% of the estate which is comprised of non-native commercial conifers. Recent policy documents have also demonstrated an official recognition of the value of native and riparian woodland for protecting water quality and for catchment management. However, there remain only 100,000 ha of true native woodland and only small pockets of ancient woodland in Ireland (Perrin *et al.*, 2008).

4.4.3. Marine

Integrated Marine Plan: 'Harnessing Our Ocean Wealth', 2012

An Integrated Marine Plan, Harnessing Our Ocean Wealth, was developed by the DAFM and released in 2012, consistent with obligations under EU Marine Strategy Framework Directive (MSFD) (DAFM, 2012). Protection and conservation of marine biodiversity is one of three high level goals of the MSFD (along with a thriving maritime economy and engagement with marine heritage). A key action of the plan, an initial assessment of environmental status, has been completed.

Marine Spatial Plan: 'National Marine Planning Framework', 2020

In line with the EU Marine Spatial Planning (MSP) Directive, ratified in 2014, Member States are required to develop a plan for human use of marine territory and resources every 10 years. Ireland's MSP, the National Marine Planning Framework, is currently under development by the Department of Housing, Planning and Local Government (DHPLG), a draft of which was released in 2019 for public consultation and Government approval (DHPLG, 2019a). Biodiversity, and the EU obligations underpinning its conservation, is a key consideration of this plan. To this end, the Department of Agriculture, Food and the Marine (DAFM) have been tasked with contributing natural capital considerations, including biodiversity and its associated ecosystem services. This plan will provide guidance for future development affecting the marine environment from an ecological, economic and social aspect, covering the next 20 years. A formalised national MSP is due by 2020.

Further to these plans, the Marine Institute (MI) and the Geological Survey of Ireland (GSI) are developing the Integrated Mapping for Sustainable Development of Ireland's Marine Resource (INFOMAR) in line with the Marine Strategic Framework and MSP Directives. Although predominantly focused on cataloguing non-biological marine resources, the high-quality data obtained through this process is likely to assist in the planning of marine biodiversity conservation and accounting of ecosystem services.

Aquaculture

A Coordinated Local Aquaculture Management Systems (CLAMS) has been introduced to oversee aquaculture development and the pressures present in individual locations, coordinated by the State body Bord Iascaigh Mhara (BIM). CLAMS seeks to ensure that stakeholders are represented in a single bay management system. This process has been complemented by an environmental management system (ECOPACT) which encourages producers to adhere to codes of best practice. Aquaculture is also subject to licensing and EIA which, in principle, must address cumulative impacts on Protected Areas or areas with low tidal influence. Various measures are being undertaken to combat these pressures on biodiversity arising through aquaculture, although often induced by other considerations such as the economic sustainability or human health. For example, the European Maritime and Fisheries Fund (EMFF) Biodiversity Scheme (2014-2020) provides support for fisheries and aquaculture compliance with the Habitats Directive. Specific State initiatives have also been developed to address pressures on coastal communities in a more holistic manner, notably the Integrated Coastal Zone Management (ICZM) process, which targets WFD and MSFD obligations relating to coastal and transition waters and has identified fin and bivalve aquaculture as a major pressure.

Fisheries

Stocks of some key commercial species such as cod and haddock have been severely impacted by past unsustainable fishing practices. Forty-three percent of commercial stocks are fished below maximum sustainable yield (MSY), although 22% are still fished above MSY and 35% are unknown (MI, 2018). However, the overall biomass has risen to above critical thresholds at which stocks would not be able to recover. In principle, harvesting in line with MSY would deliver ecological benefits, but also the maximum economic benefit to the industry itself.

The EU Biodiversity Strategy to 2020 includes a target to "Ensure the Sustainable Use of Fisheries Resources (Target 4)" (EU, 2011). As such, European fisheries are now managed according to a broader ecosystem approach which aims to restore ecological systems and populations of commercial species, including through recent controls on bycatch and discards, all aimed at keeping stocks within safe biological limits. Bottom trawling on deep sea reef habitats designated under the EU Habitats Directive has been banned. Under the EU Common Fisheries Policy (CFP), stocks have begun to be managed in accordance with an MSY framework for which Total Allowable Catches (TAC) are estimated and landing quotas agreed. Landing obligations that require boats to land all that they catch, in effect banning fish discards, have been phased in for pelagic and demersal fish since 2015 and now apply to all TAC species, as of 2019. Inspections at sea and on landings are undertaken by the Sea Fisheries Protection Authority (SFPA) to ensure that catches and gear conform to quota or other requirements of the CFP. As of 1st January 2020 (S.I. 1/2019), fishing in Irish coastal waters within the 6 nautical mile zone and within the baseline by vessels larger than 18 metres in length has been banned, lowering pressure on these vital areas for nurseries and juvenile fish, as well supporting small-scale inshore and sea-angling economies (GoI, 2019).

Through these various changes in management protocols and through the development of the National Marine Planning Framework due in 2020, Ireland is in the process of attaining Good Environmental Status (GES) of its fisheries, defining stock recovery plans and increasing enforcement of illegal fishing, to comply with the MSFD by 2020. This Directive also aims to eliminate over-fishing and discards by this time.

Outcomes: Marine Policy

Overall, fishing effort has decreased since its peak in 1998 allowing the total biomass of fish to recover slightly. Good environmental status now applies to 46% of commercial stocks in OSPAR Region III containing the Irish Sea. Policy is improving and only 11% of landings were of species below MSY in 2017 (mostly mackerel and blue whiting) (MI, 2018). Overall, there is an increase in the proportion of stocks being fished sustainably, with pelagic and demersal fish still both above the trigger point at which recovery would be impaired. The biomass of demersal species has been increasing since the late 2000s. Landings enforcement is improving, although capacity limitations in the Naval Service continue to hinder enforcement at sea.

The sustainability of inshore fishing has improved due to the adoption of quality-based initiatives by fishermen and, more recently, the ban of large trawlers from inshore waters (GoI, 2019). The situation with regard to shellfish is more difficult to determine given natural annual variations in numbers, but also variation in catches and reporting. The MSP Directive, in conjunction with reporting obligations of the MSFD, has provided an opportunity to think more cohesively about the sufficiency and connectivity of Ireland's marine Protected Areas.

Thus, EU fishing policy has been moving towards a situation of sustainable yields and improved management, thereby better protecting marine biodiversity, but the trend remains vulnerable, especially with the United Kingdom's exit from the EU and the potential use of fishing rights as leverage in trade negotiations.

The status of Ireland's Habitats Directive Annex habitats is largely inadequate, with only two marine or intertidal habitats in favourable condition. In comparison, the majority of marine Habitats Directive Annex species are in favourable status, although most of these are transient cetaceans for which reporting is difficult (NPWS, 2019b).

4.4.4. Water

The Water Framework Directive

Clean water, along with riparian vegetation, is a key resource for biodiversity which can add significant ecosystem services relating to water, including purification, nutrient and sediment retention, water storage and flood defence. High quality waters are of particular importance to the survival of species such as Atlantic salmon and freshwater pearl mussel. The WFD is the principal legal measure in this area and aims to maintain high and good status waters, to prevent any deterioration in the status of water quality through progress towards at least Good Environmental Status (GES) by 2021, although no Member State successfully met the first-cycle target in 2015. Water quality status is determined on the basis of chemical, hydromorphological and biological criteria with a key element of the latter being the diversity of macroinvertebrate fauna. Around 30% of fresh waterbodies In Ireland are at risk of not achieving Water Framework Directive status objectives, including 35% of high ecological status rivers and lakes. There has also been a reduction in the number of rivers of bad status, but at the other end of the scale, a continuing gradual reduction in the number of good and high-quality sites. This decline in water quality has impacted severely on species which require such conditions and has largely eliminated the uniqueness of some habitats whose former ecology depended on good water quality. Under the WFD, Member States are obliged to implement River Basin Management Plans, to identify key threats to water quality on a catchment basis and to develop evidence-based measures for their mitigation in the designated River Basin Districts of the state. Following review, Ireland has coalesced its former river basin districts into a single national management region and has developed the second iteration of its River Basin Management Plan, spanning 2018-2021, based on this. Complementary actions include the implementation of recommendations from research projects supported by the EPA STRIVE Programme Series 99 on Management Strategies for the Protection of High Status Waterbodies, key partners of which include the EPA, DAFM and Irish Water. The EPA is the lead competent authority for the implementation of the WFD in Ireland, enlisting the services of Local Authorities, the Marine Institute and Inland Fisheries Ireland in the management, monitoring and remediation of water bodies. As part of the RBMP management cycle, a Significant Water Management Issues in Ireland (SWMI) report was published in 2019, which highlighted agriculture as the predominant threat to GES (DHPLG, 2019b).

Water Services Strategic Plan: 2015-2040

Irish Water is the country's single water utility and is responsible for managing the infrastructure for water supply and wastewater. Its Water Services Strategic Plan (2015-2040) (IW, 2015) has a specific objective to protect and enhance the environment and deliver on the requirements of the EU Urban Waste Water Treatment Directive (91/271/EEC). Also, as part of RBMP under the WFD, Irish Water will invest approximately €1.7 billion in waste-water projects, programmes and asset maintenance. This investment will include €880 million for 255 major waste-water treatment projects, €350 million in capital investment in collection systems in 41 areas, and €465 million for capital maintenance and national upgrade programmes. This investment will significantly reduce the pressure on water quality and associated biodiversity from urban sources of water pollution.

Flood mitigation

With the advent of more intensive farming, modifications to water courses and land-use change in upland habitats, the incidence of extreme flooding events has increased across the EU. Given that climate change will exacerbate these events, mitigating their effects is increasingly pressing. The Office of Public Works (OPW) are responsible for the maintenance of drainage across the State, conducting a broad range of arterial drainage actions including the construction of embankments and channels as part of iterative Arterial Drainage Schemes. The OPW are thus the agency responsible for the implementation of the EU Floods Directive (2007/60/EC). Working with Local Authorities, this has resulted in the production of Catchment Flood Risk Assessment and Management (CFRAM) plans and schemes, now the guiding principle of flood management. As well as hard infrastructural solutions, the OPW, in conjunction with the EPA, Irish Water and other authorities are working to identify natural water retention measures including a new project known as Slow Waters which is looking at the value of forests for flood protection. The OPW and IFI are also cooperating on the Environmental Rivers Enhancement Programme (EREP) through which the natural profile of previously drained rivers is being re-established with input also from angling clubs (IFI, 2013a). As well as attenuating flood waters, this is intended to re-establish important riparian curvilinear habitats and associated species assemblages. Although some efforts to integrate biodiversity in flood mitigation is apparent, the vast majority of measures taken by the OPW remain hard infrastructural interventions, such as "cleaning" rivers (i.e. dredging and embanking).

Outcomes: Water Policy

Overall, measures have slowed the decline in water quality, although any modest gains achieved have been largely undone, as evidenced by most recent assessment. The enhancement of ecological status as targeted under the WFD has been achieved only at a localised level, rather than nationally. Although Ireland has relatively good water quality compared with some other EU States, 1,460 of the 4,829 waterbodies (30%) are "at risk" of not meeting WFD status objectives, while 481 water bodies have declined in quality since 2009 (EPA, 2019b). Of these, 35% of rivers and lakes are at risk of not meeting their high ecological status objective. The pressures of economic and agricultural development have contributed to a reduction in the number of high-quality sites to 21 compared with 82 between 2001-03 and as many as 575 between 1987-90. There are now 91 fewer rivers of high quality since 2009 and a net decline of 5.5% of rivers in good or better ecological health since the last reporting period (2010-2015) (EPA, 2019b). This decline in water quality has largely coincided with agricultural intensification, especially with the growing herd size in the dairy sector, while national policy under Food Wise 2025 seeks further expansion in dairy production.

Responsibility for these declines remains fragmented across sectors, with limited commitment exhibited at ministerial level and conflicting sectoral priorities preventing improvement. Catchment management should improve matters, but this needs greater funding and support, notably in monitoring and enforcement, especially from sectors predominantly contributing to decline.

With regard to rural diffuse pollution, septic tank maintenance is being addressed through recently introduced licensing supported by grant payments to lower income households for investment in modern facilities. However, inspection and maintenance is incomprehensive at present (EPA, 2016d). Urban pollution is improving gradually through investment in wastewater treatment facilities by Irish Water and the number of priority locations for investment has fallen by 19% since 2017 (EPA, 2019a). Thus, nutrient loads from urban point sources are likely to decline over time, although this will be gradual in response to significant investment in wastewater collection and treatment. Improvements to domestic wastewater treatment systems should continue.

The most recent assessment of Habitat's Directive Annex species and habitats has revealed largely unfavourable future outlooks for the majority of freshwater Annex habitats, largely owing to agricultural impacts. The outlook for Annex species associated with these habitats is slightly less unfavourable, but many species are still assigned unfavourable-bad future prospects (NPWS, 2019b).

4.4.5. Review of sectoral policy effectiveness

The preceding section outlines how biodiversity protection is differentially prioritised across numerous sectors. Progress on the designation of new sites and protection is improving with better inter-sector cooperation, although some key habitats remain highly threatened, especially peatlands and grasslands. Peatland conservation is, though, progressing steadily, especially now given the higher political priority being given to climate change mitigation. Forestry policy has increased the coverage of native and broadleaf trees nationally, and new management protocols and grant-aid is improving the nature value of commercial forestry by reducing relative production costs. The introduction of results-based agri-environment schemes is improving biodiversity-friendly farming practices, although these are pilot projects with coverage still largely limited to already low-intensity systems. Much greater engagement and incentivisation is required for high-intensity sectors such as dairy. Actions by the marine sector, including aquaculture, are improving, with healthier fish stocks and an MSP in its final stages of development, although there is still a need for more information on marine biodiversity. Water quality is still not improving despite the targets of the WFD and significant investment in wastewater infrastructure. This is due largely to agricultural pressures and fragmented responsibilities to address the problem. Planning around green infrastructure is an increasing focus amongst Local Authorities, for example towards addressing climate change adaptation and flood management., improving public engagement with the natural world and facilitating applications for funding towards small-scale biodiversity projects.

Greater consideration is being given to sustainability and biodiversity in sectoral policy, but it is evident that this is not yet sufficient to turn around the continuing degradation of habitat and species populations, and the threats to key ecosystem services. Agriculture, forestry and aquaculture are all aiming for significant target increases in output, or output value, under Food Wise 2025. Although in principle, the strategy contains safeguards for biodiversity, water quality and carbon emissions, it is unclear how these will be applied at producer level across a range of agri-business sectors. Similarly, the EU Common Fisheries Policy (CFP) and Marine Strategy Framework Directive (MSFD) have adopted an ecosystem approach, although currently these are more focused on fish population dynamics than fundamental ecosystem processes.

Overall, positive policy development and implementation has occurred, with some tangible net benefits. However, the pace of change, particularly in light of prescient climate considerations, is insufficient to address continued loss. The overarching pro-development planning system and the focus on increasing agricultural production stand to directly hinder progress.

5. Finance systems, incentives and mechanisms

Between 2010 and 2015, total national expenditure on biodiversity conservation in Ireland is estimated to have amounted to €1.49 billion, averaging €250 million per annum. An additional €1.51 billion is estimated to have been spent by the Government on more general environmental services and protection activities. In total this amounts to 0.31% of total government expenditure and 0.13% of GDP. Current IUCN guidelines for spending on biodiversity for OECD countries is at least 0.3% of GDP. Using BIOFIN measurement standards, Kazakhstan is currently on a par with Irish spending, at 0.1% of GDP.

The following section outlines how the Irish Government allocates funding on an annual and multi-annual basis and gives an overview of current sources of funding for biodiversity-related measures, both from the EU and from Irish government exchequer sources. This section subsequently outlines those subsidies and grants which are harmful to the biodiversity of Ireland.

5.1. Ireland's National Budgetary System

Ireland has a parliamentary system of government. The parliament (The Houses of the Oireachtas) is bicameral with a 160-seat lower house, Dáil Éireann, whose members are elected by proportional representation and a 60-seat upper house, Seanad Éireann whose members are nominated or elected. Article 28 of the Constitution of Ireland requires the Government to prepare Estimates of the Receipts and Estimates of the Expenditure of the State for each financial year and present them to Dáil Éireann for consideration. To meet this requirement, as part of the annual budgetary process, a report on expected expenditure allocations and measures for the following year is published alongside the Budget. The Oireachtas gives legislative effect to budgets announced by the government. The Dáil has greater budgetary powers than the Seanad, as Finance and Appropriation Bills can only be initiated in the Dáil. In contrast, the Seanad can only make recommendations on such bills, but cannot amend them (IFAC, 2016).

The Irish government budgetary system is arranged around '*Budget Day'* in mid-October, when the Minister for Finance presents the budget statement to the Dáil, outlining expenditure measures and amounts, as well as the general economic and fiscal outlook and any changes the government proposes to tax, spending and revenue measures. After the budget statement, the Dáil then debates financial resolutions, which may take a number of days. The Dáil can either pass the budget, to give immediate effect to some of the budget's revenue raising measures (generally tax changes to enable them to take immediate effect) or in other instances, if the Dáil does not agree, a vote is called and the resolutions are declared carried or lost. The role of the Dáil in approving or rejecting the budget is notably constrained as the vote on the budget is conventionally considered a vote of confidence in the government (IFAC, 2016).

In some cases, the implementation of the budget may require the amendment of legislation through the introduction of Bills (e.g. a financial bill to adopt a change to tax levies or social welfare) which are normally debated and passed by the Oireachtas by the end of the year. Financial resolutions passed on budget day are confirmed by the passing of the Finance Bill within four months. Finance Bills include the other tax changes announced on budget day as well as technical changes to tax legislation (IFAC, 2016).

The budget statements generally also include estimates of expenditure and set out the government's proposed allocations for each Department and the main State Agencies. During the weeks following Budget Day, a more detailed breakdown of the proposed allocations and estimates for each department are provided and refined by the Department of Finance working with other Departments to produce a financial Revised Estimates Volume (REV) by December of that year (IFAC, 2016). Dáil Select committees further debate the REV expenditures allocated for each department in February and March, with input from the Ministers in charge of spending areas. The Dáil then votes on whether to approve the spending by way of Financial Resolutions, whereupon expenditure in accordance with those resolutions is possible (DPER, 2018). However, the Dáil cannot amend the spending estimates and can only approve or reject proposed expenditure. During this intervening period spending continues under '*reversionary budget rules'* (IFAC, 2016).

The annual budget cycle is completed when the Appropriation Bill is passed in the following December, giving formal legislative effect to the earlier Dáil votes on the estimates. Supplementary Estimates are presented where additional expenditure above Dáil approved expenditure is expected in a Department/agency or where an estimate for a new purpose occurs (IFAC, 2016). After approval, the Standing Committee of Public Accounts (PAC) plays a key role in ensuring that there is accountability and transparency in budget allocation and distribution, examining the reports of the Comptroller and Auditor General (C&AG) on departmental expenditure and other accounts, as well as the C&AG's value-for-money reports. The budgetary process has used the public finance language of votes, estimates and supply, money bills and appropriation accounts for a considerable period of time.

Historically, Ireland's budget framework was cash-based and focussed on managing annual budget spending. Traditionally the budget process was considered a relatively opaque process, with the precise allocations brought forward by the government tending to be "*a fait accompli with little input from the parliament ex ante*" (IFAC, 2016). Notably, there have been efforts to reformat this approach since the 2008-2012 financial crisis where budget management came under much closer scrutiny with the introduction of more programmatic expenditure and performance information, and the introduction of Committees for greater scrutiny of the estimates. A comprehensive Expenditure Review, completed in 2015, proposed the opening up of the budget process to *"greater parliamentary oversight, scrutiny and active participation'* (DPER, 2011), essentially a push for a more substantive role for the Dáil

and its committees in the expenditure planning process before the precise allocations for each year are determined. Recommendations included the introduction of multiannual budgeting and the reformatting of estimates to show all costs, administrative overheads and activities against each project or programme to allow for more meaningful Dáil scrutiny (DPER, 2011).

Reforms to the Irish budget framework have also originated at EU level. The EU recommended that all MS "put in place stronger fiscal frameworks, including an effective medium-term planning horizon, numerical fiscal rules and clear and credible budget forecasts", as well as the formation of an independent fiscal oversight institution (i.e. the Irish Fiscal Advisory Council; IFAC) (IFAC, 2016).

5.2. Key departments, committees and institutions in the budget process

The Irish government's fiscal system is set out around a powerful central treasury department, The Department of Finance, though an increasing level of oversight and parallel assessment has evolved, particularly since the financial crash of 2008-2012.

Department of Finance (DF)

Founded with the establishment of the State, the DF is responsible for the control of public finances, including producing an annual budget and associated Revised Estimates Volume. It also advises on and implements programmes and policies, such as plans for economic expansion, international membership or required fiscal reform. This department is chaired by the Minister for Finance.

Department of Public Expenditure Reform (DPER)

Created in 2011 through re-allocation of functions previously the responsibility of the DF, the DPER is responsible for supporting the delivery of well-managed, well-targeted and sustainable public spending through modernised, effective and accountable public services. This is designed to complement the work of the DF, though works at a more strategic level having recently produced the *Project Ireland 2040* plan and the *Public Service Reform* strategy. The current Minister for Finance is also the Minister for Public Expenditure and Reform.

Irish Fiscal Advisory Council (IFAC)

The IFAC was created in 2011 through the 2012 Fiscal Responsibility Act (FRA) and under recommendation from the EU to establish an independent fiscal oversight institution. IFAC has responsibility for monitoring and assessing the government's compliance with budgetary rules and assesses the official forecasts of the government to provide an independent fiscal stance. IFAC is independent from both the government and the Oireachtas in its operations, although the Minister for Finance is responsible for appointing council members. IFAC currently publishes two assessment reports a year, covering an assessment of macroeconomic forecasts, budgetary forecasts, compliance with fiscal rules and the fiscal stance (IFAC, 2016).

Oireachtas Joint Committee on Finance, Public Expenditure and Reform and Taoiseach

This committee scrutinises the work of both the Department of Finance, the Department of Public Expenditure and Reform and the Department of the Taoiseach and regularly debates these topics. As an Oireachtas committee, it has responsibility for scrutiny of draft EU policies relevant to the DF and DPER. It also conducts debates on revisions to national policy pertaining to these departments.

Oireachtas Committee on Budgetary Oversight

The Budgetary Oversight Committee was established in 2016 to enhance the role of the Oireachtas in the budgetary formation process. The committee reviews the macro-economic and fiscal issues that form part of budget considerations. Most recently, the committee published reports on the EU Multi-Annual Financial Framework, Tax Expenditure and Property Tax, as well as an important Pre-Budget Report.

Parliamentary Budget Office (PBO)

The Parliamentary Budget Office, as an independent part of the Oireachtas, provides impartial information, analysis and advice to both Houses of the Oireachtas. It is a key source of financial and budgetary intelligence for Oireachtas Members and in particular for the Oireachtas Committee on Budgetary Oversight, by conducting ex-ante scrutiny of all budgetary matters. Amongst its main outputs, the PBO provides analysis of the government mid-year expenditure report, an annual budgetary cycle forecast and a quarterly economic and fiscal commentary. In doing so, the POB provides pre-budget baselines by examining budgetary priorities and identifying areas where significant expenditure pressures or risks are developing.

5.3. Existing financial mechanisms for biodiversity conservation

5.3.1. The European Union

At present, 42% of biodiversity funding in Ireland comes from the European Union (Morrison and Bullock, 2018). Funding received from the EU is based on the bloc's Multi-annual Financial Framework (MFF) system, with budgets currently lying in the 2014-2020 MFF. Of the six categories comprising the MFF, *Sustainable Growth: Natural Resources* is that relevant for biodiversity and covers

much of the annual disbursement of EU funding affecting biodiversity, including CAP and CFP funding. Indeed, agricultural payments have been found to comprise the vast majority (75%) of biodiversity expenditure in Ireland (Morrison and Bullock, 2018). In addition to annual funding from the EU, conservation of Irish biodiversity also benefits from the acquisition of research and conservation grants offered by the EU, such as EU LIFE, INTERREG and Local Agenda 21. These funding sources are detailed below.

Negotiations on the allocation of spending under the MFF 2021-2027 began in 2018 with the publication of the MFF Package Proposal, which has been debated since towards unanimity across all MS. As of December 2019, this included an increase in EU income and spending, but notably a reduction in the share dedicated to the CAP. Following the significant impact of COVID-19 on MS budgets and their ability to commit contributions, the EU Commission was continuing to renegotiate the MFF up to April 2020, with publication of a Joint Roadmap for Recovery (EC, 2020a). It is unclear what consequences this will have for biodiversity-related schemes or national disbursements from these, although commitments to the Sustainable Development Goals reflected in the EU Green Deal will be retained as part of a sustainable recovery, as the Green Deal is seen as "essential as an inclusive and sustainable growth strategy" (EC, 2020a).

EU Member States and parties to the Natura Directives are now obliged to produce a Prioritised Action Framework (PAF), a tool to integrate funding for Natura 2000 sites and species protection into EU financial instruments already in place. This allows Member States to account for existing funding received from the EU which targets the goals of the Birds and Habitats Directives and declare the State's contribution to this. The NPWS have produced a draft for the MFF 2014-2020, with final publication expected in early 2020. This document will also forecast predicted spending on Natura 2000 and green infrastructure for the forthcoming MFF 2021-2027.

European Agricultural Fund for Rural Development (EAFRD)

The EAFRD is the funding instrument supporting the CAP, with the aim of strengthening the EU's agri-food and forestry sectors, environmental sustainability and the wellbeing of rural areas in general. In 2017, Irish farmers received €255 million from the EAFRD or 2.7% of the total EU EAFRD budget (EP, 2019). For the current multi-annual financial framework (2014-2020), Ireland is on track to receive a total of over €3 billion in EAFRD funding (EC, 2020d). Ireland also has the second highest rate of actual spending versus proposed programmes: by the end of the current MFF Ireland will have decided upon almost €3.8 billion since 2014, or circa. 94% of its allocation.

Two of the largest categories of funding under the EAFRD relate to environmental protection; "*Environment Protection & Resource Efficiency Payments"* and *"Climate Change Adaptation & Risk Prevention".* At a national level, these subsets of finance formerly manifest through support to Agri-environment Schemes, including GLAS and the former AEOS and REPS. The vast majority of biodiversity-related funding received from the EAFRD was dedicated to the current GLAS programme in the MFF 2014-2020. European Innovation Partnership funding complements these AES schemes.

Until recently, payments for environmentally positive farming practices have been entirely prescriptive and based on actions rather than outcomes. This is currently evolving, with the introduction of results-based payments. Ireland has been used a trial site for the implementation of so-called Results-Based Agri-environmental Payments Schemes (RBAPS). This is modelled on the successful Burren Farming for Conservation programme developed with farmers and ecologists to restore more diverse grasslands, a programme originally funded through the LIFE programme (LIFE04/NAT/IE/000125). Following the recent success of trials in Romania, Spain and the UK (as of November 2019), RBAPS are to become the standard for agri-environment payments to farmers.

The LEADER programme supports local communities (Local Action Groups) with projects providing access to nature (e.g. nature walking circuits), biodiversity education, biodiversity surveys, species recovery and river or bog restoration. However, there were relatively few applications under the Rural Environment theme compared with the Economic Development and Social Inclusion themes, such that its share of total expenditure was just over 3% between 2014-17 (DAFM, 2017). Thus, in terms of positive impact on biodiversity, the LEADER model of funding (mainly under EAFRD) is currently of lower significance than other funding sources. This method of community mobilisation has since been broadened to the term Community-Led Local Development (CLLD) including LEADER, to three other funds: the European Maritime and Fisheries Fund, the European Regional Development Fund and the European Social Fund. At present, 23% of Local Authority biodiversity-related expenditure is derived from CLLD or INTERREG programmes. The LEADER mode of funding is relatively new, with limited administrator knowledge or experience in applying and social enterprise funding is generally prioritised as results are delivered more quickly. Despite this, LEADER remains the largest source of direct biodiversity funding from the EU outside of EU LIFE programmes.

European Maritime and Fisheries Fund (EMFF)

In the marine environment, significantly less funding is received than the agricultural sector. For the current MFF 2014-2020 the total proposed budget allocated to Ireland is €239 million, or 3% of the total €7.9 billion across the EU28. Again, Ireland's rate of claim is high: as of 2019, 64% of this amount has been decided upon by the Irish Government, the 5th highest in the EU28 (EC, 2020d). Ireland also leads the way in spending money already decided. However, this allocation is proportionally smaller than that of other MSs with significantly smaller marine territories (EC, 2020c). In the MFF, €9.4 million was allocated to the management and monitoring of fisheries and aquaculture activities in marine Natura 2000 sites; that is, directly relating to biodiversity. The Marine

Institute and Bord Iascaigh Mhara are the national outlets of this funding. The EMFF also supports CLLD projects, though to a much lesser extent in Ireland than through EAFRD. These have manifested in the work of BIM through the CLAMS and Fisheries Local Area Groups (FLAGs) initiatives, although funding disbursed is limited.

European Regional Development Fund (ERDF)

Though representing a significant sector of potential EU funding relevant to biodiversity, through its programme No. 85 (*Protection and enhancement of biodiversity, nature protection and green infrastructure)* and No. 86 (*Protection, restoration and sustainable use of Natura 2000*), the latest PAF review of funding does record any funding from either of these streams to Natura 2000 objectives. Ireland presently has one of the lowest allocations of this fund in the current MFF (5th from bottom) (EC, 2020d). As part of this fund, the European Territorial Cooperation Fund (a.k.a. INTERREG) is based on the EU's policy of increasing interstate cohesion, which is in turn a subsidiary payment mechanism of the European Regional Development Fund. Some of the funds awarded in Ireland specifically support conservation of biodiversity, such as Cooperation Across Borders for Biodiversity (CABB) (2017-2022), a major new cross-country initiative by Birdwatch Ireland. Similarly, MarPAMM (Marine Protected Area Management and Monitoring) aims to protect and enhance marine biodiversity across Ireland, Northern Ireland and Scotland. At present, total EU co-funding for INTERREG programmes dedicated to Natura 2000 objectives and green infrastructure has amounted to €75 million. Brexit will likely remove these cross-border funding initiatives with our nearest neighbour.

EU LIFE

The EU LIFE programme (LIFE+ from 2007-2013) is the EU's funding instrument for the environment and climate action. Established in 1992, the current MFF has allocated €3.4 billion in funding for projects aimed at the environment and climate action. The programme has been a major source of support for the conservation, management and restoration of habitats to support threatened and protected species. Twenty LIFE nature and biodiversity projects have been undertaken in Ireland since 1992, representing a total investment of €56 million, of which €33 million was contributed directly by the EU. This does not include a number of LIFE projects not administered by Irish organisations but who may have benefitted from funding through a lead partner in another EU state.

At present there are two active LIFE projects funded through the current MFF which specifically target Natura 2000 objectives: LIFE Irish Raised Bogs (LIFE14 NAT/IE/000032) and LIFE Atlantic Crex (LIFE18 NAT/IE/000090), totalling €8.4 million in direct EU funding, while the recently completed Raptor LIFE received €1.5 million and ended in December 2019. The Roseate Tern LIFE project, coordinated through the UK (LIFE14 NAT/UK/000394), will also support the conservation of three SPAs in Ireland until mid-2020. In addition, Kerry LIFE (*Land use management for the conservation of Freshwater Pearl Mussel*) with a total cost of €4.9m, and 50% funding via the LIFE+ programme, commenced in 2014 though received funding in 2013. Previous projects, such as Burren LIFE and Aran LIFE, have been a joint effort between organisations such as DAFM, NPWS, Local Authorities, landowners, Teagasc, the Heritage Council and Fáilte Ireland. Two species focused projects were completed in Ireland between 2010 and 2018: Mulkear LIFE (2009-2013) and Duhallow Samok (2010-2015). The EU Dublin Urban Rivers LIFE programme I also currently active and, though not specifically targeting Natura 2000 directives, has secondary biodiversity benefits by improving the water quality of urban water courses.

The most recent PAF has calculated that the current allocation from the EU to measures relevant to Natura 2000 amounts to nearly €6 million from 2014-2020. Further, there has been an increase of 10% in available funding at an EU level for those projects dedicated to protection of biodiversity, while keeping the LIFE budget unchanged (EU, 2017).

In addition to standard LIFE calls, the LIFE Integrated Programme call offers greater funding potential through a broader combination of funding sources over longer time periods. In late 2019 Ireland was awarded two LIFE IPs: LIFE-IP PAF Wild Atlantic Nature (LIFE18 IPE/IE/000002) and LIFE-IP Waters of Life (LIFE18 IPE/IE/000003). These projects are contributing an additional €22 million of direct EU funding, a significant funding increase on traditional EU LIFE projects.

Research Funding streams

Various EU research funding frameworks exist, which have the potential to support the conservation of biodiversity in Ireland. The Framework Programmes for Research (FP7 and Horizon 2020) are the most substantial of these. In 2018, Irish beneficiaries received €167 million in Horizon 2020 research funding (EC, 2020e). Additionally, the European Research Council (ERC) provides various calls funding fellowships and broader projects. Of the 620 European-funded research projects led by Irish institutions since 2015, an extremely small proportion (potentially numbering only 4; i.e. 0.06%) have focused on biodiversity (EC, 2020b).

European Innovation Partnerships (EIPs)

Under the acknowledgement that multiple stakeholders are often involved in environmental initiatives, and that there is often a research element to it, EIPs have been more recently implemented to link various funding sources and consortiums of stakeholders. For example, EIP-AGRI (EIP for Agricultural Productivity and Sustainability) takes a broader approach to funding and collaboration which can include rural development policies and Horizon 2020 funding. It is hoped that an increasing amount of agri-environmental scheme funding will be based on this model, especially given the small proportion of Horizon 2020 funding currently focussing on

biodiversity. The majority of these projects are expected to coalesce funding from the EAFRD and Horizon 2020, though the ERDF and European Social Fund (ESF) may also be options for support. At present, Ireland benefits from 29 EIP-AGRI projects, the vast majority of which are funded through the EAFRD for Operational Groups. It is unclear whether these projects overlap with existing AES payments within the EAFRD.

5.3.2. Central Government

Direct government spending on biodiversity originates from two sources: annual exchequer allocations and grants. This comprises 58% of spending on biodiversity in Ireland (Morrison and Bullock, 2018). Exchequer funds are disbursed to Government Departments, from where they are allocated to Local Authorities, state bodies and semi-state organisations in receipt of funding. Amongst others, these include the NWPS, the Heritage Council, the EPA and the Marine Institute. The most recent approved national budget shows a dedicated budget for the NPWS of €13.7 million, a 1% reduction from the 2019 figure of €13.8 million (DPER, 2019).

Although comprehensive figures for overall spending on biodiversity conservation between 2010-2015 have been identified through the NBER (Morrison and Bullock, 2018), disaggregating these figures into EU vs. national sources is more difficult (Table 5.1). However, the most recent PAF (2014-2020) analysed central government allocations for the total financing allocated to implement EU nature policy and associated green infrastructure, and for measures or projects not benefiting from any EU co-funding. For the 7-year PAF window, this amounts to €143,647,814 or a €20 million mean annual spend (Table 5.2). Details on the most important of these State schemes are provided in subsequent sections.

Type of project or financing instrument	National	Mean annual (x/7)
NPWS Farm Plans and related projects	€12,659,000	1,808,428
Species Protection projects in Natura	€1,747,000	249,571
Scientific monitoring and research	€19,164,000	2,737,714
Bog restoration, relocation, compensation	€54,753,814	7,821,973
DCHG (NPWS) staffing costs related to Natura	€55,324,000	7,903,428
Total	**€143,647,814**	**20,521,116**

Table 5.1: National allocations of expenditure on Natura 2000 and green infrastructure objectives from 2014-2020 (Source: Prioritised Action Framework, NPWS 2020)

Department/ Agency/ Organisation	Expenditure	Percentage of total
Department of Agriculture, Food and the Marine	€ 1160 million	79.5%
Agriculture	*€ 1100 million*	*75%*
Forestry	*€ 45.8 million*	*3.1%*
Marine	*€ 12.7 million*	*0.9%*
Department of Culture, Heritage, and Gaeltacht Affairs	€ 143 million	9.9%
National Parks & Wildlife Service	*€ 134 million*	*9.1%*
Heritage Council	*€ 5 million*	*0.8%*
Department of Housing, Planning and Local Government	€ 17.3 million	1.2%
Department of Communication, Climate and Environment	€ 4.87 million	0.3%
Department of Transport, Tourism and Sport	€ 0.3 million	0.02%
Office of Public Works	€ 13.1 million	0.9%
Inland Fisheries Ireland	€ 107 million	7.6%
EPA	€ 6.31 million	0.4%
Semi-State Companies	€ 11.6 million	0.8%

Rural Development Companies	€ 3 million	0.2%
TOTAL	**€ 1459 million**	

Table 5.2: National biodiversity expenditure by government department & agency, from 2010-2015 (Source: Morrison and Bullock 2018)

The above figures reveal the low level of funding dedicated to the protection and restoration of biodiversity in Ireland, with the NPWS receiving an average of € 20 million in annual funding since 2010, although the actual annual figure is now significantly less than this. This figure can be compared to the €16.8 million committed to the Irish Greyhound Board (Bord na gCon) or the €34 million to Bord na Móna to support an industry based on extraction of peat with significant social costs for the environment and climate. In the approved 2020 budget, evidently only limited value is attributed to the conservation of Ireland's biodiversity.

Farm Plan and other DCHG schemes

The National **Farm Plan Scheme** is currently funded wholly through the national exchequer and recently re-opened following its suspension in 2010, the objective of the NPWS Farm Plan Scheme is to incentivise landowners to deliver greater benefit for biodiversity on their land, focussing on protected species and habitats, than might otherwise be delivered through meeting basic requirements with regard to national and/or EU Good Agricultural Practice standards. The annual budget for the scheme is not intended to exceed €3 million (DCHG, 2017a). The suspension of this plan for several years post-2010 means that annual funds through the Farm Plan likely exceed the annual mean stated in Table 5.1. The output target of Budget 2020 is to have established 60 NPWS Farm Plans by the end of 2020 (DPER, 2019).

In 2019, €200,000 in small grants were disbursed to local communities through the **Peatland Community Engagement Scheme**, offering funding to develop walking trails, interpretation material and biodiversity enhancement such as bat boxes. This was supported by the advice and guidance of the NPWS.

To support the goals of the NBAP, the DCHG also offers grants to support the work of Heritage and Biodiversity Officers in promoting biodiversity conservation through the **Local Biodiversity Fund**. Thus far, this fund has disbursed €2million since its inception in 2018, with an increasing focus on multi-annual projects which contribute to the NBAP targets. These actions have included workshops, media development, awareness raising and training sessions.

Community Environment Action Fund (CEAF - formerly Local Agenda 21)

Since 1997, Local Authorities have been tasked with disbursing grants for actions targeting sustainable development at a local level. Funding is available via Local Authorities for a variety of community or local projects, of which biodiversity is an increasingly prominent element (DCCAE, 2020). CEAF funds are directed at sustainability as a consequence of agreements made at the UN Conference for Environment and Development held in Rio de Janeiro in 1992. Funds are channelled via the DCCAE to Local Authorities who co-fund various community initiatives under the Environmental Partnership Fund. CEAF environmental projects are also supported by the Environment Fund (see below). In 2019, the CEAF disbursed a total of €926,061 to 1,046 projects, up to 60% of which were aimed at actions directly supporting biodiversity (DCCAE, 2020). Oversight of this programme is required to ensure results-based cost effectiveness, potentially through improved linkages with an expanded Biodiversity Officer network.

Forest Service Grants and Premiums (GPC) Scheme 2014-2020

Various grants and assistance programmes are disbursed through the Forest Service of the DAFM, through the GPC Scheme. This is funded by an annual exchequer disbursement focussing on forest establishment, promotion and bio-energy crops. The 2020 budget allocation for this was €103.5 million, a 27% increase on 2019 figures. Although the majority of Forest Service GPC funding is not dedicated to biodiversity projects, a diverse suite of grants exist which aid the establishment, conservation and promotion of native forestry. The **Native Woodland Scheme (NWS)** has resulted in the planting of native broadleaf trees totalling 1,211 ha between 2013-2018, and 2,281 ha since 2000. Between 2010 and 2015, €6 million was dedicate to the NWS across both categories of Conservation and Establishment. The **Woodland Environmental Fund** provides an additional €1000 per ha for businesses to report on ecosystem services delivered, including biodiversity, water, carbon sequestration, etc., demonstrating corporate social responsibility and commitment to the SDGs. Additional top-up payments are being made to landowners registered with the NWS under a project involving Microsoft, Natural Capital Partners and the forestry company Green Belt. The Woodland Environment Fund (WEF) provides a €1,000 per hectare top-up to landowners registered with the NWS. The process requires input from a Natural Capital Facilitator (i.e. a consultant or forestry company) who matches up a potential project with potential business contributors, based on size, location and the particular ecosystem 'profile' of the project. The **Reconstitution of Woodland** scheme rehabilitates forests for production. The scheme can cover the removal of Rhododendron from forests ultimately intended for timber, the replanting of ash woodlands affected by the disease Chalara (Ash Dieback) or the replanting of forests affected by drought. Finally, the **Neighbourwood Scheme** provides funding to establish and enhance amenity value of woodlands, through signage, trails and parking.

DCCAE funds

The **Environment Fund** is raised from the levies on landfill waste and sales of single-use plastic bags and contributes to the operation of various environmental initiatives, most notably the operation of the Irish Environmental Network and the Environmental Pillar. This fund also contributes to CEAF projects (above). This revenue is declining owing to improved waste management with no replacement revenue source yet identified (Morrison and Bullock, 2018). In 2017 the Environment Fund amounted to €44.4 million, a decrease of over 20% from 2016. The **Climate Action Fund** aims to fund projects which develop scalable climate change solutions and socioeconomic benefits, including air quality, biodiversity and community resilience. In early 2020, this fund was forecast to allocate at least €500 million in the term of the National Development Plan (2018-2027).

The Genetic Resources Grant Aid Scheme

With an annual budget of €50,000, the Genetic Resources Grant Aid Scheme (GRGAS) is the major source of support for the *in-situ* and *ex-situ* conservation and sustainable use of genetic resources, focussing on the protection of endangered breeds/cultivars of animals and plants.

Irish Sovereign Green Bonds (ISGBs)

In October 2018 the National Treasury Management Agency (NTMA) successfully launched the first ever Irish Sovereign Green Bond, following official second-party endorsement of its financial soundness. Under the terms of this bond, any proceeds raised can only be devoted to eligible "green" expenditure and the Government must report to investors through an annual allocation report on the disbursement of these sums (NTMA, 2018a). These payments are in line with the "green bond principles" (GBP) of the International Capital Market Association. Importantly, any investments in ISBGs must be aimed at projects that promote Ireland's transition to a "*low-carbon, climate resilient and environmentally sustainable economy*" and must be at least partially funded through exchequer funding, subsidies or tax foregone (NTMA, 2018a). Total investments may be split across the six categories of the fund, though of these "*Environmentally Sustainable Management of Living Natural Resources and Land Use"* is likely the most relevant to the protection of Irish biodiversity. It was estimated in 2018 that €270 million will be made available annually across the life of the bonds for this category of investment (circa. 15% of fund total), focusing on afforestation, programmes aimed at reducing agri-environmental impacts and the operation of the EPA (NTMA, 2018b). The "return on investment" of the ISGB is reported as an environmental impact indicator; for example, the number of hectares of forest planted. Following the most recent syndicated auction of bonds (or "tap") in October 2019, the total size of the fund is now €15.4 billion. The most recent sales, which were substantially over-subscribed, were based on a return of 0.229% maturing in 2031. The vast majority of these were bought by Asset Managers (42%), Banks (24%) and Hedge Funds (14%), with its success resulting in the cancellation of a subsequent auction (NTMA, 2019). Further detail is required on the proportion of investments focused on biodiversity conservation specifically, as opposed to those linked to emissions or climate change adaptation, and on the decision-making around allocations.

Marine funding for biodiversity

Outside of the various supportive EU funds supporting marine biodiversity, the Marine Institute was allocated direct exchequer funding of €38 million in Budget 2020, of which €14.5 million was for research (DPER, 2019). It is difficult to ascertain, however, what proportion of these figures was focused on biodiversity, although previous analyses of MI spending indicated that most actions were only loosely related to biodiversity (Morrison and Bullock, 2018). The majority of this Marine Institute spending concentrates on data collection and spatial analysis, towards developing the Marine Spatial Plan. Similarly, Bord Iascaigh Mhara have also been allocated direct exchequer funding of €38 million, of which €4 million is dedicated to science, technology and innovation research. Spending by Bord Iascaigh Mhara related to biodiversity is limited to lowering the environmental impact of aquaculture and wild harvest practices (pers. comm, G. Devine). Depending on the nature of initial impacts, these could yield substantial biodiversity benefits.

Government research funding (with no EU component).

Several government-funded bodies provide direct research funding to academic institutions, private entities and NGOs. The **EPA** offer funding on a competitive-call basis, the focus of which addresses biodiversity-relevant priorities (i.e. Climate, Water and Sustainability). Further, **Science Foundation Ireland** and the **Irish Research Council** offer various funding streams to support high-level academia, across a multitude of scientific fields, various career stages and annual/multi-annual cycles. Given that all of the above are reliant on application quality, institutional research priorities, annual exchequer allocations and the availability of expert research staff to apply for and utilise funding, these sources of funding are difficult to predict on an annual basis and are an unreliable sources of conservation funding.

5.3.3. Licence and Hunting Fees

Although the wild harvest industry (hunting and fishing) was historically prominent in Ireland, this is now substantially diminished and the sale of licenses and hunting fees contributed only 0.2% of biodiversity funding in the period 2010-2015 (Morrison and Bullock, 2018) or circa. €430,000 annually. Salmon and wild trout angling accounts for 25% of trips in an angling sector whose direct economic value has been estimated at €676 million (IFI, 2013b). In the latest EPA report, water quality has again declined, including the number of high status salmonid waters (EPA, 2019b). However, IFIs most recent Corporate Plan intends to ensure the growth of

the recreational angling industry by assisting the return of relevant species and water bodies to favourable status, potentially leading to greater revenue from fishing licences (IFI, 2016).

5.3.4. Private contributions

Although a much smaller proportion of biodiversity-related funding, private companies still contributed almost €11 million in the period 2010-2015 (Morrison and Bullock, 2018). The actual figure is likely to be much higher than this as most corporate social responsibility (CSR) contributions are not openly declared or publicly promoted. The recent PAF did not include this potentially important source of funding in its accounting of spending on Natura 2000 and green infrastructure spending.

Some private contributions are coalesced into pooled community funds. For example, the Community Foundation for Ireland combines bequeaths, endowments, corporate donations and philanthropy to fund various social causes. As part of this, the Environment and Nature call aims to provide €200,000 in 2020 for community groups to develop a Community Biodiversity Plan. In 2019, unexpected demand resulted in the initial €200,000 offering being expanded to €370,000, via joint funding from the DCHG and private donors, demonstrating the potential to generate useful biodiversity funding using a blended model.

5.4. Harmful Subsidies

There is a recognition of the need to remove incentives that are contrary to sustainability and, by extension, biodiversity. However, much of the impetus for this objective is founded on the need to conform with EU Policy and Directives, particularly in relation to greenhouse gas emissions, ignoring the interlinkages between climate mitigation and biodiversity. Total state transfers in 2017 were €895 million, increasing by 31% from 2016 figures, with most subsidies paid to renewable energy (€282m) and wastewater management (€230m), much of which is protecting the environment, including biodiversity, from adverse impacts. Direct protection of biodiversity and landscape itself received a transfer of €210 million, although much of this is EU-mandated match funding (e.g. €2.56m match funding for EU LIFE projects). Due to the increasing spend on renewable energy, the relative size of 'resource management transfers' has increased to a point that is now almost equal to 'environmental protection transfers' (CSO, 2019c).

Incentives which have an overt negative impact on biodiversity have diminished in the past decade. The main remaining subsidies focus on domestic energy allowances. By comparison, although agricultural subsidies still represent a significant proportion of the EU budget, these have been decoupled from production since 2005 and subsidies for activities such as land clearance and reclamation phased out. In 2016, direct payments accounted for an average of 75% of farm income (Teagasc, 2017) the principal subsidy being the Basic Payment Scheme, to which all farmers are entitled. The BPS is calculated on the basis of farm area and includes a requirement to keep the holding in 'Good Agricultural and Environmental Condition'. These are enforced through the principle of 'cross-compliance' and adherence to "Good Agricultural Practice" (GAP Regulations) introduced under the Nitrates Directive to reduce the loss of unnecessary fertiliser from the farm. However, despite cross-compliance there continue to be instances of loss of hedgerows and clearance of scrub habitat, the latter sometimes to avoid any loss of area eligible for forage payments. The scale of the BPS transfer provides an opportunity to do more to ensure no net loss of biodiversity. Despite this, significant sums (€1.5 billion between 2010-2015) are spent by the EPA monitoring, minimising and remediating environmental impacts on Irish water bodies whose quality is steadily decreasing in part due to continued official targets for production increases, especially in the dairy sector.

Regarding forestry, afforestation grant payments are still available, but environmental criteria have been tightened. Subsidies in the fishing sector were once available for purchases of trawlers but were subsequently largely replaced with payments for decommissioning. Most transfers from the European Maritime Fisheries Fund are now directed at support services such as fish quality, hygiene, safety, etc. Significant transfers are being made to aquaculture which moderate the cost of capital investment, but issues have arisen with environmental compliance. The facilitated development of the aquaculture industry continues, despite the deteriorating condition of estuaries and coastal habitats (NPWS, 2019b).

A subsidy (€115m in 2016) to ensure that milled peat is competitive with other fuel uses had been paid since 2002, for purposes of security of supply (CSO, 2019c), even though milled peat emits the most carbon dioxide equivalents of any fuel (DAHG, 2015a). This peat is produced by existing worked bogs whose biodiversity value has already been compromised. However, the Commission for Regulation of Utilities (CRU) has discontinued any further PSO payments for peat, leading to a reduction in levies from a high of €121 million in 2015, to €27.5 million in 2019, with final cessation in December 2019 (CRU, 2019). This is in line with the intention of Bord na Móna to move out of peat production by 2028 and to rehabilitate its worked bogs (BnM, 2015, 2018) and the conversion of formerly peat-fuelled power plants to biomass. Subsidies will still be paid, however, for co-firing the two retro-fitted biomass powerplants with up to 30% peat, under the REFIT 3 category (CRU, 2019). In the transport and industrial sectors, fuel and energy tax rebates are still available, providing social and economic benefits, but potentially encouraging excess use with implications for greenhouse gas emissions and consequently for climate change and biodiversity. The CSO has analysed these Potentially Environmentally Damaging Subsidies (PEDS), finding that €4.1 billion was transferred as PEDS in 2016. Although environment taxes have increased, there has been year-on-year growth in fossil fuel subsidies, amounting to €2.5 billion as of 2016 (CSO, 2016).

Subsidies to livestock producers and fossil fuels contribute to greenhouse gas emissions and so make an adverse contribution to climate change and indirectly on global biodiversity. Although this is somewhat countered with annual transfers of around €370m to

alternative energies and €100m to energy saving initiatives, the bulk of the livestock and fossil fuel subsidies are antagonistic to the governments commitments to reduce emissions and halt biodiversity loss. Thus, all existing subsidies for fossil fuel industries remain harmful to biodiversity, undoing the limited resources allocated to climate action and biodiversity conservation. Having said this, in 2018 Ireland became the first country in the world to divest its entire investment in fossil fuels, amounting to €300 million. Under the Fossil Fuel Divestment Act (SI/29/2018), the Ireland Strategic Investment Fund must divest its interest in fossil fuel companies by 2023, in line with commitments of the Paris Agreement (GoI, 2018a).

Overall, there has been good progress on the removal of incentives that are harmful to biodiversity, but more limited progress on payments for ecosystem services outside of those in place for agriculture, while the scale of those in place for agriculture are inadequate to offset its impact on the Irish environment, especially water bodies and biodiversity. Further, a greater issue is the failure to capture the full social cost of the impact of sectoral activities on biodiversity. This represents a de-facto subsidisation. For example, the social cost of clearance of local non-designated habitats for development is not realised by the building sector or county planners. The social cost of water pollution is not fully realised by the agricultural sector. The social cost of biodiversity loss and greenhouse emissions is not realised by the fossil fuel sectors (government subsidies and the private sector).

5.5. Potential future sources of finance

5.5.1. EU

LEADER / CLLD

In the most recent multi-annual financial framework, LEADER has been expanded (as Community Led Local Development) beyond the EAFRD across three other prominent EU funding mechanisms: the EMFF, ERDF and ESF. This broader remit in co-funding presents a greater chance of successfully obtaining funding and provides the potential for broader sectoral coverage of positive biodiversity action, if stakeholder collaborations are created as Local Action Groups (LAGs). Outreach is likely required to inform and motivate stakeholders, establish LAGs and apply for funding. Similar expansion opportunities exist with agricultural European Innovation Partnerships (EIP-AGRI), requiring the establishment of 'Operational Groups' of stakeholders such as farmers, researchers, advisers, businesses, and environmental groups.

Expansion of LIFE applications

In the past decade, Ireland has benefitted greatly from funding provided through the EU LIFE programme. However, this has been proportionally lower than other MS and has diminished in recent years, with only two active LIFE projects as of 2020. Through application to the technical assistance fund, or by provision of seed funding to assist applications, the LIFE fund could provide significantly greater finance than at present. Also, until now the maximum EU co-financing rate for LIFE projects was 50% of the total eligible project costs, with the remainder being covered by MS governments. With the upcoming LIFE 2021-2027 fund, a co-financing rate of up to 75% of the total eligible costs may be granted to LIFE Nature proposals that focus on concrete conservation actions for priority species or habitat types of the Birds and Habitats Directives. Strategically, there should thus be greater impetus to apply for biodiversity-specific projects with concrete conservation outcomes focussing on Natura 2000 objectives, which may subsequently increase eligibility for SNaPs, below.

Strategic Nature Projects (SNaPs)

As part of LIFE 2021-2027, Strategic Nature Projects (SNaPs) are a newly proposed mechanism for mainstreaming biodiversity concerns into a broader range of EU and national policies and financial instruments than is currently the case, including the integration of PAF findings. Although structurally similar to existing integrated projects (IPs), SNaPs will have a much broader remit, with the potential to triple the funding available for biodiversity by expanding the collective sourcing of financing and direct funding. One per nation. Although not labelled as such, SNaPs are in response to a call for a "dedicated nature fund" for Europe. Core funding will support sectoral synergies and assist in application to EU funding calls. Central to this core funding is that complimentary linkages must support concrete conservation actions. One application per Member State is allowed, with actual funding available in the new MFF (2021-2027). The amount received by each Member State will be based on the number/area of Natura 2000 sites and the nations financing capacity, capped at a minimum of €10 million (EC, 2018).

European Maritime Fisheries Fund (EMFF)

There is great potential to expand both applications to, and spending of, our allocation based on the EMFF, particularly in support of those community-led local development (CLLD) schemes which promote biodiversity in the marine environment. At present, Ireland currently spends over 90% of its biodiversity-related funding on the terrestrial environment while just 1.3% is spent on marine biodiversity (Morrison and Bullock, 2018).

European Regional Development Fund (ERDF)

In the MFF 2014-2020 Ireland planned to spend 115% of its allocation of €821 million, though as of January 2020 had spent 26% of this (EC, 2020d). Thus, a significant opportunity lies here to ensure that more allocated funds are actually spent, notably on the various biodiversity-relevant categories of this fund. Seed funding is required to provide institutional capacity to administer these

applications and spending, however. Specifically, targets No. 85 (*Protection and enhancement of biodiversity, nature protection and green infrastructure*) and No. 86 (*Protection, restoration and sustainable use of Natura 2000*) of this fund present great potential for biodiversity-related funding, if the capacity is provided to apply for and administer awards. In light of the COVID-19 pandemic and Brexit, these allocations are likely to fall.

Cohesion Fund

Though aimed at bringing lower income EU nations up to EU averages, the threats to EU cohesion brought about by Brexit could open up some of this funding for Ireland, which currently does not benefit from any Cohesion funding. This would be particularly relevant to conservation concerns, given that the UK (including Northern Ireland) may no longer be subject to the various environmental directives previously operated on an all-island basis.

European Social Fund

Although currently not categorised as providing direct biodiversity funding for Ireland (Morrison and Bullock, 2018) (although some may be indirect through IPs) as a source of funding for CLLD schemes the ESF could provide more support for biodiversity-related initiatives in the future. At present, Ireland has spent 29% of its allocation to this fund in the current multi-annual financial framework (EC, 2020d).

Natural Capital Financing Facility (NCFF)

Offering tailored loans and investments, the European Investment Bank (EIB) and the European Commission have recently introduced the Natural Capital Financing Facility (NCFF), targeting projects which address biodiversity and climate change while at the same time generating a profit or demonstrating cost savings (EIB, 2018). One of the first trials of this scheme is based in Ireland: the Irish Sustainable Forest Fund, or SLM Silva Fund. This fund, focusing on the establishment of high-nature value continuous cover forestry, has received a €12.5 million equity contribution from the NCFF. Although centred on the eventual sale of timber products, it is also expected to generate revenue from the sale of verified carbon units and payments for ecosystem services. The NCFF thus presents one example of novel equity mechanisms to stimulate nature-positive economic activity, a revenue stream for biodiversity conservation with high potential. The fund, currently in its pilot phase, offers a maximum of €15 million derived from the EIB and the EU LIFE programme and will sign projects until the end of 2021.

FP9: Horizon Europe

Under previous Framework Programmes for Research (FP6, FP7, Horizon 2020), much research funding was garnered through competitive application to this EU funding stream, resulting in limited funding directly related to climate change or biodiversity. However, under EU Green Deal restructuring proposed in early 2020, a proposal has been made to set a minimum of 35% of the next Framework Programme for Research (FP9 'Horizon Europe') to be dedicated to climate solutions, which would include biodiversity protection and restoration. Indeed, the OECD has highlighted "*Biodiversity in Climate Change Funding*" as a viable source of co-funding (OECD, 2013). This presents a potentially significant source funding for Irish research into biodiversity, if the capacity for application is made available by consortiums of relevant Irish bodies.

5.5.2. National

At present, the chronically low budgetary allocation to state bodies responsible for biodiversity protection does not allow these organisations to fulfil their EU-mandated environmental objectives. Notably, the NPWS, charged with protecting and improving the status of Natura 2000 sites and species, receives inadequate financial support to conduct these activities. Across the period 2010-2015, cuts to NPWS funding were 8-times higher than other sectors (Morrison and Bullock, 2018) It's current allocation from government is €13.7 million: a 47% reduction since 2010. A significantly higher priority allocation from government needs to be sought, concomitant with the importance of biodiversity, not only based on its intrinsic value but also in terms of its natural capital value to human beings, but also as a precautionary approach given incomplete understandings of the value of natural ecosystem processes and functions. Although funded action within some services (the Forest Service, for example) are commendable, a recognition of the cross-cutting values of biodiversity, particularly for carbon emissions or mitigation of the effects of climate change, is still lacking.

Carbon tax ring-fencing

In 2010, Ireland introduced a carbon tax (technically three taxes: The Natural Gas Carbon Tax, the Mineral Oil Tax and the Carbon Charge and Solid Fuel Carbon Tax) which together currently accounts for 49% of national emissions. Presently at €20 /tonneCO_2e, this is set to rise by €6 annually, to reach €80 by 2030. This is expected to raise €90 million in 2020, all of which is ring-fenced for climate action measures, which includes increased investment in AES schemes and investment of €5 million in peatland restoration, although the latter is largely focussed on carbon sequestration (DPER, 2020b). Although this level of investment is welcomed, the opportunity exists for an increase in dedicated funding from the carbon tax to support the operation of relevant under-funded State bodies, the NPWS in particular. This investment would have multiplicative effects by providing the capacity to compete for wider non-exchequer funding.

Irish National Lottery Fund (INLF)

The National Lottery donated €3.69 million in 2015 to the DCHG, mainly aimed at heritage projects and public amenity. Additional funding for biodiversity conservation could be accessed from the INLF by being linked to community health and recreation. For example, the Health Service Executive is allocated funding for distribution to community groups. Given the growing body of evidence of the salutogenic value ('wellbeing') of natural green space, bids could be made to use this funding for the natural environment as an upstream preventative measure for public health improvements (Morrison and Bullock, 2018).

5.5.3. Other, including private sector

Offsetting

Although offsetting of impacts on biodiversity is already built into the mitigation hierarchy of any environmentally conscious planning process, scope is present to seek enhanced corporate investment for offsetting from international sources (i.e. outside the EU). These could include carbon credit purchases, if investments and actions are appropriately accredited. For example, in partnership with Natural Capital Partners and the private company Green Belt, Microsoft have invested in the planting of 137 ha of native woodland in Ireland, for which they will be issued with certified carbon credits using a unique carbon fee model. The success of this model presents a template for future offsetting investments in Irish biodiversity, such as peatland restoration or payments to lower the intensity of some farming practices.

Green bonds

In addition to the recently introduced ISGBs from the State, the international green bonds market is now estimated at over €200 billion, although this still only represents around 1% of the international bonds market (Morrison and Bullock, 2018). Providing access to this source of finance could be extremely beneficial for biodiversity, especially in light of the continuing decline in State direct spending on biodiversity. A tangible return-on-investment would be required for these investments, likely through payments for ecosystem services such as flood attenuation or carbon sequestration. Direct benefits to biodiversity could accrue if the NPWS (for example) acted as broker for these investments, ensuring that environmental interventions result in net-gain of biodiversity (Morrison and Bullock, 2018). Knowledge of how to apply for and navigate this opaque set of mechanisms will continue to hinder uptake. The Climate Bond standard has been developed to standardise terms of operation, although much of this investment remains in the developing world. These investments are not limited to governments or banks, but can expand to corporate entities, such as Apple's $1.5 billion green bond of 2016. Ireland's success with these mechanisms has been mixed: the first private green bond, issued by Gaelectric Holdings for €10 million in 2017, which offered a 20% return over 3.5 years, did not prevent the company from falling into liquidation less than a year later (Irish Times, 2018).

Philanthropy

Philanthropy is seen in other states as a reliable and lucrative source of funding, although this is less the case in Ireland. The Royal Society for the Protection of Birds in the UK relies heavily on large charitable donations from wealthy individuals, in addition to bequeaths. Similarly, the Pew Charitable Trust provides a critical source of direct funding for conservation across Europe. A limited number of Irish organisations likely benefit from this, especially in the NGO sector, though the majority of this is kept anonymous and remains hard to quantify. Although not a secure long-term funding stream, smaller donations could provide the seed funding to generate additional revenue via the alternative sources listed above. For example, the Community Foundation for Ireland provides seed funding for start-up initiatives and had hoped to increase its biodiversity fund to €500,000 in 2020.

5.6. Overview of finance systems, incentives and mechanisms

The limited amount of funding dedicated to biodiversity conservation shows the inadequate priority it occupies. The decrease of almost 50% in funding for the NPWS since 2010, despite significant economic recovery and a much stronger green agenda nationally, is indicative of the necessity for a phase shift in government priorities. Clearly, a major reframing of the funding system in conforming to our EU environmental obligations and achieving CBD Aichi targets is required. These efforts must go significantly further than those solely focussing on climate mitigation/ adaptation and should recognise the co-benefits of conserving biodiversity while removing the harmful subsidies such as the PSO for peat fuel.

At present the majority of biodiversity funding in Ireland is dedicated to the terrestrial environment, of which most is disbursed as agricultural subsidies. Although there is a requirement for future agri-environmental payments from the EU to be results-based (RBAPS, etc.), these are based on voluntary initiative which have low uptake from the more intensive enterprises such as dairy.

Finally, the dominance of central government funding over local government is apparent throughout the sections outlined above. Decentralisation of agricultural and forestry payments may, for example, increase uptake of agri-environmental schemes in those areas showing limited interest. Further, the Heritage Council is currently relied upon to fund the biodiversity-related activities of Heritage Officers, owing to the limited number of Biodiversity Officers currently in place nationally. Providing each Local Authority with a mandated Biodiversity Officer would add valued monitoring potential and promotion at a local level, while assisting the mainstreaming of biodiversity conservation in local government decisions.

6. Sectoral Institutions, Capacities and Interactions

Multiple Government Departments and Agencies have responsibilities that can influence biodiversity or are responsible for sectors which benefit from functioning ecosystems. Ecosystem services underpin the sustainability of key sectors such as agriculture, forestry and the marine, and support human health and well-being through water quality, protection from extreme weather events such as storms and flooding, and by providing a resource for recreation, amenity and quality of life. Fundamentally, partnership-working is essential to the management of Protected Areas across Ireland. The following section gives an overview of the key sectors or territories important for Ireland's biodiversity. Within each realm, governmental, semi-state and non-governmental organisations involved in biodiversity conservation are documented, including how these institutions are organised, their capacity to achieve stated aims and the extent to which sets of these organisations work together. Finally, the effectiveness of these institutional assemblages towards contributing to conserving Ireland's biodiversity within each key realm is assessed.

The European Union is a crucial partner in the conservation and restoration of biodiversity in Ireland, through Ireland's ratification and transposition of the numerous Directives and Regulations of the European Commission. The EU's Multi-Annual Financial Framework, the currently iteration of which runs to 2020, provides various funding streams directed at active conservation (e.g. EU LIFE) scientific research (e.g. Horizon 2020) and positive environmental practices (e.g. CAP). The EU Biodiversity Strategy to 2020 also provides a time-bound framework to guide the development national-level conservation initiatives, plans and targets (EU, 2011). These EU instruments, strategies and funding mechanisms are reflected in the below sections as applicable.

6.1. Biodiversity and Environmental Protection

Thought efforts to mainstream biodiversity concerns across sectors and institutions have continued for several years, there remains significant gaps in its inclusion, beyond minimal adherence to EU and international obligations transposed into Irish law. Thus, the majority of activities aimed at protecting and restoring biodiversity are conducted by a number of key institutions at state, semi-state and NGO level.

6.1.1. National Parks and Wildlife Service

The National Parks and Wildlife Service (NPWS) falls under the aegis of the Department of Culture Heritage and the Gaeltacht (DCHG) and has responsibility for nature conservation in Ireland. Representatives from the NPWS serve as National focal points for most of the multilateral environment agreements (MEAs) Ireland is a party to, including the CBD. The NPWS manages Ireland's National Parks and Nature Reserves which are important areas for biodiversity in Ireland. It also has responsibility for the enforcement of conservation legislation and the designation and protection of Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Natural Heritage Areas (NHAs). Other activities include research, monitoring, agri-environmental advice, licensing and peatland conservation policy, including the management of compensation to private households with turbary (peat-cutting) rights. The NPWS coordinates delivery of the National Biodiversity Action Plan (NBAP) and the National Peatlands Strategy and is also the lead department for reviewing the effect of sectoral actions on climate change relevant to biodiversity.

6.1.2. Heritage Council

The DCHG is also the parent department for the Heritage Council. The Heritage Council promotes engagement with Ireland's natural and cultural heritage and channels funds to support a network of Biodiversity Officers and Heritage Officers in local authorities across the country. It also funds various research reports and projects relevant to biodiversity, including on High Nature Value Farmland and Landscape Character Assessment and supports the National Biodiversity Data Centre and the NGOs Woodlands of Ireland, the Burren Beo Trust and the Irish Uplands Forum.

6.1.3. Department of Communications, Climate Action and the Environment (DCCAE)

The Department of Communications, Climate Action and the Environment (DCCAE) has responsibilities relevant to biodiversity that include sustainability, climate change mitigation and adaptation, and management of the EU LIFE programmes. The Department has led responsibility for the 2030 Sustainable Development Agenda and its 17 Sustainable Development Goals. Climate change could have profound implications for biodiversity, as is recognised in the National Adaptation Framework (NAF) which acknowledges serious impacts for biodiversity, but also identifies adaptation measures which, if adopted, could have some positive biodiversity effects, including non-structural approaches to flood, storm and coastal management (DCCAE, 2018). This has led to the publication of the Climate Action Plan 2019 (DCCAE, 2019). The DCCAE has responsibilities for the growth of the bioeconomy which in turn requires a functioning natural environment for the delivery of renewable resources and ecosystem services. The Local Agenda 21 Environmental Partnership (now the Community Environment Action Fund) is overseen by DCCAE and supports sustainability and environmental awareness, including local projects such as biodiversity action plans. DCCAE also manages the Environment Fund which is raised from the levies on landfill waste and single-use plastic bags. The Fund has been used to support the Irish Environmental Network and grant programmes. DCCAE also coordinate and fund the actions of Inland Fisheries Ireland (see section 6.5.2) which, although mainly focussing on angling species, has a role to play in promoting biodiversity-positive activities and maintenance of stretches of waterways.

6.1.4. Environmental Protection Agency

The Department of Communications, Climate Action and the Environment (DCCAE) is the parent Department for the Environmental Protection Agency (EPA). Licensing, monitoring and enforcement by the EPA provides a safeguard against pollution, waste and radiation. The EPA is also responsible for environmental research, monitoring the state of the natural environment, for communicating the effect of climate change and for guidance on environmental and strategic impact assessment. These activities are primarily designed to protect human health and well-being, but the agency's monitoring work is essential in ensuring the protection of water, soil and atmospheric resources upon which biodiversity is dependent and to which it contributes via regulating ecosystem services. The agency also has a key role in producing the State of the Environment report (e.g. Ireland's Environment 2016) informing the NBAP and overseeing EIA, ELD and SEA reporting and the publication of relevant criteria and guidance.

6.1.5. Local Authorities

The majority of Ireland's regional administration is split into 31 Local Authorities, including 3 city councils, falling under the responsibility of the Department of Housing, Planning and Local Government (DHPLG). Local authorities can have a direct influence on biodiversity through planning and environmental assessment. They also have a key input to biodiversity indirectly through their responsibility for local amenities including park management and green infrastructure. Specific biodiversity actions of Local Authorities are modest, but most include Heritage Officers and four include Biodiversity Officers who can have an important influence on local planning. Local Agenda 21 (now Community Environment Action Fund) and the EU LEADER programmes are both important sources of funding for Local Authority support for environmental and biodiversity projects. In 2018, a grant scheme of €400,000 was made available by the DCHG to Heritage/Biodiversity officers to implement biodiversity actions at a local level, including workshops for school children, actions on invasive species, pollination, surveys of swifts (*Apus apus*) and the supply of nesting boxes for this species.

6.1.6. Central Statistics Office

The Central Statistics Office (CSO) collects demographic, social and economic data to support Government policy. It is also working to integrate natural capital values into accounting and reporting systems as required by Eurostat. This work can be extended into the development of a System of Environmental and Economic Accounting (SEEA) as sought by the EU Biodiversity Strategy. There are six modules in the Eurostat Environmental Accounts Regulation as well as voluntary Eurostat modules. The CSO's release of the voluntary module 'Environmental Subsidies and Transfers' has also allowed the publication of data on potentially environmentally damaging subsidies (PEDS), which will improve the distribution of funding for biodiversity and complies with Aichi Target 3 (CSO, 2016). The Material Flow Accounts are of relevance to Aichi Target 4 (sustainable production and consumption) and the annual Fish Landings release provides an objective perspective on wild harvests outside of sectoral interest bodies. In addition, the CSO commenced a new survey in October 2018 that provides better quality data for the Eurostat Environmental Protection module, collecting expenditure by industry and services enterprises on the protection of the environment. The CSO is also responsible for coordinating statistics around the Sustainable Development Goals.

6.1.7. Other relevant government bodies

Positioned within the **Department of Transport, Tourism and Sport (DTTS)**, Fáilte Ireland is the state agency responsible for the promotion of tourism and tourist infrastructure, a major industry in Ireland. Ireland has a modest ecotourism sector largely focused on whale and dolphin watching, but the countryside is a major attraction for tourists in itself, including areas of landscape and ecological interest. While Fáilte Ireland does not have specific responsibilities for biodiversity, its promotion programmes, for example the Wild Atlantic Way, rely heavily on the quality of the natural environment and landscape and contain distinct measure to minimise impact on this natural resource. Fáilte Ireland's periodic strategic plans therefore require the preparation of SEAs. Ireland's National Parks, which are managed by NPWS, are regarded as 'honeypot destinations' for tourists and are significant drivers of local economies. A Tourism Interpretative Master Plan has been drawn up to manage the coexistence of tourism and sensitive biodiversity in Ireland's National Parks (DCHG, 2018). **Transport Infrastructure Ireland (TII)**, formed by the merger of the National Roads Authority and the Railway Procurement Agency in 2015, is the state authority in charge of much of the transportation infrastructure of Ireland. Given its extensive development portfolio, its activities have significant implications for biodiversity. TII has produced guidelines on the management of noxious weeds and non-native invasive plant species on national roads and, along with the DTTS, has funded a €5.5 million national framework to tackle the spread of Japanese Knotweed with the initial pilot phase having treated 10,000 m^2 of Japanese Knotweed along one major road. The TII also work with partner environmental NGOs in developing species mitigation actions, such as work being conducted with BirdWatch Ireland on bird collisions along stretches of motorway.

The **Department of Rural and Community Development (DRCD)** is responsible for the administration of the EU LEADER programme which is supported under the EU Agricultural Fund for Rural Development and has the rural environment (water resources, local biodiversity and renewable energy) as one of its three priorities. LEADER has supported various small projects such as nature walks and habitat restoration. Thus, although its direct biodiversity conservation remit is peripheral, investment in the promotion of the societal values of natural environments is an important contribution.

The **Department of Housing Planning and Local Government (DHPLG)** oversees the National Planning Framework (GoI, 2018b), which includes national policy objectives for built development and infrastructure, but also green infrastructure, sustainable use and biodiversity. The DHPLG also coordinates the production of Regional Spatial and Economic Strategies and the Marine Spatial Plan in line with the MSP Directive.

The National Botanic Gardens (NBG) in Dublin are managed by the **Office of Public Works (OPW)**. As well as Victorian conservatories, the gardens hold over 17,000 plant specimens, hosts a permanent research facility with a laboratory and also holds the Irish National Herbarium (International Herbarium Code DBN) with over 600,000 pressed specimens.

6.1.8. Other bodies and non-governmental organisations

The National Biodiversity Data Centre (NBDC) was established by the Heritage Council in 2007 and is contracted for the collection, collation, management, analysis and dissemination of data on Ireland's biological diversity. It is the national node for the Global Biodiversity Information Facility (GBIF), feeding Irish biodiversity data into a global repository. The NBDC is heavily involved in cross-sectoral research, outreach, training and engagement, and the production of the All-Ireland Pollinator Plan (NBDC, 2015).

To further the implementation of the Actions for Biodiversity contained in the NBAP, and to mainstream biodiversity within national and sectoral policy, an interdepartmental **Biodiversity Working Group (BWG)** was established in 2012 drawn from 18 Government Departments and Agencies. Members have responsibilities for sectors where activities can have a direct impact on biodiversity or where there are opportunities for changes in the management of environmental resources that can support biodiversity policy formation. These sectors include strategic and land use planning, management of agriculture and forestry, management of marine and freshwater fisheries, the management and monitoring of water and environmental quality, and the provision of transport and energy infrastructure. In addition, there are government departments or agencies with responsibility for sectors where there are opportunities for synergies between biodiversity protection and community development, education or health. The BWG contributed substantially to the development of the National Biodiversity Action Plan and have been tasked with conducting an interim review of the Plan (BWG, 2020). Policy is also informed by an independent **National Biodiversity Forum** which is currently comprised of 16 members drawn from environmental NGOs, academic institutions, professional and sectoral representative organisations, community bodies, and business and finance. This forum provided expert opinion and input on the most recent NBAP.

The **Irish Forum on Natural Capital (IFNC)** was launched in 2015 and aims to gather wider experience on biodiversity from a diversity of organisations, stakeholders and the wider public. The IFNC has a steering group drawn from the public and private sectors, NGOs, consultancy and academia. Administration is supported by a grant from the NPWS and the EPA. The IFNC developed out of a National Conference held at Ireland's National Botanic Gardens in 2014 which had been organised by the voluntary Natural Capital Committee. The IFNC provides for an exchange of expertise and experience through public presentations, webinars and blogs on topics such as the Natural Capital Protocol, natural capital accounting and payments for ecosystem services (PES). The IFNC has also provided workshops to local authority planners and ecologists, and briefings for the business community. Its seminal conference in 2016 ("Making Nature Count") included 25 invited speakers, international experts and 150 delegates. Most recently, the IFNC has coordinated the establishment of the **INCASE Project (Irish Natural Capital Accounting for Sustainable Ecosystems)**. Using the UN's System of Environmental-Economic Accounts (SEEA), this project will develop a spatially explicit account of the natural capital provided by Irish species and habitats, including biotic and abiotic stocks and flows and, where appropriate, a monetary value. This project will run until 2023, beginning with the aquatic environment using four sample catchments.

Although not directly focusing on conservation of biodiversity, the work of the **Climate Change Advisory Council** has multiple cross-cutting drivers and objectives which affect biodiversity. This independent advisory body consists of economists, geographers and climate scientists advising the government on a transition to a low carbon, climate resilient and environmentally sustainable economy by 2050. The Council was established through a provision of the Climate Action and Low Carbon Development Act 2015 and provide annual and periodical reviews of government progress. It's most report highlighted that Ireland's emissions continue to grow in spite of international agreement, mainly due to the expansion of intensive cattle-based agriculture and the reduction in the afforestation rates (CCAC, 2019).

The **Environmental Pillar** promotes policies to advance sustainable development and is comprised of environmental NGOs, including those acting to protect or conserve biodiversity, as well as others working on relevant issues such as climate change. The **Irish Environmental Network (IEN)** contributes directly to the Environmental Pillar and represents eNGOs and local groups comprised of over 35,000 volunteers. Local groups may also be represented in the Public Participation Networks (PPNs) which were established in 2014 by the Local Government Act and are intended to allow community groups to input to local and national government policy on various issues including the environment.

Finally, the Irish environmental NGO sector performs a wide swathe of scientific, educational and restoration functions for biodiversity. The most prominent of these include **BirdWatch Ireland**, the **Irish Wildlife Trust** and the **Tree Council of Ireland**. The funding and capacity of these organisations is extremely limited, however.

Effectiveness: Biodiversity and Environmental Protection

The remit of the NPWS and the EPA are strongly linked to biodiversity benefits, through broad dedicated actions to conserve species and habitats or the environmental conditions to support healthy ecosystems and the services they provide. The obligation of these bodies to implement various European and international biodiversity agreements, under extremely limited capacity (particularly the NPWS) limits the likelihood of meeting these targets, resulting in formal proceedings or fines and much greater costs than initial capacity investment. These capacity limitations are somewhat offset by increasingly well-established linkages across Departments and sectors, in terms of planning, actions and monitoring. For example, the development of the National Biodiversity Action Plan, the National Planning Framework and the Climate Action Plan all included broad participation and strong collaboration in composition and continued review. However, some of these interactions and linkages appear a result of engrained bureaucracy and not through intent. Local Authorities are a good example of this inefficiency through poor coordination and legacy arrangements. Although they perform substantial biodiversity protection work as part of the DHPLG, their biodiversity-related funding originates from multiple different Departments, including the DCCAE (Local Agenda 21), DRCD (EU LEADER) and the DCHG (Biodiversity / Heritage Officers). Various other examples of these cross-departmental transfers are evident through subsequent sections of this report, such as EU LIFE funding being coordinated by the DCCAE but disbursed to multiple other Government Departments, serving to heighten administrative burdens and costs. Consequently, the cost-effectiveness of spending relating to biodiversity and environmental exhibits substantial opportunity for improvement.

6.2. Agriculture

Given the importance of agricultural to communities and economies across rural Ireland, and that the land mass of Ireland is composed of over 63% agricultural land, a consideration of this sector's environmental and biodiversity performance is increasingly important, especially in light of desires to intensify and expand agriculture production under Food Wise 2025 (DAFM, 2015). The potential for this sector to impact biodiversity through intensification is high, though opportunities to protect biodiversity through augmented practices are similarly prominent.

6.2.1. DAFM - Agriculture

The Department of Agriculture, Food and the Marine (DAFM) is responsible for agriculture policy, national and EU schemes in support of agriculture, food, fisheries, aquaculture, forestry, and the regulation of those sectors, including animal and plant health and animal welfare. The Department manages agricultural income supports, the Nitrates Action Plan (2018-2021), commonage grazing, organic farming, and linking land use policy to sustainability. Specifically, for biodiversity, the Department employs ecologists and manages agri-environmental schemes (AES) including the Green Low Carbon Agri-Environmental Scheme (GLAS; 2014-2020). New AES initiatives are being explored which are results-based or locally led. The Department is also supporting new projects which are integrating land use with environmental and biodiversity objectives under the European Innovation Programme (EIP-AGRI). The NPWS has continued to work with DAFM to develop AESs for farmed protected areas in the Natura Network, most recently with GLAS. In addition, the Department has links with Origin Green (www.origingreen.ie), the food industry's voluntary programme of sustainable production, which is supported by Bord Bia, the state agency for food marketing.

6.2.2. Teagasc

Teagasc are the national body responsible for agricultural research and innovation, farm advisory services, training and community engagement. Its 11-member Authority is appointed by the DAFM and has representation from DAFM, farming bodies, universities and Teagasc staff. Predominantly funded by the State, they offer extensive advice on animal nutrition, breeding, crop yields, educational material and assistance in applying for environmental grants. In 2018, Teagasc received €8.8 million for a National Food Innovation Hub, as part of Food Wise 2025. Relating to biodiversity, Teagasc provides advice on applying for GLAS. Of note, the Agricultural Sustainability Support and Advice Programme (ASSAP) provides confidential consultation for farmers to minimise overland flow and diffuse pollution in order to improve the quality of water bodies. This programme is voluntary, with no penalties, and is currently set to run until the end of 2021. The 30 ASSAP advisors originate from Teagasc (20) and dairy cooperatives (10) and do not have the ability to regulate or report actions which contravene WFD obligations. Rarely are solutions offered supported by incentives or penalties, with the exception of nutrient management. Teagasc has also produced a Greenhouse Gas Marginal Abatement Cost Curve (GHG MACC) report, which estimates the emissions of the industry and compares these to both EU-mandated emissions reductions by 2030 and the likely intensification of agriculture, especially growth in the dairy herd (Lanigan *et al.*, 2019). Teagasc is a leading partner in the Smart Farming Programme which includes measures to reduce GHG emissions on farms.

6.2.3. IFA

As Ireland's largest farming representative organisation and as a strong lobbying voice for Irish farming concerns at national and EU-level, the Irish Farmer's Association (IFA) has an influential role in affecting how policies are structured. At an EU-level, the IFA declares annual expenditure on lobbying of between €300,000 - €400,000, records the second highest level of interactions with EU officials by any Irish lobbyists (after Facebook Ireland) and hires two full-time lobbyists in Brussels (EC, 2020f). The concerns of the IFA relating to biodiversity appear limited, though given their role in shaping Irish farming practices they are an important stakeholder.

Effectiveness: Agriculture

The agriculture sector is vitally important for biodiversity in Ireland, given its broad national coverage and its potential to enhance protection through modified practices. The continuing expansion of the dairy industry and generalised intensification is though impacting on biodiversity and water quality. At present, the remit of the DAFM, Teagasc and other non-state bodies is almost exclusively focused on production and intensification. The influence that the IFA has on policy making, along with that of other farm organisations, in protecting the immediate interests of their members and opposing constraints on activities which can have negative environmental impacts, has been the subject of criticism. Potential exists to improve the monitoring and regulation of current environmental obligations, particularly with regard to fertilizer application, hedge removal and the burning of vegetation. Encouragement of more biodiversity-friendly farming practices is also necessary, as many schemes remain voluntary and have low uptake. Interactions between the agricultural sector and conservation bodies has historically been low, characterised by distrust and suspicion. This is improving through dialogue, joint planning and the new Agricultural Sustainability Support and Advice Programme (ASSAP), although more genuine buy-in is needed in recognition of the important ecosystem services provided by biodiversity in ensuring the long-term viability of agriculture and farm livelihoods. Additional environmental pre-requisites for EU funding are providing further top-down positives for biodiversity, although this requires increased monitoring. The cost-effectiveness for biodiversity of investing in increased monitoring of implementation and compliance at a user level is therefore high.

6.3. Forestry

From historically low coverage, forestry in Ireland has expanded steadily since the post-war period. Formerly an almost exclusively public activity, this is now completely private in nature, either through the semi-state forestry company or via the provision of grants to assist private individuals to plant forestry.

6.3.1. DAFM - Forest Service

In addition to agriculture, DAFM also includes the Forest Service (FS), the state body responsible for the sustainable management and expansion of forestry. The FS manages the Forestry Programme 2014-2020 and has an overall broadleaf planting target of 30%, as well as a range of measures supporting biodiversity, such as the Native Woodland Scheme (NWS). It implements measures to protect against the introduction and spread of potentially harmful pests and diseases, such as the disease Ash Dieback (Chalara) which, since 2012, has been threatening native ash, an important species for the Irish landscape and for biodiversity. Solely public afforestation by the Forest Service has been steadily decreasing since the 1990s, resulting in almost no actual afforestation being conducted by the FS, but rather through partnerships with various semi-state and private entities (DAFM, 2019). The Forest Service has worked closely with Woodlands of Ireland, NPWS, the Heritage Council, Teagasc, IFI and other stakeholders in implementing the Native Woodland Scheme. The Forest Service also collaborate with Coillte, the state-owned forestry company, in the restoration of raised bog through EU LIFE projects which, in 2012, extended to 12 raised bog SACs. The majority of expenditure by the FS is now through their Grants and Premium Schemes and the building of forestry roads.

6.3.2. Coillte

Coillte is the national forestry company and has responsibility for an extensive estate of forestry across the country, managing 7% of Ireland's land. Its main commercial activities span three areas: forestry, the production and sale of Medite Smartply, and land solutions, totalling a gross income of €115m in 2018 and turnover of €330m (Coillte, 2018). The latter includes the development of wind farms, housing developments, data centres and tourism initiatives. Coillte forests are open for public access, with an estimated 18 million visitors annually, while presently 20% of its estate is managed for biodiversity (Coillte, 2018). It is responsible for many native woodlands and the maintenance of the Peoples' Millennium Forest. More recently, the company has announced 'Coillte Nature', a plan for greater focus on biodiversity, ecosystem services and human wellbeing. This constitutes four main areas of work; 1) the establishment of increased areas of native woodland, most of which will be on former extractive peatlands in conjunction with BnM, 2) projects aimed at rehabilitating areas of existing woodland to promote biodiversity, 3) the creation of a network of public-

amenity forest near urban areas, beginning with the 'Dublin Mountains Makeover', and 4) embedding ecosystem services-thinking into existing management, such as water quality and bird conservation.

6.3.3. Private interests

An increasing proportion of forestry activity in Ireland is being conducted on a private basis. From 2000 effectively all afforestation has been on private land. Of this, between 1980 and 2018, farmers accounted for 82% of afforestation on private lands (DAFM, 2019). This has been assisted by the Grants and Premium Scheme of the Forest Service. In addition, commercial forestry companies are increasingly involved in planting, managing and harvesting plantations, such as Green Belt and Arbor Forest Management. Most recently, private investors through accredited intermediaries are entering the forestry market, who provide linkages to corporate investors seeking carbon credits or other corporate benefits.

Effectiveness: Forestry

Organisations involved in forestry are well-positioned to achieve their aim of increasing coverage and promoting the profitability of this sector. However, establishment and conservation of native woodlands in Ireland is done on a voluntary basis and has been a poor performing grant premium category (GPC) of the Forestry Programme 2014-2020. The importance of native woodlands to Irish biodiversity and the detrimental impact of poorly planned conifer forestry on aquatic species through acidification, run-off and siltation, require that measures should be prioritised to increase the area of native broadleaf afforestation. Given that much of the labour and land acquisition requirements of the Forest Service have now been outsourced to private and commercial entities, it is likely that capacity is available to promote native woodland establishment over conifer plantations of lower nature value. The modified commercial model of Coillte may provide substantial biodiversity benefits, although its commercial viability requires clarification. The interaction between stakeholders in the forestry sectors is extensive, through collaborative research, advice and regeneration projects, and through the administration of broad-ranging GPC schemes. Further, innovative linkages to commercial sources of funding are admirable and provide a model for biodiversity investment in other sectors. The provision of grants and premiums by the Forest Service to encourage afforestation (particularly of native species) is a cost-effective method of expanding the national forest estate, avoiding much of the labour and land acquisition costs of conducting this on a public basis. However, the decreasing pace of afforestation observed in the past decade may mark the limits of this strategy, relying on the uptake of grants to continue growth in direct competition with traditional agriculture, especially on land most suited to native broadleaf forests. Linkages with commercial financial markets may continue to diversify this field further, although appropriate standardisation is required beyond these 'first-movers'. Unfortunately, native forestry of high nature value has not been directly incentivised with these investments, aside from built-in GPC weighting towards native species, meaning biodiversity benefits of expanded forestry is limited.

6.4. Peatlands

Ireland is fortunate to harbour large areas of high-nature value peatlands, particularly active raised and blanket bogs. In line with the necessity to offsets carbon emissions from other sectors, the carbon sequestration potential of these active peatlands is increasingly recognised, as is their water storage and filtration capacity. The legacy of peat extraction in Ireland, and the small set of important of organisations which have emerged as a result, continue to affect the restoration of these lands. However, a large proportion of peat soils have already been converted to other land uses (pasture and forestry) while the growth strategies of the forestry and agricultural sectors continue to hinder peatland conservation and reinstatement.

6.4.1. Bord na Móna

Bord na Móna (BnM), the state peatland company, manages 80,000 ha of peatland and so is a major landowner with considerable influence on biodiversity. Historically, its principal activity has been peat extraction for producing electricity, sale of moss peat for horticulture and production of household briquette fuel. BnM has a target of divesting from peat production by 2028 and investing in renewable energies such as wind, solar and wood biomass, as well as the rehabilitation of peat workings for biodiversity and amenity. BnM is looking to rehabilitate its worked bogs as these fall out of production over the next 5-10 years and has various established rehabilitation and bog restoration projects, including some in conjunction with Coillte. It has launched a Sustainability 2030 Plan for the future use of peatlands and is in the process of implementing its second Biodiversity Action Plan 2016-2021 (BnM, 2016). An Ecology Team was set up in 2009 to ensure the appropriate approach to rehabilitation in terms of biodiversity and other ecosystem goods and services benefits, which has resulted in BnM now embarking on a process of natural capital accounting under the System of Environmental Economic Accounting (SEEA) of the UN.

6.4.2. Irish Peatland Conservation Council (IPCC)

Founded in 1982, the IPCC has operated an active campaign of purchasing and conserving peatland habitats, raising awareness of their importance and developing long-term monitoring on peatland sites across the country. The organisation is largely funded by donations, bequeaths and government grants from both national and international sources.

6.4.3. Stakeholder groups

The **Peatlands Council** was established in 2013 to represent the wide array of stakeholders in Ireland's bogs, including conservation organisations (NPWS, IPCC, IEN, PSIG), farmers (IFA), the extraction industry (BnM) and rural communities (Irish Rural Link). The **Peatland Strategy Implementation Group (PSIG)** is a cross-departmental group developed in 2017 to monitor the implementation of the National Peatland Strategy. This implementation group brings together the DHPLG, the DAFM, the DCCAE, the DCHG, OPW, EPA, Bord Na Móna and Coillte, and reports to the government on an annual basis. This group also has a seat on the Peatlands Council. Further, the **Peatlands Community Engagement Scheme**, established in 2019 and administered by NPWS, seeks to engage local communities with raised bog conservation by offering small grants for community initiatives aimed at conservation and education.

6.4.4. Other organisations

Given its broad coverage in Ireland, peatlands have a wide array of other stakeholders beyond those mentioned above. Coillte are involved in restoring peatlands and removing conifer plantations from former industrial bogs, wind energy companies are increasingly partnering with BnM and other peatland owners to install infrastructure and the Electricity Supply Board (ESB) owns substantial portions of peatlands for transmission purposes. Finally, various EU LIFE projects are involved in peatland conservation and restoration, including the ongoing LIFE Irish Raised Bog project and the newly awarded LIFE-IP Atlantic Crex and LIFE-IP PAF Wild Atlantic Nature. The Irish Government have also made a firm commitment in the most recent budget to restore peatlands in Ireland, committing €10 million to bog restoration, €5 million of which originates from the carbon tax.

Effectiveness: Peatlands

The remit of organisations involved in peatland conservation, from NGOs, extractive industry and government bodies, is appropriate, especially in light of the decision of BnM to transition away from peat extraction. There is strong collaboration between a wide array of organisations and stakeholder groups and an emerging commitment from the Government to restore bogs. At an EU level, further commitment has been shown to protect Irish peatlands and the biodiversity they support through a growing set of EU LIFE programmes targeting peatlands. In general, there is greatly enhanced awareness of peatland values, including for biodiversity and climate change mitigation. However, given the importance of DAFM and the agricultural intensification it currently oversees, a greater level of collaboration on the restoration and protection of peat soils outside of identifiable peatlands (active or degraded) would be expected, especially in relation to the prevention of harmful activities such as drainage or inappropriate afforestation, although the latter is now somewhat curtailed. Estimates of the cost-effectiveness of peatland restoration from a carbon sequestration perspective have shown that up to €118 ha-1yr-1 of avoided climate change losses can be generated through restoration, especially in more biodiverse communities (EPA, 2012a). Given the extremely poor conservation status of these unique habitats and the species they support, Irish Government resources (including direct grants and funding of the NPWS) should prioritise bog conservation for biodiversity concerns in addition to climate change mitigation.

6.5. Water

Despite the close association between water bodies and biodiversity in Ireland, water quality continues to decline (EPA, 2019b), owing to a combination of changes to upland catchments, excessive agricultural run-off and water course modification. Action is being taken to resolve some of these issues across a limited number of organisations.

6.5.1. Irish Water

Established in 2013, Irish Water are the semi-state body charged with the maintenance and improvement of Ireland's domestic water supply, including mains water and wastewater removal and treatment in urban environments. It combines what was formerly the individual responsibility of 31 Local Authorities nationwide. Through their role in reducing contamination of water bodies with wastewater and in the abstraction of water for household use, Irish Water have an important role in conserving Ireland's aquatic biodiversity. Irish Water is regulated by the Commission for Regulation of Utilities and the EPA. As well as improving water quality in general, biodiversity-positive measures are being taken around their 4000+ sites nationwide, including pollinator-friendly mowing regimes and tree planting. The use of green infrastructure by Irish Water in the treatment of wastewater (integrated constructed wetlands) and sludge biproducts is increasing, especially in rural low-density settings, although the formation of standardised

monitoring at these sites has reportedly slowed their formal licencing by the EPA (pers. comm., B. Deegan: 17/02/2020). Though Irish Water are currently in the process of developing a Biodiversity Action Plan, the above biodiversity measures are predominantly seen as lower cost alternatives to existing management practices. However, these nonetheless have the potential to positively support Irish biodiversity.

6.5.2. Inland Fisheries Ireland

The DCCAE is the parent department for Inland Fisheries Ireland (IFI) whose principal objective is the protection of inland fisheries and sea angling. While it is focused on the protection of the angling resource and specific fish species, its activities also support threatened species such as eel (*Anguilla anguilla*), lamprey (*Petromyzon and Lampetra spp.)* and charr (*Salvelinus alpinus*). A significant proportion of the agency's activity is directed at angling (and sea angling), but there is a cross-over with biodiversity as this angling resource includes vulnerable fish species reliant on good water quality and a healthy aquatic ecosystem. These species represent so-called "umbrella" species for conservation. Biodiversity more widely is supported through applied research relevant to aquatic ecosystems, the rehabilitation of rivers under the Environmental Rivers Enhancement Programme (EREP), the control of invasive species (for example, curly-leaved waterweed; *Lagarosiphon*) and restoration of the connectivity of rivers for migrating fish through the removal of weirs and other barriers. IFI is also responsible for fish stock assessments which are reviewed annually. Conservation limits for Atlantic Salmon have been in effect since 2007 and appropriate catch limits set for 143 rivers. IFI also administers the Salmon Conservation Fund which is supported by salmon license income from anglers. A proportion of expenditure by the fund supports rehabilitation of salmon habitat with co-funding provided by angling clubs.

6.5.3. Office of Public Works

The Office of Public Works (OPW) has responsibility for river, flood and coastal management, the continued management of arterial drainage and the protection of cultural heritage, including some UNESCO World Heritage Sites. Flood and coastal protection measures have tended to involve structural engineering to date and although there is interest in non-structural works, use of nature-based flood prevention works (e.g. integrated constructed wetlands; ICW) is not yet apparent. The management of existing drainage, for which the OPW has responsibility, has sometimes been accused of affecting water quality and biodiversity. A Catchment Flood Risk Assessment and Management (CFRAM) approach has been adopted since 2007 with which there are evident synergies with other aspects of water management more generally. The Interdepartmental Flood Policy Co-ordination Group is intended to address multiple objectives in relation to flood management including considerations around species and habitat protection (OPW, 2016). The OPW, along with IFI, is involved in the Environmental Rivers Enhancement Programme (EREP) to enhance the ecology of rivers that were previously drained. To help restore freshwater Protected Areas, the NPWS has also partnered with the OPW on the restoration of SAC fen sites.

6.5.4. Local Authorities

Although no longer holding responsibility for wastewater, Local Authorities have an important role in water quality by hosting the Local Authority Waters Programme (LAWPRO: formerly Local Authority Waters and Communities Office). LAWPRO has been established to foster public awareness and engagement with water management policy and to encourage community initiatives, such as River Trusts, which have also been promoted by the Sustainable Water Network (SWAN). Combining the capacity of both Local Authorities and State Agencies, under the WFD obligations and the RBMPs as part of this, LAWPRO targets the improvement of water quality for human health and biodiversity. The organisation also provides small grants to support community-led water improvement or outreach projects through the Community Water Development Fund. LAWPRO has a community and pubic engagement arm and has also assumed some of the responsibilities of the EPA in terms of catchment characterisation in Priority Action Areas, an evidence-based sampling strategy to identify pressures from agriculture, forestry, domestic and urban wastewater treatment intended to inform relevant actions. The Catchment Team works closely with the Agricultural Sustainability Support and Advice Programme (ASSAP), a new-established farm advisory service aimed at encouraging changes in farm practice to improve water quality. ASSAP advisors originate from Teagasc and dairy cooperatives, but the actions it recommends can only be taken up on a voluntary basis at present, with there being little in the way of either incentives or on-farm monitoring. Some urban Local Authorities are also implementing Sustainable Urban Drainage Systems (SuDS), which may have biodiversity benefits if they include integrated wetland or riparian vegetation.

Effectiveness: Water

The remit and capacity of public institutions to advance aquatic biodiversity is modest given tight budgets and the emphasis now being given to flood prevention. Although the concept of catchment management has taken hold, the ability of the EPA to thoroughly monitor diffuse pollution is limited. While progress is being made through LAWPRO, there remains a fragmentation of responsibilities between bodies responsible for water quality and a familiar a lack of joined up thinking. In particular, there is a need to confront the fact that the majority of water quality issues are linked to land use and agricultural intensification, despite the importance of environmental quality as a comparative marketing advantage for the sector. Elsewhere, only limited interest in nature-based solutions to water treatment or flood prevention is apparent to date, while SuDS is predominantly focused on the Dublin area. Physical flood prevention measures are likely to be implemented in areas experiencing increased impacts, but could adversely affect biodiversity without adequate mitigation and are certainly missing an opportunity to improve conditions for biodiversity. Irish Water are now recognising the cost-saving benefits of ICW, even if this is an option for only some locations.

6.6. Marine

Ireland's marine territory is substantially larger than many other EU Member States, yet relatively little is known about the biodiversity it holds, while the monitoring and regulation of impacts is more limited than in other sectors. Although Habitats Directive Article 17 reporting requires the NPWS to report on Annex species and habitats in Ireland's marine territory, the remit of the NPWS rarely covers marine biodiversity beyond transitional waters (estuaries, intertidal wetlands, foreshore), meaning protection of marine biodiversity is reliant on other institutions largely focused on wild harvest, aquaculture and the extractive industries. Despite being an island nation, the fishing industry receives significantly less financial support than terrestrial agriculture from either the State or the EU, reducing that available for conservation. The DAFM coordinates activities in the marine sector, including sea fisheries and aquaculture, through various marine state agencies, details of which are listed below.

6.6.1. Bord Iascaigh Mhara (BIM)

The sea fishing and aquaculture industries are supported by the work of Bord Iascaigh Mhara (BIM), the state agency responsible for developing the Irish seafood and aquaculture industries through grants, advice, training and publications. Its primary objective is the expansion of the volume, quality and value of outputs from these sectors. However, increasing consideration of environmental impacts beyond those regulated by EU Directives are being taken by BIM. The majority of these sustainability initiatives focus on reducing water and energy use and waste production, such as the development of less intensive aquaculture systems, reducing bycatch and recycling nets. BIM also conduct an increasing number of programmes directly related to biodiversity, such as invasive species monitoring, harvesting of native oyster and mussel seed and experimentation around native seaweed aquaculture (BIM, 2017). Further, BIM are involved in the designation of marine protected areas along with NPWS and the Marine Institute and initiated a natural capital accounting process in late 2019 in collaboration with the Irish Forum on Natural Capital which focused on water quality, marine ecology and carbon sequestration.

6.6.2. Marine Institute (MI)

The Marine Institute (MI) is the agency responsible for marine research, technology development and innovation, with activities that include marine spatial mapping, fish stock analysis and environmental assessment. Although the majority of their operation is in relation to data collection and scientific analysis, as part of the EMFF fund allocated to Ireland, the MI also leads a programme of biodiversity research under Ireland's Operational Programme for the EMFF 2014-2020. Topics covered under this biodiversity strategy include reductions in bycatch, cataloguing the biodiversity of Ireland's offshore reefs, the effects of microplastics, restoration of native oyster populations and the effect of static net fisheries on coastal biodiversity. The majority of these projects are conducted under broad partnership with academic institutions, the DCCAE, DAFM, and the NPWS.

6.6.3. Sea Fisheries Protection Authority (SFPA)

Enforcement of fisheries is provided by the Sea Fisheries Protection Authority (SFPA) who produce an annual report on the patrolling of Irish waters (i.e. within the 200-mile limit) by the Irish Defence Forces, the monitoring of Irish vessels wherever they operate and the regulation of seafood production (SFPA, 2018). Through this activity, the SFPA provide a valuable role in regulating the exploitation of endangered species, thereby contributing to Ireland's marine biodiversity.

6.6.4. Department of Housing Planning and Local Government (DHPLG)

The Department of Housing, Planning and Local Government (DHPLG) has responsibilities for the terrestrial and marine environment, and spatial planning and are the competent authority for the Marine Strategy Framework Directive (including marine Protected Areas) and the Marine Spatial Planning Directive.

Effectiveness: Marine

Although the number of organisations involved in the marine sector is more limited than that of agriculture or peatlands, these institutions have large portfolios spanning research, regulation, sustainable use, innovation and community development. However, the remit of these institutions to address biodiversity concerns is extremely limited. The limited capacity of the NPWS, as the competent authority for Natura 2000 sites, to address marine biodiversity highlights the unbalanced nature of biodiversity priority in the marine sector. Conversely, although the marine environment is seen as a single contiguous assemblage of resources, responsibility spans the activities of numerous Government Departments, including the DHPLG, DCCAE, DCHG and DAFM. This splitting of strategic responsibilities across these Departments, though helping to mainstream biodiversity concerns, has likely increased administrative burdens. The minimal acknowledgement of marine biodiversity in institutional strategies highlights its limited legitimacy alongside higher priority commercial interests. Thus, biodiversity actions might be considered only loosely related to conservation, lacking funding and resources. This does, however, present opportunities for the expansion of marine biodiversity actions, allowing appropriate valuation of ecosystem services, such as sustaining nursery areas or providing nature-based solutions to climate change adaptation. Following historical difficulties around designation of marine protected areas and aquaculture licencing, communication and collaboration between NPWS, BIM and MI have improved, notably around the Appropriate Assessment of aquaculture licences. The limited number of key State Agencies involved should facilitate these interactions, while their collaboration on the Marine Spatial Plan should also improve biodiversity protection. Given the remit of these organisations to sustain, support and promote the sustainable extraction of an extremely limited assemblage of commercially viable species, any initiatives protecting biodiversity reflect obligations under EU Directives rather than strategic conservation efforts. It is therefore difficult to gauge the cost-effectiveness of institutions and their operations in relation to biodiversity, as few actions are specifically directed at protection or restoration, aside from EU-mandated research or production-linked sustainability measures.

6.7. Institutional limitations

6.7.1. Recognition of biodiversity

At present, the emphasis placed on biodiversity is mixed and, for some departments and agencies can still be viewed as a marginal consideration in relation to the requirements of the National Planning Framework or in response to EU or national legislation relating to the environment or sustainability. There is only a modest acceptance by some departments of their dependence on natural capital. Although responsibilities towards biodiversity are more frequently reflected in the objectives and organisational structure of government departments and agencies, more evidence is needed of proactive policies, particularly where objectives are potentially compromised by other higher or core government policies. There has been positive progress on the NBAP in relation to environmental accounting and reviews of biodiversity expenditure.

6.7.2. Funding and capacity

The NPWS is chronically under-funded to fulfil its remit of ensuring compliance with various EU Directives and associated Irish laws. Although funding for peatland restoration increased substantially in the 2020 budget (€3m to €10m), the core annual funding received by the NPWS has decreased by a further 1% in Budget 2020 to under €14m. A review of Ireland's biodiversity expenditure as part of this project found the NPWS receives circa. 9% of annual biodiversity-related funding (Morrison and Bullock, 2018). This is in comparison to the €16.8m received by the Irish Greyhound Board (despite recent controversies), the €34 million by Bord na Móna or the €54 million by the Irish Aviation Authority (a 31% increase) in the 2020 budget (DPER, 2019). Given the limited levels of exchequer allocation to the NPWS, despite a period of strong economic growth, identifying alternative funding streams to strengthen internal capacity (and thus generate additional funding through grant applications) is a priority. Although increased funding is now available through schemes such as forestry grants, the limited capacity to administer these funds stretches existing capacity and hinders future growth. Similarly, Local Authorities are struggling with resource constraints, but some biodiversity funding is being maintained. An increase in the number of Biodiversity Officers would help to ensure that more attention is given to biodiversity and there is increasing interest in green infrastructure which could yield some biodiversity dividends. At present, the funding of Biodiversity Officers through Heritage Council funding threatens their existence in harsher economic climates, not least with the uncertainly brought by Brexit and more recent funding redirection for the COVID-19 pandemic.

With regard to eNGOs, despite their disproportionate contribution to biodiversity conservation in Ireland, their budgets remain extremely small, with a large part of their operations relying on volunteers. Government funding, through the Irish Environment Network, is welcome, although this is reliant on the continued liquidity of the Environment Fund derived from plastic bag levies and landfill tariffs. Greater financial support of the work of these dedicated NGOs is urgently required, in recognition of their fulfilling the government's obligations for minimal investment.

6.7.3. Policy coordination

Although a structure is in place to promote the integration of biodiversity considerations across government policy, actions to protect biodiversity are presently widely distributed and poorly coordinated. Overall, each department and agency listed is advancing a shared awareness for biodiversity encapsulated in many of the measures described in this report. However, more proactive efforts at integration are needed, including an acknowledgement of the contribution of biodiversity to ecosystem services and its intrinsic link to carbon sequestration and climate change adaptation. There has, however, been little concrete progress in adaptation planning to ensure that biodiversity is protected from climate change, while recent reviews of climate action have recommended measures that could counteract biodiversity protection, namely discussion of increased afforestation without considerations of the implications for biodiversity. Similarly, recent calls for physical flood defences and river dredging serve to seriously threaten biodiversity and the nature-based climate adaptation solutions this would offer.

7. Conclusion and Recommendations

7.1. Ireland biodiversity: trends, drivers and value

Ireland's biodiversity is now at a critical horizon. The most recent reporting to the EU's Habitats and Birds Directives found a continuing decline in the status of many of our protected habitats and species. Despite concerted efforts of recent years, the overall quality of our water bodies shows no improvement and, in some cases, continued decline. Further, our lack of effort in tackling invasive species has led to legal action from the European Union over our failure to put appropriate legislation in place. Failures in properly enforcing EIA around peat extraction and conservation of SACs have attracted similar actions. The reasons for these continuing declines are centred on overexploitation of marine resources, continuing degradation of our most endangered habitats (dune systems, semi-natural grasslands, peatlands) and contradictory national strategies which aim for a doubling of agricultural output and marine exploitation while simultaneously expecting improvements in water quality and introducing more environmentally sensitive farming practices. In spite of these daunting challenges, native Irish biodiversity continues to offer substantial value to the Irish economic model, through pollination, soil retention, flood attenuation, coastal stability, carbon sequestration, wild species harvest (mainly marine) and human wellbeing benefits. The increasing acknowledgement and valuation of these important ecosystem services may lead to increased conservation priority, though this is heavily reliant on political will and public support.

7.2. Policies and Plans in place to protect Irish biodiversity

A wide and growing set of EU Directives exist, aimed at generating more environmentally sound practices and conserving and restoring our dwindling biodiversity. These EU Directives have significantly enlarged Ireland's environmental protection coverage, beyond what would otherwise be a limited set of measures, especially in relation to the protection of endangered species and habitats. Below national government, a growing set of time-bound sectoral strategies have been produced to either take action on biodiversity loss or plan for climate change impacts, all with their own set of objectives and targets. Although providing good coverage in theory, in practice many of these policies and plans fail to meet their targets through a mixture of poor implementation and monitoring, a failure to dedicate resources for their support and an absence of legitimacy for biodiversity conservation. Further, many of these national strategies operate in isolation from each other, with little cross-sectoral cooperation in their composition or coordination in enforcement. For example, agriculture fails to consider the public good benefits of good water quality except by encouraging Good Environmental Practice. Enforcement actions are rare, with farm specific data not provided across sectors, and an expectation of independently generated bottom-up engagement. While sectors continue to operate in isolation, developing further strategies for environmental protection will be highly limited in their potential to protect biodiversity.

7.3. Institutions involved and their capacity

There is an emerging recognition of the value of biodiversity across departments and institutions, as evidenced by its inclusion in an increasing number of departmental and sectoral policies, although this rarely goes beyond Ireland's obligations to EU Directives, notably the Birds and Habitats Directives. There is still, however, a lack of understanding of the relationship between climate mitigation and adaptation and the co-benefits provided by biodiversity and the ecosystem services it provides. The priorities of certain sectors, notably the DAFM in their expansion of high-intensity farming, have not mainstreamed water quality or biodiversity concerns into their thinking. Those public institutions which are involved in active conservation and restoration of biodiversity remain chronically underfunded and barely able to fulfil their EU obligations. As a developed nation, the failure of our state institutions to meet the minimum EU requirements (let alone exceed these and lead the way) is testament to its undervaluation.

7.4. Financing biodiversity conservation; the present and future

Ireland's annual spend on biodiversity-related activities amounted to an average of €250 million per year between 2010 and 2015. Given that Ireland spends roughly the same amount on biodiversity as much less-developed nations globally, the economic, social and ecological imperative for conservation needs greater recognition, through the funding afforded it and the inclusion of biodiversity

concerns in the financial planning of every sector nationally. This spending should be conceptually reframed as binding investment in future cost-savings, as opposed to optional expenditure if budgets allow. The direct monetary returns through ecosystem services, as an alternative to costly engineered flood defences, water treatment, climate adaptation and food production, need greater recognition than is currently the case. Further, there should be much stronger acknowledgement that *capacity* leads to *funding*. By failing to invest in the NPWS, depriving it of capacity, the government is preventing the acquisition of additional EU grants or the spending of existing EU allocations which are not fully claimed. The historically low number of EU LIFE projects in Ireland, particularly in the marine environment, is testament to this, a point identified in the most recent PAF. The prioritisation of terrestrial biodiversity spending over the marine is also starkly apparent. Finally, given the limited budgets at a national and EU level, combined with competing fiscal pressures and uncertainty in global economies, funding for biodiversity should extend to private sources of funding such as corporate-social responsibility budgets, philanthropy and the creation of bond standards for ecosystem investment, such a carbon credits for peatland restoration. The financial needs assessment of the BIOFIN project will elaborate on these novel sources of funding in greater detail.

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List of Acronyms

AA – Appropriate Assessment

ASSAP – Agricultural Sustainability Support and Advice Programme

AES – Agri-environmental Scheme

BIM – Bord Iascaigh Mhara

BnM – Bord na Móna

BoCCI – Birds of Conservation Concern in Ireland

BWG – Biodiversity Working Group

CABB – Cooperation Across Borders for Biodiversity

CAP – Common Agricultural Policy

CBD – Convention on Biological Diversity

CEAF – Community Environment Action Fund

CFP – Common Fisheries Policy

CFRAM – Catchment Flood Risk Assessment and Management

CLAMS – Coordinated Local Aquaculture Management Systems

CLLD – Community-led Local Development

CRU – Commission for Regulation of Utilities

CSO – Central Statistics Office

CTCCS – Cessation of Turf Cutting Compensation Scheme

DAFM – Department of Agriculture, Food and the Marine

DCCAE – Department of Communications, Climate Action and the Environment

DCHG – Department of Culture, Heritage and the Gaeltacht

DF – Department of Finance

DHPLG – Department of Housing, Planning and Local Government

DPER – Department of Public Expenditure and Reform

DTTS – Department of Transport, Tourism and Sport

DRCD – Department of Community and Rural Development

EAFRD – European Agricultural Fund for Rural Development

EbA – Ecosystem-based approach

EC – European Community

EEC – European Economic Community

EIA – Environmental Impact Assessment

EIB – European Investment Bank

EIP – European Innovation Partnership

EMFF – European Maritime and Fisheries Fund

EREP – Environmental River Enhancement Programme

EPA – Environmental Protection Agency

FLAGS - Fisheries Local Area Groups

FPS – Farm Plan Scheme

FS – Forest Service

GES – Good Environmental Status

GHG MACC – Greenhouse Gas Marginal Abatement Cost Curve

GSI – Geological Survey of Ireland

GLAS – Green Low Carbon Agri-environment Scheme

GoI – Government of Ireland

GPC – Grant Premium Category

ICZM – Integrated Coastal Management System

IAS – Invasive alien species

IEN – Irish Environmental Network

IFA – Irish Farmers Association

IFAC – Irish Fiscal Advisory Council

IFI – Inland Fisheries Ireland

IFNC – Irish Forum on Natural Capital

INCASE – Irish Natural Capital Accounting for Sustainable Ecosystems

INFOMAR – Integrated Mapping for Sustainable Development of Ireland's Marine Resource

IPCC – Irish Peatland Conservation Council

ISGB – Irish Sovereign Green Bond

LAG – Local Action Group

LAWPRO – Local Authority Water Programme

LEADER - Liaison Entre Actions de Développement de l'Économie Rurale

MarPAMM - Marine Protected Area Management and Monitoring

MI – Marine Institute

MFF – Multi-annual Financial Framework

MSP – Marine Spatial Planning

MSFD – Marine Strategy Framework Directive

MSY – Maximum Sustainable Yield

NAF – National Adaptation Framework

NTMA – National Treasury Management Agency

NWS – Native Woodland Scheme

NBAP – National Biodiversity Action Plan

NBDC – National Biodiversity Data Centre

NBER – National Biodiversity Expenditure Review

NCFF – Natural Capital Financing Facility

NHA – Natural Heritage Area

NPF – National Planning Framework

NPWS – National Parks and Wildlife Service

OECD – Organisation for Economic Cooperation and Development

OPW – Office of Public Works

PAF – Prioritised Action Framework

PEDS – Potentially Environmentally Damaging Subsidies

PIR – Policy and Institutional Review

PSIG – Peatland Strategy Implementation Group

PSO – Public Service Obligation

RBAPS – Results-based Agri-environmental Payment Scheme

REV – Revised Estimates Volume

RBMP – River Basin Management Plan

RDP – Rural Development Programme

REPS – Rural Environmental Protection Scheme

RSES – Regional Spatial and Economic Strategy

SAC – Special Area of Conservation

SEEA – System of Environmental and Economic Accounting

SFPA – Sea Fisheries Protection Authority

SNaPs – Strategic Nature Projects

SPA – Special Protection Area

SDG – Sustainable Development Goal

SEA – Strategic Environmental Assessment

SEMRU – Socio-economic Marine Research Unit

SFPA – Sea Fisheries Protection Agency

SWMI – Significant Water Management Issues

SuDS – Sustainable Urban Drainage System

TII – Transport Infrastructure Ireland

UNDP – United Nations Development Programme

WFD – Water Framework Directive