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International Case Studies of Ecosystem Accounting

SECRETARIAT PAPER

No.33 March 2024



An Chomhairle Náisiúnta Eacnamaíoch agus Shóisialta
National Economic & Social Council

An Oifig Náisiúnta um Fhorbairt Eacnamaíoch agus Shóisialta
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Abbreviations

ABS

Australian Bureau of Statistics

AII

Adjusted inclusive income

CBS

Centraal Bureau Voor de Statistiek

CEEA

Committee of Experts on Environmental Accounting (UN)

CONABIO

the National Commission for the Knowledge and Use of Biodiversity (Mexico)

CONAFOR

the National Forestry Commission (Mexico)

CONAGUA

the National Water Commission (Mexico)

CSO

Central Statistics Office

DEFRA

Department for Environment Food and Rural Affairs (UK)

ENCA

Enabling a Natural Capital Approach'

GDP

Gross Domestic Product

GII

Gross Inclusive Income

INFyS

National Forest and Soil inventory (Mexico)

INECC

the National Institute of Ecology and Climate Change (Mexico)

INEGI

National Institute of Statistics Geography and Informatics (Mexico)

IUCN

International Union for the Conservation of Nature

LULUCF

EU Land use Land-use Change and Forestry

MRV

Monitoring Reporting and Verification

NCAVES

Natural Capital and Valuation of Ecosystem Services

NCC

Natural Capital Committee

NDP

Net Domestic Product

NII

Net Inclusive Income

NOVI

National Environmental Vision (Netherlands)

ONS

Office of National Statistics (UK)

PBAF

Partnership for Biodiversity Accounting Financials

PINE

Environmentally Adjusted Net Domestic Product (Mexico)

PM2.5

Particulate Matter

PROFEPA

Federal Environmental Protection Attorney's Office (Mexico)

SEEA-CF

System of Environmental-Economic Accounting Central Framework

SEEA-EA

SEEA Ecosystem Accounting

SEEA UN

System of Environmental Economic Accounts

SEMARNAT

The Federal Environment and Natural Resources Ministry (Mexico)

SNMB

National Biodiversity Monitoring System (Mexico)

TNFD

Taskforce for Nature related Financial Disclosures

UNCBD

UN Convention on Biological Diversity

UN-CEEA

UN through its Committee of Experts on Environmental-Economic Accounting



1. Introduction

As described in (NESC, 2024), the world is increasingly recognising the global crisis in biodiversity and building a response. Biodiversity in Ireland is no less in crisis: The National Biodiversity Action Plan 2023-2030 set out the problem as: ‘Despite ongoing conservation and restoration efforts, Ireland’s biodiversity is in a state of crisis, and urgent, impactful action is imperative to prevent the continued erosion of our natural heritage’ (DHLGH, 2022: 6). As part of building a response to this crisis, a number of countries have developed and built a statistical system to recognise the contributions of nature to the economy and society, natural capital accounting.

This paper will provide an overview of international experience in natural capital and, in particular, ecosystem accounting and present the policy and legal context for these tools in the UN and the EU. This paper will then focus on examining implementation in the UK, Netherlands, and Mexico in some detail and a brief introduction to relevant developments in Australia, Canada and the U.S.A.

The approaches vary significantly with each country offering diverse and valuable insights and learnings. The UK example demonstrates how natural capital accounts can be deeply embedded in policy making processes through legislation, policies and government guidelines but at the same time, how a focus on monetisation rather than spatial data can reduce the immediate insights available from the data. The Netherlands demonstrates the possibilities of a rich, spatial data set for insights but the dangers of neglecting the policy and implementation linkages. The Mexican example demonstrates the value of collaboration and strong linkages between key data providers. Australia, Canada and the U.S. offer some further insights on these themes.

Finally, this paper draws out some common themes across countries and lessons that might be particularly useful for the Irish context. For an introduction to the principles of natural capital or ecosystem accounting approaches please see NESC (2024).

The paper has benefited from engagement with statisticians and experts in the listed countries and from the European Environment Agency. Their assistance is greatly appreciated. Any errors in this paper are the author’s own.

2. Overview of international implementation

2.1 UN-SEEA

The UN, through its Committee of Experts on Environmental-Economic Accounting (UN-CEEA) has led the codification of environmental economic accounting, providing overall vision, coordination, prioritization and direction. It developed the System of Environmental-Economic Accounting Central Framework (SEEA-CF) which was agreed as an international statistical standard in 2012. This brings together economic and environmental information to measure the contribution of the environment to the economy and the impact of the economy on the environment. It looks at 'environmental assets' such as water resources, energy resources, forests, fisheries etc. and their use in or input to the economy and the economy's input back to the environment in the form of waste, air and water emissions (UN, 2022).

The SEEA Ecosystem Accounting (SEEA-EA) standard was adopted by the UN Statistical Commission in 2021. The SEEA-EA complements the Central Framework by providing information on ecosystems and ecosystem services in a format compatible with the system of national accounts and its estimates of countries' wealth and income (e.g. GDP).

The Committee of Experts (CEEA) conducts regular surveys on the status of implementation of the accounting standards, with the most recent being an abbreviated assessment in 2022.

According to the 2022 Global Assessment report, 92 countries have implemented the SEEA. Of these 92 countries, 66 (72 per cent) publish at least one account on a regular basis (stage III); 16 (17 per cent) publish their accounts on an ad-hoc basis (stage II); while 10 countries (11 per cent) compile, but do not yet publish their accounts (stage I). Out of the 92 countries compiling the SEEA, nearly all (91 out of 92) compile SEEA Central Framework accounts. In addition, nearly half (41) of these countries compile the SEEA Ecosystem Accounting. (UN, 2024)

However, the level of implementation, or completeness of these accounts varies considerably. The Global Assessment report lists Ireland one of the countries compiling SEEA Ecosystem Accounts though Ireland is at an early stage of development (UN, 2023).

A review by Hein et al (2020a) digs a little deeper, distinguishing between accounts compiled or published, and detailing which account modules within the Ecosystem Accounts have been undertaken at national or regional level within each country. When exploring which countries in 2020 had undertaken one or more of either ecosystem extent, condition or service accounts or a biodiversity assessment at a national level, this study found just 18 countries had done so, again with high variation in the level of implementation (*ibid.*). This reflects the comparative recency of the standardisation of these accounts. Nevertheless, with a global crisis in biodiversity, interest is high, and implementation across countries is steadily progressing in both rich and poor nations (where many less wealthy nations or communities often have a higher and more direct reliance on natural ecosystems). The UK and the Netherlands produce the most complete set of ecosystem accounts on a regular basis. More detail is provided in the following sections on the approaches of those two countries and Mexico which is also advanced in this area. Highlights are also provided of the approaches taken by Australia, Canada and the United States.

2.2 UNCBD Global Biodiversity Framework

In December 2022, Parties to the UN Convention on Biological Diversity (UNCBD) agreed the Kunming-Montréal Global Biodiversity Framework (UNCBD, 2022a). The Framework sets out a vision and goals for 2050 alongside 23 targets for 2030. The concept of ecosystem services and nature's contribution to people, society and the economy is central. The vision under the framework is as follows:

...by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people (ibid.: p8).

Goal B under the framework is that 'Biodiversity is sustainably used and managed and nature's contributions to people, including ecosystem functions and services, are valued, maintained and enhanced, with those currently in decline being restored, supporting the achievement of sustainable development for the benefit of present and future generations by 2050' (*ibid.*:8). The framework recognises the existence of different value systems for nature in different cultures, mentioning both concepts of ecosystem services and monetisation on the one hand and also rights of nature or mother earth on the other.

The 23 targets for 2030 under the framework are more specific and action oriented. Table 2.1 presents a selection of the 23 targets that are particularly relevant to natural capital accounting and related policy frameworks.

The Framework also establishes a mandatory monitoring framework which includes national reports with headline indicators and suggested other indicators. The agreed, required, headline indicators include; 'services provided by ecosystems', 'extent of natural ecosystems', 'indicator on monetary benefits received', 'indicator on non-monetary benefits', indicators on public expenditure on biodiversity and ecosystems (national and international), 'proportion of agricultural area under productive and sustainable agriculture', 'Average share of the built-up area of cities that is green/blue space for public use for all' (UNCBD, 2022b: 4-5). Natural capital accounts and environmental-economic accounts, such as those developed under the UN-SEEA, can provide the data to address these new reporting requirements. In particular the information provided by ecosystem extent accounts, and ecosystem service accounts will be crucial. The next (Seventh) national report is due by 28th February 2026, with the eighth national report due by 30th June 2029. The national reports will inform global assessments of progress towards the goals and targets of the Framework.

Table 2.1: Selected targets in the Kunming Montreal Global Biodiversity Framework

Target	Relevance
Target 1: 'ensure that all areas are under participatory, integrated and biodiversity inclusive spatial planning and/or effective management processes addressing land- and sea-use change to bring the loss of areas of high biodiversity importance... close to zero by 2030...'	Ecosystem accounting can assist in identification and management of areas of high biodiversity importance.
Target 2: 'Ensure that by 2030, at least 30% of areas of degraded terrestrial, inland water, and marine and coastal ecosystems are under effective restoration...'	Ecosystem accounting can quantify degraded ecosystems
Target 10: 'Ensure that areas under agriculture, aquaculture, fisheries and forestry are managed sustainably, in particular through the sustainable use of biodiversity, including through a substantial increase of the application of biodiversity friendly practices, such as sustainable intensification, agroecological and other innovative approaches, contributing to the resilience and long-term efficiency and productivity of these production systems, and to food security, conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services'	Ecosystem accounting can assist in management and measure the outcome of changes in practices including impacts on ecosystem functions and services.
Target 11: "Restore, maintain and enhance nature's contributions to people, including ecosystem functions and services, such as regulation of air, water, and climate, soil health, pollination and reduction of disease risk, as well as protection from natural hazards and disasters, through nature-based solutions and/or ecosystem-based approaches for the benefit of all people and nature"	Services provided by ecosystems is the suggested indicator for this target which ecosystem accounting can quantify.
Target 14: 'Ensure the full integration of biodiversity and its multiple values into policies, regulations, planning and development processes, poverty eradication strategies, strategic environmental assessments, environmental impact assessments and, as appropriate, national accounting, within and across all levels of government and across all sectors...'	Ecosystem accounting can support the integration of biodiversity into policy making and planning etc.
Target 15: 'Take legal, administrative or policy measures to encourage and enable business, and in particular to ensure that large and transnational companies and financial institutions: (a) Regularly monitor, assess, and transparently disclose their risks, dependencies and impacts on biodiversity, including with requirements for all large as well as transnational companies and financial institutions along their operations, supply and value chains, and portfolios'	Ecosystem accounting can support risk identification and management approaches in the public and private sector.
Target 21: 'Ensure that the best available data, information and knowledge are accessible to decision makers, practitioners and the public to guide effective and equitable governance, integrated and participatory management of biodiversity, and to strengthen communication, awareness-raising, education, monitoring, research and knowledge management...'	Ecosystem accounting can improve data availability and accessibility

Source: UNCBD (2022).

2.3 European Union

As part of the EU Green Deal (EC, 2019), the European Commission published a biodiversity strategy to put Europe's biodiversity on the path to recovery by 2030 for the benefit of people, climate and the planet (European Commission, 2020). The proposed Nature Restoration Law, which has been agreed between the European Commission, the European Parliament and the European Council, is a significant part of that strategy (European Council, undated). Also under the biodiversity strategy, the European Commission proposed an amendment to the EU, Regulation 691/2011 on European environmental economic accounts (EC, 2022). This is currently under negotiation between the Council and the Parliament. The broad intentions of the proposal appear to be accepted with negotiation focussing on timelines and support for implementation for some Member States.

Regulation 691/2011 sets a common framework for the collection, compilation and submission to the Commission (Eurostat) of Member States' environmental economic accounts, by providing a methodology, common standards, definitions, classifications and accounting. It was previously amended by Regulation 538/2014 to expand the range of modules. The Regulation currently requires six modules of accounts:

- Air emission accounts

- Environmentally related taxes by economic activity

- Economy-wide material flow accounts

- Environmental protection expenditure accounts,

- Environmental goods and services sector accounts, and

- Physical energy flow accounts

In July 2022, the European Commission put forward a proposal for a further amendment to the Regulation to add three further modules;

- Forest accounts,

- Ecosystem accounts, and

- Environmental subsidies and similar transfers accounts

The stated aim of the proposal is 'to provide better information for the European Green Deal'. The three proposed modules respond to and are underpinned by international statistical standards: the UN System of Environmental Economic Accounts (SEEA) Central Framework and UN SEEA Ecosystem Accounts. The definition of ecosystem accounts under the regulation is 'a set of accounts designed to provide consistent information on extent and condition of ecosystems and on the flows of services from these ecosystems to society (*Ibid.*: p10).' The ecosystem extent and ecosystem condition accounts are to be compiled and reported every three years.

The proposal has been discussed by the European Council. Published documents from those meetings seem to suggest that the inclusion of ecosystem accounts is accepted but that some Member States will require extra support for their national statistical institutes. The Commission proposal suggested that ecosystem service accounts be compiled and reported annually, which seems like it might be accepted. Extent and condition accounts will be reported every three years. The base year will be 2024 (Council of the European Union, 2022). It should be noted that a requirement for reporting every three years would not preclude more regular reporting.

With the principle of legislation for Ecosystem Accounts broadly accepted, Eurostat has been proceeding with developing guidelines for Member States. Ireland (through the CSO) is participating in a Taskforce on Ecosystem Accounting led by Eurostat (Sharkey, 2023).

2.4 Other initiatives

Countries are not the only entities that can and do report on nature. There has been much development in recent years regarding reporting by the corporate sector of their impacts on nature. The Taskforce for Nature-related Financial Disclosures (TNFD) was launched in 2021 with an aim to provide decision makers in business and capital markets with better information through corporate reporting on nature, allowing business to incorporate nature-related risks and opportunities into their strategic planning, risk management and asset allocation decisions.¹ In 2023, the TNFD published its first recommendations with respect to nature related disclosures. Its recommendations are consistent with the goals of the Global Biodiversity Framework and is aligned with the UN SEEA ecosystem accounting in its definitions and list of environmental assets and ecosystem assets. The recommendations note the agreed metrics in place at global and national levels but also the lack of agreed metrics and target frameworks below national level comparable to the developed frameworks for scope 1, 2 and 3 metrics for reporting greenhouse gases and the setting of science based targets consistent with goals for net zero emissions (TNFD, 2024). More than 300 companies announced at Davos in 2024 that they would report on the impacts they have on the natural world, based on the TNFD recommendations (Jessop, 2024).

The Global Reporting Initiative (GRI), an organisation that has provided guidance on communicating and demonstrating accountability for organisations' impact on nature for over 25 years, provided updated guidance in 2024 for reporting biodiversity impacts throughout their operations and value chain (GRI, 2024).

The EU is also encouraging the corporate and business sector in its reporting of impacts on nature and biodiversity. Under the Sustainable Financial Disclosure Regulation, financial market participants have been required to disclose the adverse impacts of their investments on environment and biodiversity (European Union, 2019).

These are just some of the initiatives in development globally. Without some further coordination, there is a risk here of confusion across different standards and methodologies, even if most take their basic definitions at least indirectly from the UN SEEA ecosystem accounting standards. Further coordination and alignment of reporting efforts would present an opportunity for an enhanced shared understanding and more robust data on overall trends in nature based on bottom up data provided by a wider range of actors, including the public sector, business and academic and research institutions.

¹ See <https://tnfd.global/> accessed 05/03/24.

3. The United Kingdom

As far back as 2011, the UK Government published a Natural Environment White Paper discussion document that initiated the development of natural capital accounting in the UK with a commitment to develop and publish a roadmap in 2012 for the incorporation of natural capital into the UK's environmental accounts by 2020 (DEFRA, 2011). This was jointly led early on by Department for Environment, Food and Rural Affairs (DEFRA) and the Office of National Statistics (ONS). The commitment was met, and momentum has since been maintained for continual improvement. A Natural Capital Committee, chaired by Prof. Dieter Helm, was established in 2012 and very influential on the development of the accounts. The Committee was wound up in 2020 (NCC, 2020).

The UK official statistical agency, the ONS has produced natural capital accounts annually since 2019, and reported under the banner of its national accounts since 2020 (ONS, 2022b). The natural capital accounts team, numbering about ten people, sits within the environment division under the economics area of the ONS. The UK natural capital accounts produced by the ONS are just one component of a broad-based effort to integrate a natural capital approach in decision making across government and society. The Treasury, the Department for Environment, Food and Rural Affairs (DEFRA), and Natural England are just some of the key players in this effort.

3.1 Legislative and Policy Context

The legislative and policy context for ecosystems and natural capital is very rich in the UK with significant developments occurring in recent years. The Environment Act (2021) sets out environmental principles which must be taken into account by ministers when making policy (except in matters of defence and national security):

- the principle that environmental protection should be integrated into the making of policies,

- the principle of preventative action to avert environmental damage,

- the precautionary principle, so far as relating to the environment,

- the principle that environmental damage should as a priority be rectified at source, and

- the polluter pays principle (*ibid.*).

Under the Act the environment minister (the minister) is required to set at least one long-term environmental target under each of the following areas: air quality; water; biodiversity; resource efficiency and waste reduction, with a requirement for a further short term 'species abundance target'.

The Environment Act (2021) also sets out a requirement for an environment improvement plan covering a period of at least 15 years and for the minister to obtain data 'for the purpose of monitoring whether the natural environment is, or particular aspects of it are, improving in accordance with the [mandated] current environmental improvement plan (*ibid.*). The 2018 document 'A Green Future: Our 25 Year Plan to Improve the Environment' was retrospectively identified under the 2021 Act as the first environment improvement plan (HM Government, 2018). The 2018 plan specified an intention to 'set gold standards in protecting and growing natural capital – leading the world in using this approach as a tool in decision-making. We will take into account the often hidden additional benefits in every aspect of the environment for national wellbeing, health and economic prosperity, with scientific and economic evidence to the fore' (*ibid.*:9). In December 2023 an updated plan was released, which built on the 2018 document, recognising the estimated £1.8 trillion valuation of natural capital, puts forward further plans for improving the use of natural resources (DEFRA, 2023b).

Many articles of the UK Environment Act (2021) require an assessment of the costs and benefits of actions to determine the course of action. The Treasury Green Book (the central government guidance on appraisal and evaluation of policies, programmes and projects) includes an explainer and recommendations on natural capital. In its guidance on the valuation of costs and benefits, it strongly advocates the use of the natural capital approach (HM Treasury, 2022). This is further discussed in section 3.4.

In 2019 the Treasury commissioned the Dasgupta Review on the Economics of Biodiversity which was published in 2021 (Dasgupta, 2021). The Review called for changes in how we think, act and measure economic success to protect and enhance our prosperity and the natural world. Grounded in a deep understanding of ecosystem processes and how they are affected by economic activity, the framework presented by the Review sets out how nature should be accounted for in economics and decision-making. The Review has been influential on UK policy and the international debate on addressing the biodiversity crisis (*ibid.*).

3.2 The Accounts

The UK Natural Capital Accounts are wide ranging with physical and monetary estimates of annual flows of ecosystem services as well as monetary estimates of asset values. They are however explicitly labelled as experimental statistics i.e. they are ‘in the testing phase, are not yet fully developed and have not been submitted for assessment to the UK Statistics Authority’ as the methodologies are still evolving and changing (ONS, 2022c). Asset values are estimated from the Net Present Value of ecosystem services over the lifetime of the asset. Renewable natural capital assets are assumed to have a 100-year lifetime. The ecosystem services covered are listed in Table 3.1 along with their units of measurement in physical terms where available.

Table 3.1: UK Natural Capital Accounts Ecosystem Services

Provisioning Services
Agricultural biomass (Thousand tonnes, primary biomass)
Fish (Thousand tonnes, live weight)
Oil and gas (Million tonnes of oil equivalent)
Coal (Million tonnes of oil equivalent)
Minerals and metals (Thousand tonnes)
Timber (Thousand cubic metres overbark standing)
Woodfuel (Thousand cubic metres overbark standing)
Water (Million cubic metres)
Renewable electricity (Gigawatt hours)
Regulating Services
Greenhouse gas regulating (Thousand tonnes of CO2 equivalent)
Air pollution regulating (Thousand tonnes)
Urban heat regulating
Noise regulating (Number of buildings benefiting from 1 decibel reduction in noise)
Cultural Services
Recreation and tourism (expenditure) (Number of outdoor recreation and tourism visits, millions)
Recreation (health benefits) (Number of people gaining health benefits from recreation, millions)
Recreation and aesthetic (House prices)

Source: ONS (2023c).

The annual natural capital accounts for the UK, since 2023, are now also presented for the different countries of the UK and some of the underlying data is available on a local basis, such as air quality (ONS, 2023c). Changes in ecosystem extent are now also presented in the accounts for the UK and the respective countries of the UK. The condition accounts are not presented in the annual accounts but such changes are intended to be reflected in the value of the ecosystem services presented. This perhaps could reduce the informational value of the accounts. However, references are supplied online for all data sources and methodologies of valuation for the different ecosystem services are also supplied online. Table 3.2 presents the asset value account of the UK Natural Capital Accounts 2023.

Table 3.2: Ecosystem Services in the UK 2021 (2022 prices)

Ecosystem Service	2021
Agricultural biomass provisioning (£ million, 2022 prices)	183,735
Coal provisioning (£ million, 2022 prices)	-3,703
Fish provisioning (£ million, 2022 prices)	2,969
Minerals and metals provisioning (£ million, 2022 prices)	12,589
Oil and gas provisioning (£ million, 2022 prices)	111,975
Renewable electricity provisioning (£ million, 2022 prices)	40,736
Timber provisioning (£ million, 2022 prices)	11,767
Woodfuel provisioning (£ million, 2022 prices)	2,988
Water provisioning (£ million, 2022 prices)	130,792
Air pollution regulating (£ million, 2022 prices)	124,511
Greenhouse gas regulating (£ million, 2022 prices)	-35,935
Noise regulating (£ million, 2022 prices)	944
Urban heat regulating (£ million, 2022 prices)	18,048
Recreation (health benefits) (£ million, 2022 prices)	444,808
Recreation and aesthetic (house prices) (£ million, 2022 prices)	118,342
Recreation and tourism (expenditure) (£ million, 2022 prices)	380,606
All services (£ million, 2022 prices)	1,545,172

Source: ONS (2023c).

The ONS also produces experimental supply and use tables for ecosystem services and natural capital. This estimates the flow of associated goods and services through the economy. It allows an estimation of the direct gross value added of nature to the UK in economy, estimated at £51 billion in 2020 ONS (2023a). Further development of the supply and use tables is planned.

3.2.1 Natural England

Natural England is an executive non-departmental public body, sponsored by DEFRA. They are the government's adviser for the natural environment in England with a mandate to protect and restore the natural world (Natural England, 2024). Natural England has produced natural capital atlases for counties and cities, at a resolution of 5km² or 500 hectares, which define concentration or quantity of different asset types, and also the distribution of a small number of ecosystem services such as; water available for abstraction, carbon sequestration, and water quality. The atlases do not assign values to the natural capital or ecosystem services (Natural England, 2020).

3.2.2 Monetisation

The UK's natural capital accounts are built towards monetisation of the annual flows and asset values of ecosystem services across all ecosystems. The analysis underpinning this valuation is used by the ONS to inform and support periodic valuations of different individual ecosystem types of the UK.² For example, an estimate of the asset value of forestry and woodland ecosystems, taking into account the value of ecosystem services from standing trees, has been regularly prepared. Less regular estimates have also been prepared for peatlands, the marine and most recently, urban natural capital. These estimates are useful to inform policy priorities. For example, the estimates of value of woodland ecosystems routinely show that the value of ecosystem services from woodlands is greater than the harvesting value of the timber. In fact, the non-market benefits from woodlands (e.g. of carbon sequestration, pollution removal and recreation) were an estimated £8.6 billion, exceeding the market benefits of timber and woodfuel (£372.9 million) by approximately 23 times (ONS, 2022d).

3.3 Impact of Accounts: Contribution to Understanding

DEFRA published an 'insights' paper on nature and natural capital based on the ONS data, 'Nature at work for people and the economy' in 2023. The paper included the following among its ten insights:

- 'Nature should be seen as a large economic sector in its own right;

- Nature works for many sectors of the economy and society, but this contribution is not visible within conventional accounts.

- Natural capital is a major source of national wealth.

- The economic value of nature depends on its location, on demand and population, as well as its extent and condition.

- Nature is a significant health service provider; and

- Nature in urban areas is especially valuable' (DEFRA, 2023c: 3).

Thus, the natural capital accounts provide a useful framing and context for ambition setting and policy development.

The natural capital accounts support and underpin the modular development of more detailed statistics on specific ecosystems, such as the regular preparation of woodland accounts by providing the individual or unit values that support the overall valuation of an ecosystem type such as woodlands. This has led to the findings previously mentioned in section 3.2.2 that the value of standing natural woodlands exceeds the value of the timber.

The Government's 2018 Environment Improvement Plan seeks 'to improve social justice by tackling the pollution suffered by those living in less favourable areas, and by opening up the mental and physical health benefits of the natural world to people from the widest possible range of ages and backgrounds' (HM Government, 2018: 9). The value of the UK's natural capital annual accounts is seen in their use as an input to other processes or analytical efforts. For example, one ONS publication was able to highlight that 'areas least likely to have a private garden are most likely to live close to a public park', an important check on spatial planning outcomes (ONS, 2020a).

The lack of spatial or ecosystem disaggregation in the ONS annual accounts means that understanding the values or contributions in individual areas or of different ecosystem types is difficult. The accounts provide information regarding the comparative values of different ecosystem services or the overall value of ecosystem annual services or assets.

The ONS has begun releasing a 'work in progress' national statistic on inclusive income. Inspired by the concept of 'inclusive wealth' put forward in the Dasgupta review, the aim in developing this statistic is to complement rather than replace national accounts based measures of economic progress. The Gross Inclusive Income (GII) measure expands the

² From interviews with ONS staff (2023).

definition of ‘the economy’ to include the unpaid household production and additional ecosystem services from natural capital. GII will include investment in all natural capital assets identified in the SEEA environmental economic accounts and the associated ecosystem services they produce. The UK’s natural capital accounts do not yet disaggregate changes into investment, and capital consumption and therefore more research is required to properly reflect natural capital in GII. Net inclusive income (NII) builds on GII by accounting for depreciation in produced human, and natural capital. Adjusted inclusive income (AII) could reflect e.g. externalities amongst other adjustments (ONS, 2023b). The natural capital and environmental dimension of the GII, NII and AII statistics, when complete, could be comparable environmental adjustments made to national income in the longstanding Mexican ecologically adjusted NDP (PINE) statistic, discussed further in section 5.4.

3.4 Impact of Accounts: Policy and Decision Making

As natural capital accounting is so recently developed, impact on outcomes is hard to gauge as yet. However, as described below, steps have been taken through policy and legislation to ensure that natural capital accounting is used in decision making. The values of nature for any given policy, programme or project are not always going to be sufficient to shift decision making in themselves but the mandated inclusion of natural capital considerations in decision making can generate a cultural shift that leads to a wider consideration of options to reduce negative impacts where they occur.

The Treasury’s guidance on options appraisal and evaluation, the Green Book, includes screening questions for officials to consider the possibility of unintended consequences or missed opportunities in relation to natural capital. Screening questions determine the need for the policy maker to undertake further assessment of natural capital impacts. ‘Understanding natural capital provides a framework for improved appraisal of a range of environmental effects alongside potentially harmful externalities such as air pollution, noise, waste and GHGs. Natural capital stock levels should be systematically measured and monitored for the social costs and benefits of their use to be understood and controlled ... the cumulative effects of multiple decisions on natural capital stocks need to be considered. Where appropriate therefore, and particularly for major impacts, assessments should consider whether affected natural assets are being used sustainably’ (HM Treasury, 2022: 63). In the event of further assessment being required, the treasury guidance directs policy makers towards Defra guidance.

In 2020, Defra published a guidance document and tools for ‘Enabling a Natural Capital Approach’ (ENCA) (DEFRA, 2023a). This builds on the Treasury’s official appraisal and evaluation guidance for government policies, programmes and projects. The Treasury recommends use of the ENCA guidance where natural capital impacts are anticipated to be significant. The aim of ENCA is *inter alia*, to build capacity among users to assess and value the natural environment by providing comprehensive information and resources (DEFRA, 2020).

The Environment Act 2021 introduced a statutory framework for biodiversity net gain (UK Government, 2021). This means that every planning permission is subject to securing the biodiversity gain objective which is to deliver at least a 10% increase in relation to the pre-development biodiversity value of the development granted permission. This can be achieved through onsite biodiversity gains, registered gains offsite or statutory biodiversity credits. A plan for biodiversity gain must be submitted to the planning authority before commencement of the development. There are some exemptions to this requirement but also special treatment for irreplaceable habitats (DHULC, 2023).

3.5 Impact of Accounts: Communication and Awareness

As the regular accounts are relatively new, they are not yet familiar to the public or the media and so the media pick up has generally been limited. Though a more recent release accompanied by an ONS blog titled “A million fewer people are gaining health benefits from nature since 2020” received more attention (ONS, 2023d). Some individual statistics, such as on private and public green space, have received media attention. For example, the woodland natural capital accounts 2021 provided the basis for an article by Bloomberg titled ‘London’s Trees are Saving the City Billions’ (O’Sullivan, 2020). The peatlands accounts informed a Guardian article ‘Nature is not an impediment to UK economic growth: it’s vital to it’ (Juniper, 2022).

The ONS has thought about how to improve its communications with blogs and articles on the topic available on their website. ONS releases are written in accessible form and clear messaging is given on the meaning or implication of the accounts where possible. The ONS found across all areas, ‘charts that allow the user to get information that is personalised or local to them, like calculators or maps, tend to get more interaction’ (Broad, 2021).

4. The Netherlands

The initial development of ecosystem or natural capital accounting in the Netherlands goes back about a decade. Between 2011 and 2014, the Dutch government launched a series of studies and experiments involving businesses, the International Union for the Conservation of Nature (IUCN) and the government – to stimulate awareness about and experiences with the values of biodiversity and natural capital. Subsequently an online platform, Natural Capital Atlas was developed for the sharing of spatial, ecosystem and natural capital data (Van Bodegraven, 2018).³

4.1 Legislative and Policy Context

Decentralisation of nature policy was agreed between the central government and the provinces, with the division of responsibility set out in regulations in 2011 and the relationships further elaborated in 2013. The central government is responsible for setting the boundaries and ambitions of nature policy while the twelve provinces are responsible for the detailed development of policy and its implementation. Central government agreed a vision for nature with the provinces in 2014, ‘The Natural Way Forward’, which covers the period up to 2025 (Biodiversity-CHM.NL, 2024b). A National Rural Area Programme (Nationaal Programma Ladelijk Gebied (NPLG)) was established to provide a framework for provinces to draw upon in developing their plans to meet the goals for nature (Government of Netherlands, undated).

In 2019, a further nature policy was agreed between the central government and the provinces; Strengthening Biodiversity (‘Versterken Biodiversiteit’) with an aim to turn the general decline in nature into recovery (Biodiversity-CHM.NL, 2024a). The policy covers many dimensions of nature and environment including *inter alia* the Water Framework Directive, agriculture and the circular economy, energy, built environment and the financial sector. It includes a new focus beyond protected nature areas towards making other land uses (agriculture, renewable energy, housing construction) nature positive. In 2023 a ‘Nature Inclusive Agenda’ was launched. It is a public private partnership for transition to a nature-positive society with a plan for investment and diverse practical projects on the ground to deliver enhanced spaces for nature while also including action plans for different sectors to work better with and for nature (Collectief Natuurinclusief, 2023).

The Dutch government is also a key supporter of the Partnership for Biodiversity Accounting Financials (PBAF), a partnership led by the financial industry that facilitates the industry to transparently assess and disclose their impact and dependency on biodiversity, and the Taskforce for Nature related Financial Disclosures (see section 2.4). The PBAF aligns and cooperates with the Taskforce for Nature related Financial Disclosures (TNFD) (PBAF, 2024). Furthermore the Strengthening Biodiversity policy aims to move towards better measurement of biodiversity within the Welfare Monitor produced by CBS, the national statistics agency of the Netherlands. There is a commitment to investigate how to better safeguard biodiversity during formulation of policies and regulations. The Netherlands also supports the Ecosystem services Valuation Data base (also available in English), with data on ecosystem services globally (ESVD, 2024). Finally, to support biodiversity worldwide as well as at home, the policy includes a target to halve the ecological footprint (an indicator reflecting impact of both consumption and production) of the Netherlands by 2050 (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2024).

³ This Atlas is still maintained and is also available in English. See <https://www.atlasnatuurlijkkapitaal.nl/>

4.2 The Accounts

Development of the natural capital accounts began as collaboration between the Dutch statistical agency, CBS in partnership with experts at the University of Wageningen, with EU funding, and support subsequently provided by the Ministry for Agriculture, Nature and Food Safety. Initially CBS contracted the work out to the University of Wageningen. CBS now has a team of about nine people working on the ecosystem accounts, with eleven overall on natural capital accounting (Hein *et al.*, 2020b).

The Dutch approach from the start has been spatially based with accounting at a resolution of 10m² based on a mix of downscaling and local data. They take an integrated approach to developing and presenting the six main accounts of the SEEA EA at national level. Accounts are produced every three years with a small delay in the most recent accounts due to Covid-19. Complete accounts have been published for 2013, 2015 and 2018. Data for 2020 is available for some areas (CBS, 2021).

The complete accounts include ecosystem extent, ecosystem condition, ecosystem service estimates in physical and monetary terms, by ecosystem type and by province. Finally, asset values are derived from ecosystem services and made available on a per province basis. Table 4.1 shows the ecosystem types for which extent, condition and ecosystem services are measured.

Table 4.1: Ecosystem Types Netherlands Ecosystem Accounts

Forest	(Semi) natural forest
	Hedges
	Productive forest
	Other forest
Open Nature	Thicket
	Heath
	Drifting sand
	Semi natural grassland
	Natural farmland
Wetlands	Other
	Swamp forest
	High moor
Dune and Beach	Low moor
	Coastal dunes
	Salt marsh
Water	Strand
	Watercourse
	Pond
	Brackish water
	Intertidal area
	Sandbank
	Estuary
	North Sea
Wadden sea	

Agriculture	Arable Farming regular
	Arable farming extensive
	Perennial regular
	Perennial extensive
Grassland	Grass-land permanent
	Grass-land temporary
	Grass-land extensive
Intensive Horticulture	Green-house horticulture
	Pot & container cultivation
Agriculture other	Fallow
	Wild margins
Residential	Built-up urban
	Built-up rural
Economic	Company premises
	Company Grounds
Infrastructure	Infra-structure
	Sea, other (ports)
Other	Other grassland
	Other terrain
Public Parks	Landscape garden
	Park
	Garden
	Green zone
	Semi-public green
Recreation	Sports field
	Residential recreation

Source: CBS (2023c).

Table 4.2 shows the ecosystem services, their unit of physical measurement and the 2018 values for selected provinces and the Netherlands. With about 50 ecosystem types included and assessed at a nationally aggregated level, there is great capacity to inform understanding at a national level of the state of ecosystems and their value (CBS, 2021).

Table 4.2: Ecosystem Services 2018 for Selected Provinces and Netherlands

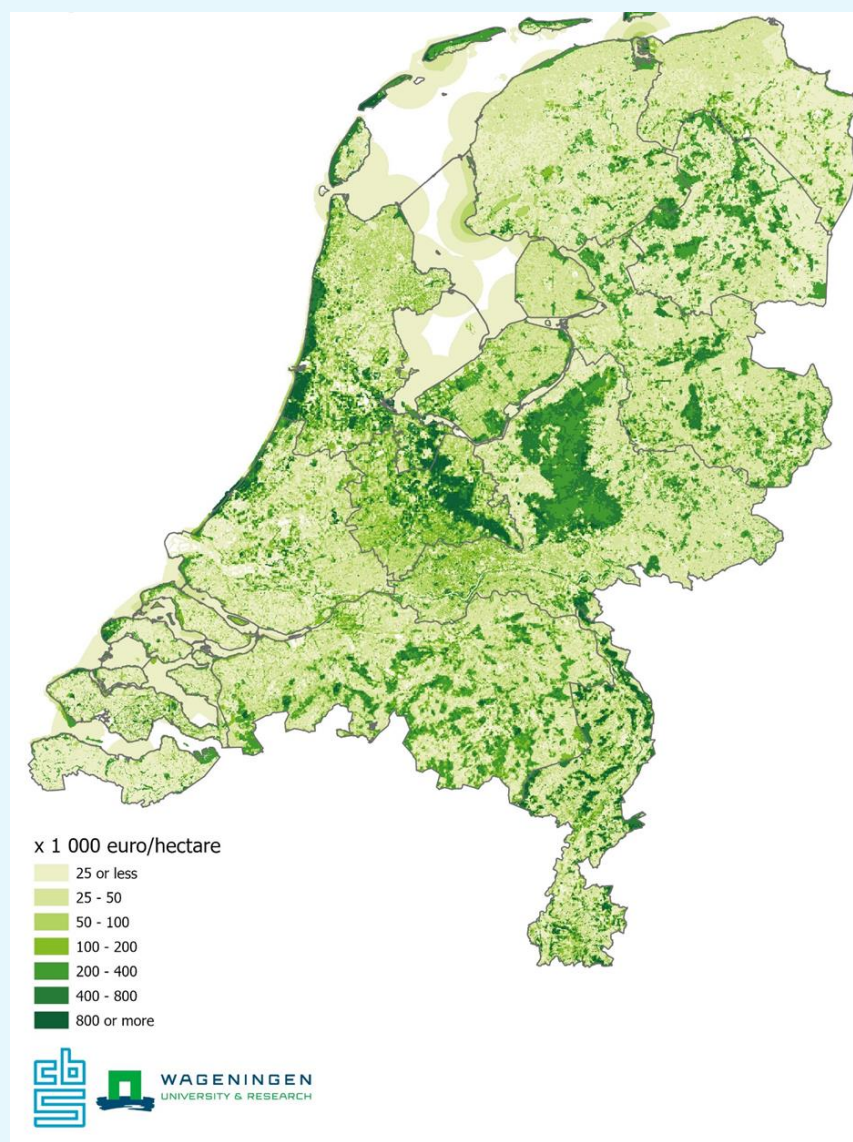
Supply table of ecosystem services for Netherlands and selected provinces, 2018	Unit	Flevoland	Gelder-land	Utrecht	Total Netherlands
Provisioning Services					
Production of food crops (arable farming)	kt	2,486	513	9	15,702
	mln euro	68	12	1	339
Production of food crops (horticulture)	kt	128	214	65	1,423
	mln euro ¹⁾	23	12	3	178
Production flower bulbs	kt	27	2	0	186
Production fodder crops (grass)	kt	104	1,239	447	7,746
Production of fodder crops (maize)	kt	140	1,498	248	8,307
Production of fodder crops (grass and maize)	mln euro	20	110	37	666
Wood production	1000 m ³	75	276	56	1,069
	mln euro	3	11	2	44
Regulating Services					
Water purification	mln m ³	.	.	.	429
	mln euro	.	.	.	181
Air filtration	tonne PM _{2.5}	652	4,638	1,034	18,834
	mln euro	5	28	17	172
Climate regulation (worldwide)	kt C	35	169	41	827
	mln euro	7	33	8	161
Pollination	kt	17	109	48	347
	mln euro	12	90	43	374
Rainwater regulation	mln litre in 1 hour	23,229	184,325	34,728	940,971
Coastal protection	hectare	0	0	0	36,071
	mln euro	0	0	0	161
Local Climate Regulation	reduction in °C
Cultural Services					
Nature recreation (hiking)	mln km	131	687	358	4,818
Nature recreation	mln euro	188	681	330	5,826
Nature tourism	x1000 overnight stays	1,945	11,527	1,983	90,237
	mln euro	161	944	105	7,053
Green liveability	mln euro	32	135	108	1,476

Source: CBS, (2021).

4.2.1 Monetisation

The Netherlands provide estimates of values with a possibility to see the values attributed to individual ecosystem types or disaggregated to province level in the accounts. They have produced a map where it is possible to view the contribution of ecosystems to the green quality of life in the Netherlands, on a euro/hectare/year basis. They have also produced a table of the top 15 ecosystem types with highest average monetary value, with parks and coastal dunes in first and second place followed by semi natural woodland (CBS, 2021). However, given the caveats attached to monetisation of ecosystem services and natural capital assets, they have chosen to generally not emphasise the results of the monetisation exercise when publishing their accounts.⁴

Figure 4.1: Value of ecosystem capital in the Netherlands based on 10 ecosystem services in 2020



Source: Updated from (CBS, 2021).

⁴ From interviews with CBS staff (2023).

4.3 Impact of the accounts: Contribution to Understanding

The granular level of detail and spatial disaggregation has created an impressive set of accounts for the whole country. However, because the provincial data in the accounts are derived top-down from the national level data, provinces can have better data on their own province where local level data was collected.⁵

CBS tracks 'broad prosperity' of the Netherlands in the 'here and now', 'later' and 'elsewhere'(CBS, 2023c). This includes an environmental component in the 'here and now' and a future component, called natural capital (see Table 4.3). The natural capital element now includes results from CBS' ecosystem capital accounts, namely green blue space, excluding conventional farming, surface water with good chemical quality and surface water with good biological quality. Two new indicators will be included this year.

Table4.3: Broad Prosperity Indicators for the Netherlands 'here and now'

Well-Being in the 'Here and Now'		
Subjective Well-being	Satisfaction with life	%
	Feeling in control of own life	%
Material prosperity	Median disposable income	€ per household
	Individual consumption	€ per capita
Health	Healthy life expectancy men	Years at birth
	Healthy life expectancy women	Years at birth
	Overweight population	%
Labour and leisure time	Long-term unemployment	%
	Net labour participation	%
	Highly educated population	%
	Satisfaction with leisure time	%
	Time lost due to traffic congestion	Vehicle hours lost per capita
	Satisfaction with work (employees)	%
Living	Housing costs (rented and own homes)	% of disposable income
	Satisfaction with housing	%
Society	Contact with family, friends or neighbours	%
	Voice and accountability	%
	Volunteer work	%
	Trust in institutions	%
	Changes in values and norms	%
	Trust in other people	%
Safety	Victims of crime	%
	Often feeling unsafe in the neighbourhood	%
Environment	Managed natural assets (terrestrial) within NNN	%
	Urban exposure to particulate matter (PM _{2.5})	micrograms
	Environmental problems	%
	Quality of inland bathing waters	
	Nitrogen deposition and terrestrial nature	%

Source: CBS (2023a).

⁵ From interview with Prof. Lars Hein (2023).

CBS has looked at distribution of wellbeing outcomes across the population and the extent to which favourable or unfavourable outcomes across categories 'stack' or accumulate for different population groups and to track whether this improves or disimproves over time (CBS, 2023d). A reduced set of indicators is employed so far with the environment being represented by the 'environmental problems' indicator. Nevertheless, it shows the potential for future insights as the methodologies develop.

Table 4.4: Broad Prosperity Indicators for the Netherlands 'later'

Well-being Later		
Economic capital	Physical capital stock	€ / hour worked
	Knowledge capital stock	€ / hour worked
	Median household wealth	euros
	Average debt per household	euros
Natural capital	Installed capacity renewable electricity	MW / million inhabitant
	Managed terrestrial nature in NNN	% land area
	Green-blue space, excluding regular agriculture	M ² area
	Phosphorus surplus	Kg/ha cultivated land
	Nitrogen surplus	Kg/ha
	Fauna of the country	Index trend
	Fauna of freshwater and marsh	Index trend
	Surface water of good chemical quality	%
	Groundwater abstraction	m ³
	Urban exposure to PM _{2.5}	mg/m ³
	Cumulative CO ₂ emissions	tCO ₂ per capita
Human capital	Hours worked	Per capita
	Highly educated population	%
	Healthy life expectancy for women	Years at birth
	Healthy life expectancy men	Years at birth
Social capital	Trust in other people	%
	Feelings of discrimination	%
	Trust in institutions	%

Source: CBS (2023b).

4.4 Impact of the accounts: Policy and Decision Making

It appears that a route of impact on policy for CBS' natural capital ecosystem accounts has not been established. Regulations and government policies make no reference to it. This is perhaps due to a mismatch between the level of the statistics development, at national level and the reality that decisions on detailed elaboration of policy and implementation are taken at provincial level in accordance with the division of mandate and responsibilities set out in legislation in 2011 (Biodiversity-CHM.NL, 2024b).

As noted in the Section 4.3, because the provincial data in the natural capital accounts are derived from a combination of the national level data and local data, at a local level they can be seen as less accurate. The natural capital accounts have yet to be embraced by the provinces, though workshops are ongoing to increase understanding and awareness in provincial government.⁶

Since 2013, national guidelines for cost benefit analysis have offered some guidance on including the impact on nature (Romijn & Renes, 2013). In 2018, a supplementary guideline on nature was published which recommends the use of biodiversity points. The biodiversity points are calculated by multiplying three components:

- 'The area of natural or semi-natural ecosystems affected (in hectares or square kilometers);

- The ecological quality of each area;

- A weight factor per type of ecosystem, reflecting the contribution of the ecosystem to species richness at national, European or global level, which depends on the species present in the ecosystem and their threat level' (Bos & Ruijs, 2019: 8).

The biodiversity points are not monetised and therefore do not have an impact on the 'bottom line' of a cost benefit analysis. However, a track record of analyses using the points has allowed an increased understanding of the cost-effectiveness of achieving increased biodiversity points. It is noted that biodiversity points allow positive impacts on biodiversity to be taken into account whereas a regulatory compliance check can only reflect on negative impacts. However, use of the natural capital accounts would also allow the consideration of both positive and negative impacts. The biodiversity points does not seem to point to data from CBS' natural capital accounts (Bos & Ruijs, 2019).

In the Netherlands a 'Policy Compass' provides guidance to policy makers on formulating a social intervention, revision of existing policy or creating a new policy file. The policy compass contains five steps, asking: 1) what is the problem? 2) what is the intended purpose? 3) what are the options to achieve the goal? 4) what are the consequences of the options? And finally 5) what is the preferred option? Guidance for the fourth step includes checking what are the consequences for the environment, how do the options impact broad prosperity, including natural capital and how do the options impact on achievement of the sustainable development goals. The Netherlands also provides guidance for Social Cost Benefit Analysis that includes consideration of impacts on biodiversity through the lens of ecosystem services as well as biodiversity points (KCPR, 2023).

Netherlands' environmental assessment agency PBL, in collaboration with the University of Wageningen, the National Institute for Public Health and the Environment (RIVM) and CBS, developed a Nature Capital Model. This model allows the mapping and calculation of ecosystem services in the present and a projection of change in ecosystem services under different scenarios in the future. This allows for the ex ante assessment of possible impacts of policy changes on ecosystem services. The model is designed to inform and support decision makers to capture nature's contribution to people in decision making (PBL, undated).

⁶ From interview with Prof. Lars Hein (2023).

4.5 Impact of the accounts: Communication and Accessibility

The natural capital accounts for the Netherlands are published in complete form on the CBS website (CBS 2024). Excel spreadsheets of the accounts, alongside a report of the results and a technical report on the methodology behind the data are all published together. The technical report addressing the methodology behind the accounts is available in both Dutch and English.

The Netherlands collects a lot of environmental data and uses it in many different ways. A website, Compendium for the Living Environment, is a collaboration between the national statistics office, CBS, the Netherlands Environment Assessment Agency, PBL, Wageningen University and the National Institute for Public Health and the Environment, RIVM which brings together data on the environment, nature and space in the Netherlands (Government of the Netherlands, 2023). The website also provides visitors with an explanation and interpretation of the data. Much of this data is used to monitor progress on the 'National Environmental Vision' (NOVI). PBL prepare a biennial assessment of progress on the vision. Indicators include e.g., marine fauna, waste generation and treatment, greenhouse gas emissions, housing construction in unfavourable locations for soil and water, nature quality red list species, soil acidity, scattered buildings in valuable landscapes (Kuiper *et al.*, 2023).

5. Mexico

Mexico has long played a leading role in producing official national environmental statistics. In 1991, Mexico's National Institute of Statistics and Geography (INEGI) was one of the first to produce national environmental accounts, through a pilot project with the World Bank (Van Tongeren *et al.*, 1991). Since 1998, Conabio has synthesised and published information on Mexico's biodiversity and natural capital, bringing together a wide range of experts (Biodiversidad Mexicana & CONABIO, 2023). In 2017, INEGI participated in the EU funded Natural Capital and Valuation of Ecosystem Services (NCAVES) project to develop pilot ecosystem accounts under the framework of the UN SEEA EA. The project completed in 2021 with a publication of the accounts and a comprehensive report (INEGI, 2021b).

5.1 Legislative and Policy Context

In 1999, the constitution of Mexico was amended to include the following provision under article 4.:

'Any person has the right to a healthy environment for his/her own development and well-being. The State will guarantee the respect to such right. Environmental damage and deterioration will generate a liability for whoever provokes them in terms of the provisions by the law.' (Government of Mexico, 2019)

Aside from this right, article 4 of the Constitution identifies other rights that require biodiversity and the services it renders for their fulfilment, such as the right to health, water, and sanitation, as well as the right to food, among others (INEGI, 2021b).

In 1998, the General Law of Ecological Balance and Environmental Protection was passed which set a framework for all subsequent environmental legislation (Government of Mexico, 1988). The constitution and the LGEEPA lay out the primary role for central government to develop and implement environmental policy. The LGEEPA also includes a provision that the National Institute of Statistics, Geography, and Informatics (INEGI), must calculate an Ecological Net Domestic Product through the quantification of the cost of environmental pollution and the depletion of natural resources caused by economic activities in a given year and that this will be integrated with the national accounts system. This is the 'PINE' statistic, discussed further below.

The Federal Environment and Natural Resources Ministry (SEMARNAT) oversees the administration and enforcement of environmental policy. A number of agencies assist the ministry in this including the Federal Environmental Protection Attorney's Office (PROFEPA), the National Water Commission (CONAGUA), the National Institute of Ecology and Climate Change (INECC), the National Forestry Commission (CONAFOR) and the National Commission for the Knowledge and Use of Biodiversity (CONABIO) among others (INEGI, 2021b).

The National Institute of Statistics and Geography (INEGI), established in 1983, has some advantages in the development of natural capital accounting (Palma, 2021). The combination of statistics and geographical functions in one institute already brings together two types of data that in Ireland are governed and administrated separately by the CSO and *Taillte Eireann*, formerly the Ordnance Survey Ireland. The creation of INEGI cemented the collaborative approach by establishing a system of 'specialised technical committees', with participation of ministries producing and consuming the data in respective thematic areas as well as allowing for the participation of other experts, social and private institutions etc. (*ibid.*).

A collaborative approach and political commitment have been deeply embedded in Mexico's approach to biodiversity policy and support for decades. In 1992, an interministerial commission (CONABIO) was created by presidential accord with the 'objective of coordinating actions and studies related to the knowledge and preservation of biological species, as well as promoting and encouraging scientific research activities for the exploration, study, protection and use of biological resources aimed at conserving the country's ecosystems and generating criteria for their sustainable

management' (CONABIO, 2023). The federal executive chairs the commission, while the secretary general of the environment ministry serves as technical secretariat. Other members include the secretaries general of the ministries of foreign affairs, finance, welfare, energy, economy, agriculture, education, health and tourism. CONABIO furthermore has an executive secretary and approximately 243 staff, including secondments from the environment ministry and contracted positions for temporary projects or programmes.

5.2 The Accounts

Mexico's natural capital ecosystem accounts were first begun under the NCAVES project, supported by funding from the EU, with a view to pilot test the SEEA Experimental Ecosystem Accounting in order to: improve measurement of ecosystems and their services; to mainstream biodiversity and ecosystems in national level policy planning and implementation; and to contribute to the development of internationally agreed methodology. Implementation of the NCAVES project in Mexico was led by the national statistics office, INEGI in collaboration with the environment ministry (SEMARNAT), the environmental and academic sectors. Within INEGI, the implementation of the NCAVES project was led by the directorate general of economic statistics in collaboration with the directorate general of geography and environment. 'Throughout the project, SEMARNAT has supported the development of the ecosystem accounts, both as a user of the information and also by providing support and expert opinion for the elaboration of some pilot accounts' (INEGI, 2021b: 14). The development of the Ecosystem Accounts is coordinated across two areas in INEGI, with three technicians in the Directorate of Economic Statistics and four in the Directorate of Geography.⁷

Mexico's accounts are spatially based at a resolution of 6.25 hectares (INEGI, 2021b). For comparison, until the recent publication of Ireland's Landcover Map (at resolution of 1ha), Ireland relied on the European Corine database which offers resolution at a scale of 25ha.⁸ The NCAVES project assessed ecosystem extent in 2002, 2007, 2011 and 2014. In 2023, the extent accounts were updated to 2018 data, adding more detail with disaggregation of grasslands and mangrove ecosystems each into two categories. Ecosystem condition or integrity accounts were assessed for 2018. Ecosystem service valuation was conducted for the year 2013 in the NCAVES project and have since been updated to 2021. These accounts are all available on the INEGI website (INEGI, 2023b).

The ecosystem extent accounts are based on a simplified version of a vegetation and land use classification that was developed by INEGI, resulting in reporting of extent and extent changes for about 30 categories (see Table 5.1).

⁷ From interview with INEGI staff (2023).

⁸ One hectare is 100m by 100m or 10,000 square metres.

Table 5.1: Vegetation and Land use Classification, Mexico Ecosystem Accounts

Human Land use ecosystems	Aquaculture
	Annual Cropland
	Perennial cropland
	Human Settlements
	Planted forest
	Cultivated grassland
Natural terrestrial ecosystems	Primary coniferous forest
	Secondary coniferous forest
	Primary oak forest
	Secondary oak forest
	Primary montane cloud forest
	Secondary montane cloud forest
	Primary special other woody vegetation types
	Secondary special other woody vegetation types
	Special other non-woody vegetation types
	Primary woody xeric shrubland
	Secondary woody xeric shrubland
	Primary non-woody xeric shrubland
	Secondary non-woody xeric shrubland
	Other lands
	Natural grassland
	Inducted grassland
	Primary deciduous tropical forest
	Secondary deciduous tropical forest
	Primary evergreen tropical forest
	Secondary evergreen tropical forest
	Primary semideciduous tropical forest
	Secondary semideciduous tropical forest
	Primary woody hydrophytic vegetation
	Secondary woody hydrophytic vegetation
	Mangrove vegetation
	Primary non-woody hydrophytic vegetation
	Secondary non-woody hydrophytic vegetation
Water bodies	

Source: INEGI, (2021a).

An ecosystem integrity index, developed independently by researchers at the Institute of Ecology A.C., was used to assess the ecosystem condition using measurements listed in Table 5.2. These measurements can be expressed as percentage changes over a period to illustrate the direction of trend. Much of the data is based on pre-existing data sets such as a National Forest and Soil inventory (INFyS), a National Biodiversity Monitoring System (SNMB) and satellite imagery using Landsat (INEGI, 2021a).

Table 5.2: Ecosystem Integrity Index Components, Mexico Ecosystem Accounts

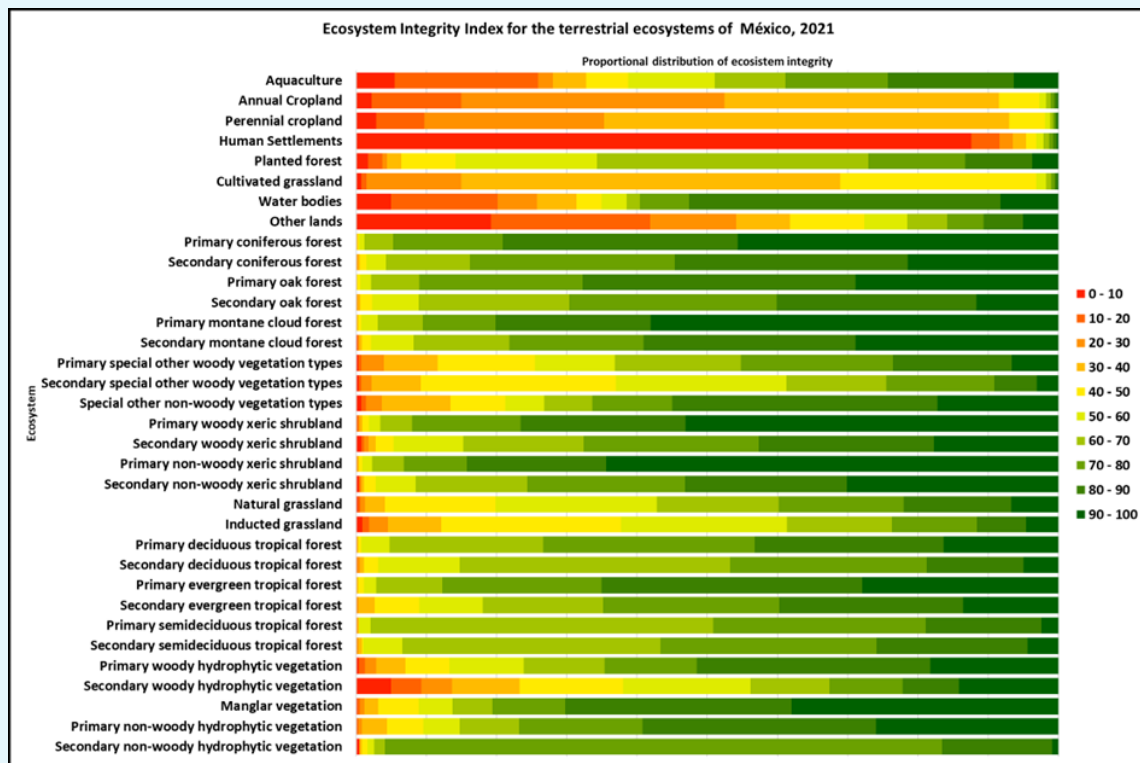
Structural	Number of trees and shrubs per ha
	Average tree height
	Standard deviation tree height
	Diameter at breast height (DBH)
	Standard deviation of DBHs
	Average tree crown diameter
	Standard deviation of tree crown diameters
	Average shaft height
	Standard deviation of shaft height
	Probability of presence of standing dead trees
	% of pixel covered with shrub growth
Probability of presence of tree pests	
Functional	Average net annual photosynthesis
	Standard deviation of net annual photosynthesis
	Average net photosynthesis in dry season
	Average net photosynthesis in rainy season
	% of pixel covered with herbaceous growth
	Future variables; pollination and predation functions, fragmentation/connectivity.
Pressure	Presence / absence of human settlements
	Presence / absence of covered with barren land

Pixel refers to the 250m x 250m or 6.25 ha size resolution of the area data.

Source: INEGI (2021a).

The spatially disaggregated nature of the assessment makes it possible to understand the extent to which areas of a specific category are in good or bad condition, where a perfect score of 1.0 is good condition with no human intervention seen (see Figure 5.1).

Figure 5.1: Proportional distribution of aggregated ecosystem integrity according to ecosystem type for 2018. Mexico



Source: INEGI, (2021b).

Changes in integrity from 2004 to 2018 were also assessed which showed an increase in ecological integrity in some categories such as grassland, deciduous tropical forest etc and decreases in integrity for areas of aquaculture and human settlement. Combining the extent account with the condition account also allowed an assessment of the weighted ‘effective extent’ of different ecosystem types. The effective extent is a product of actual extent, multiplied by its condition. This can be related back to an estimated original extent with no human intervention to determine a Natural Capital Index, whereby it is estimated that Mexico still has around 65% of its original natural capital (or effective extent of the various ecosystems is at 65% of the original extent).

Figure 5.2: Ecosystem Integrity Index for the terrestrial ecosystems of Mexico in 2018 (250 x 250 metre or 6.24 hectare grids)



Source: INEGI (2021b).

The NCAVES project estimated annual monetary valuations of five ecosystem services:

- Crop provisioning service (rice, beans, maize, wheat, sorghum, and soy)

- Regulating service for carbon capture and sequestration (in biomass and soil)

- Pollination regulating service for agricultural crops

- Provisioning and regulating service for residential and municipal water supply

- Cultural services for the nature tourism economy

They followed UN SEEA guidance that only the exchange value of any item should be included in the accounts. This means non-use values such as inherent value or existence values are not included.

Table 5.3: Gross Monetary contribution of provisioning, regulating and cultural ecosystem services as a percentage of 2021 GDP, Mexico Ecosystem Accounts

Gross monetary contribution of provisioning, regulating and cultural ecosystem services	(% of 2018 GDP)
Crop provisioning service (rice, beans, maize, wheat, sorghum, and soy)	1.38%
Regulating service for carbon capture and sequestration (in biomass and soil)	1.73%
Pollination regulating service for agricultural crops	0.64%
Provisioning and regulating service for residential and municipal water supply	0.02%
Cultural services for the nature tourism economy	0.20%

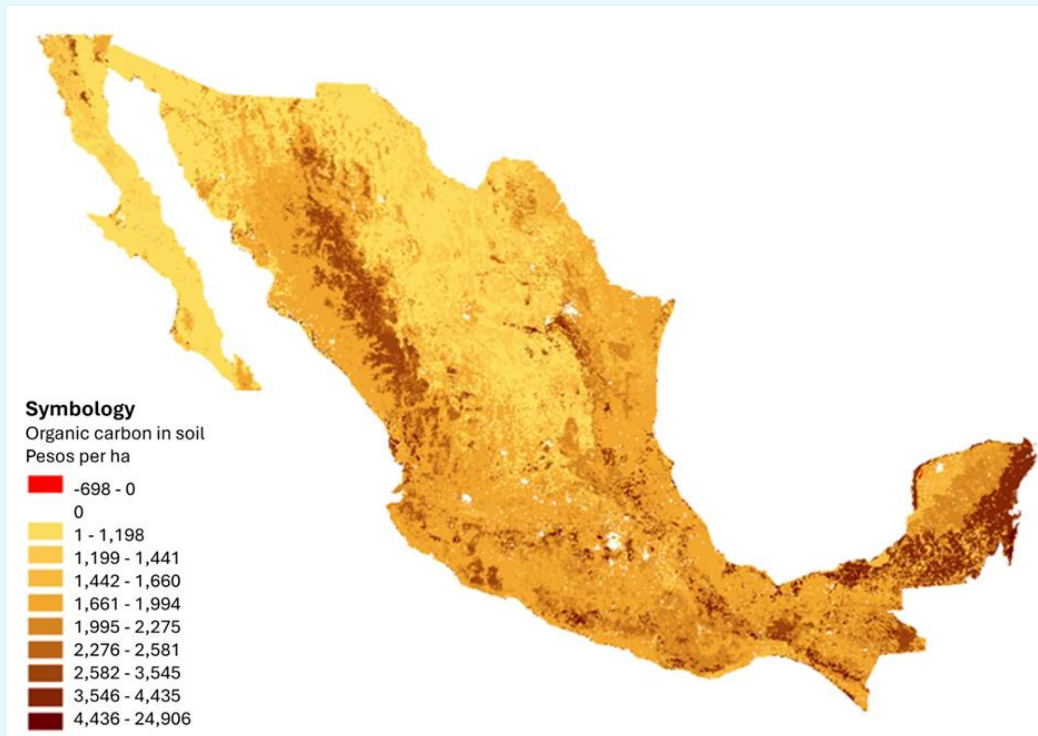
Source: INEGI (2021b).

Economic supply and use tables were also estimated whereby the ecosystem type supplying the ecosystem service is identified and the economic sector using or consuming the ecosystem service is identified. The use table splits the ecosystem service value for each category across the following sectors: primary sector (agriculture), secondary sector, tertiary sector (tourism), homes, government, rest of the world, agriculture, forests (primary), tropical forest (primary), shrubland (primary), other forest (primary), secondary vegetation, and other land uses. The Government sector is the identified 'user' of carbon sequestration. The supply and use tables are useful for tracking which of the conventional economic sectors benefit from ecosystem services.

5.2.1 Monetisation

Mexico produced estimates of monetary valuation of ecosystem services as part of its NCAVES project. They found that in 2013, the net contribution of ecosystems services assessed under the project (agricultural provision, carbon (soil and biomass) sequestration and storage, pollination, residential water and nature tourism) was estimated at 3.11% of GDP. The largest share of that was from carbon storage and sequestration service, assuming a carbon price of US\$25/t CO₂. The valuations per hectare of the different assessed ecosystem services were mapped across the country at the 6.25ha resolution (see Figure 5.3). The project recommended that 'The monetary valuation of ecosystem services relies on a considerable amount of physical data that serve as input for the biophysical models. Therefore, it is recommended to compile ecosystem services flow accounts, in a spatially explicit manner, before starting with the monetary valuation' (INEGI, 2021b: 169).

Figure 5.3: Value of annual soil organic carbon storage and sequestration service (2013 pesos per ha)



Source: INEGI, (2021b).

5.3 Impact of the Accounts: Contribution to Understanding

The NCAVES project found that the ecosystems that lost the greatest historical extent are the evergreen tropical forest and the deciduous tropical forest. More importantly the development of the extent accounts was found to allow an identification of the areas nationwide where the main processes of change are occurring. This will assist more targeted intervention by government as appropriate to manage land use change or degradation. Similarly, the condition accounts were able to identify the ecosystems at most risk (INEGI, 2021b).

The monetary valuation results of the NCAVES project are considered only preliminary and partial as more ecosystem services remain to be valued. Nevertheless, their significance against GDP is notable, in particular the high value of carbon sequestration and storage services. Correspondence with INEGI reveals that the valuation of ecosystem services has been proposed as part of the indicators for monitoring the Kunming Montreal Global Biodiversity Framework under the UNCBD, and as part of the update of Mexico's National Biodiversity Strategy.⁹

⁹ Interview with INEGI staff (2023).

5.4 Impact of the accounts: Policy and Decision Making

Mexico has been a global leader in estimating environmentally adjusted national economic accounts with annual estimation of an Environmentally Adjusted Net Domestic Product (PINE) since 1996. This statistic is derived from gross domestic product (GDP), adjusted for consumption of fixed capital (to give conventional net domestic product (NDP)) and for total costs of environmental depletion and degradation to give the environmentally adjusted NDP. The factors used to make the adjustment are displayed in percentage terms in Table 5.4. This statistic has been used in Mexico's national development plans to assess the sustainability of growth since 2000. This statistic allows the tracking over time of the growth in GDP against what has been an increased depletion of natural resources and environmental degradation.

Table 5.4: Summary of global supply and demand for goods and services, total environmentally adjusted net domestic product (PINE)/main derived indicators (SCEEM3), Selected Years, base year 2018.
P=preliminary estimate. Mexico

	2003	2019	2020	2021 ^P	2022
	%	%	%	%	%
Environmentally adjusted net domestic product/gross domestic product	79.40	77.07	74.96	75.56	75.66
Total costs of environmental depletion and degradation/gross domestic product	5.98	4.42	4.15	4.11	4.11
timber forest resources	0.22	0.12	0.13	0.13	0.12
Hydrocarbons	0.50	0.38	0.28	0.27	0.25
Underground water	0.13	0.18	0.13	0.12	0.11
Soil degradation	0.32	0.35	0.43	0.46	0.52
Urban solid waste	0.28	0.30	0.35	0.38	0.39
Untreated wastewater discharges	0.35	0.23	0.25	0.23	0.21
Air emissions	4.18	2.85	2.58	2.52	2.51
Weighted index reference year 2018 = 100					
Gross domestic product at market prices	34.16	104.00	99.61	110.10	121.82
Total costs of depletion and environmental degradation	47.62	107.14	96.33	105.32	116.65
Air emissions	84.37	101.86	83.70	85.88	92.33

Source: INEGI (2023a).

5.5 Impact of the Accounts: Communication and Awareness

The ecosystem accounts are relatively new in Mexico. However, there is a long tradition of promoting knowledge of biodiversity in Mexico. The interministerial body, Conabio has the mission of promoting, coordinating, supporting and carrying out activities aimed at understanding biological diversity, as well as its conservation and sustainable use for the benefit of society (CONABIO, undated). It is an applied research organization and supporter of research, that compiles and generates information on biodiversity, builds human capacity in biodiversity and is a public source of accessible information and knowledge.

6. Other Countries

Initial research and engagement with other countries suggest that they may offer further valuable insights and experience. Due to time constraints in the project this section does not present a comprehensive picture but highlights initiatives and experience in some of those countries that Ireland could learn from.

6.1 Australia

The Australian government, state and territory governments agreed on a strategy and action plan for environmental-economic accounting. The agreed vision is that ‘the Australian community understands the environment’s contribution to our quality of life, and its condition and value are accounted for in decision making for a prosperous and healthy society’ (Australian Government, 2020: 3). The national approach aims to enable;

- ‘strategic and coordinated investment in, and management of, the environment

- decision-making which balance economic, social and environmental outcomes

- policy and planning that reflects the benefits of a healthy environment

- the environmental, economic and social return on investments in the environment to be clearly demonstrated

- measures of the condition and value of environmental assets to be integrated with social and economic indicators’ (*ibid.*: p3).

Subsequently, in 2022, the Government published a policy document ‘Nature Positive Plan: better for the environment, better for business’. This document alongside other significant commitments such as establishing an independent Environment Protection Agency, sets out plans for a new data vision in the ministry of environment to work in partnership with the Australian Bureau of Statistics (ABS) to deliver environmental economic accounts and to support analysis needed for environmental indicators in a wellbeing budget. The Plan also commits to development of a ‘Nature repair market’ to make it easier to businesses and individuals to invest in nature. Legislation will establish a ‘nationally consistent framework for measuring, monitoring, reporting, verifying and publicly tracking biodiversity projects’ (DCCEE, 2022: 10). A nature repair market bill was introduced in parliament in March 2023. ‘It will enable the Clean Energy Regulator to issue Australian landholders with tradeable biodiversity certificates for projects that protect, manage, and restore nature. These certificates can then be sold to businesses, organisations, governments, and individuals’ (DCCEE, 2023). This will undoubtedly increase the demand for consistent environmental and ecosystem data to underpin the environmental integrity of the scheme.

Australia has been producing environmental economic accounts for many years, including a land account, a water account, an energy account and a waste account. In 2017 they also produced an experimental estimate of environmental-economic accounts for the Great Barrier Reef and in 2022 produced experimental estimates of a national ocean account.

The sheer scale of Australia presents many challenges including consistency of data across different regions and different scales of research, and the assessment of landcover. Challenges are also faced with respect to the statutory obligation on ABS, the independent official statistics agency, to maintain confidentiality in large areas of the country where population density is very very low.¹⁰

¹⁰ From interviews with ABS staff (2023).

6.2 Canada

Statistics Canada (Statcan) is the official statistics agency in Canada. Statcan began developing its environment economic accounts in the 1990s. In 2021, Statcan proposed to the treasury to fund a multi-annual programme to develop a Census of the Environment. The request was co-sponsored by the ministry of the environment. The request was successful and Statcan was awarded CAN\$26m over five years with a commitment to annual funding of CAN\$6m per year after that.¹¹ A webpage has been created for the Census of the Environment that outlines the overall objectives and plans for the programme. The Census of the Environment will have the first national register of Canada's ecosystems as its foundation, designed to track the size and condition of ecosystems such as wetlands, coastal areas and urban forests over time. The aim is to provide spatially disaggregated statistics where the data allows (Statistics Canada, 2023).

A first accounting of ecosystem change in Canada was released in January 2022. Similarly, to Australia, the sheer scale of Canada and the vast differences in population density across the country present challenges to monitoring and tracking ecosystem extent and change. Earth observation satellite data is a key resource. Data on ecosystem extent is produced at a scale of ecozones which is an established official approach to dividing the territory of Canada according to geographic and climatic features (Statistics Canada, 2022b). Canada has 15 ecozones. An initial assessment of ecosystem condition has been made for an initial set of indicators including total water storage change, ambient air quality, forest condition, urban greenness and a human landscape modification index (Statistics Canada, 2022a). Statisticians in StatCan found that the environmental data that generated most media interest was the urban greenness indicator where the performance in different communities and localities can be compared. Statcan has also developed thematic reports on ecosystems such as agro-ecosystems, ocean, ecosystem change and saltmarshes.¹²

Since 2021, StatCan has been developing a quality of life index that includes environmental data such as air quality, drinking water, conservation areas, walkable communities, greenhouse gas emissions, climate change adaptation and satisfaction with local environment (Statistics Canada, 2023b). The data is available at province level and also by a range of sociodemographic characteristics. Statcan is increasingly making its data available at a geographically disaggregated level and accessible via a map viewer to allow the public ready access to the data that is relevant to them (Statistics Canada, 2023a). Statcan also has a 'Disaggregated Data Action Plan' to produce statistical information to highlight the experiences of specific population groups such as women, indigenous peoples, minority groups and people with disabilities (Statistics Canada, 2021). The plan includes a goal to increase the disaggregation of its statistics geographically where possible, to make it more relevant to different communities and make it available where possible on maps.

6.3 United States

In January 2023, the White House Office of Science and Technology Policy with the Office of Management and Budget and the Department of Commerce, published a 'National Strategy to Develop Statistics for Environmental-Economic Decisions' (The White House, 2023). The strategy underlines how nature starts many supply chains, such as critical minerals for technologies, water and pollinators for food and drinks, how nature protects property with reefs, dunes and forests reducing damage caused by storms and floods, and how nature provides recreational opportunities and supports health. The strategy outlines a 15 year phased approach to move from 'research grade' environmental economic statistics to developing core statistical products with physical and monetary flows and a single headline summary statistic. The aim is to produce a 'Change in Natural Asset Wealth' statistic which can be integrated with changes in GDP to provide a more complete and useful view of US economic progress.

¹¹ From interviews with Statcan staff (2023).

¹² From interview with StatCan statisticians.

7. Conclusions

The countries examined for this report represent a broad spectrum with very different geographies, biodiversity, political institutions and economies. Nevertheless, in addition to the variety of experience it was also possible to discern some commonalities. This section describes some insights drawing on the experiences of the examined countries which may be useful to inform Ireland's development of ecosystem accounting and finally draws some overall conclusions in section 7.10.

7.1 National Statistical Offices & Geography

The institutional home of natural capital accounting, and its linkages to geographical/mapping resources and/or economic expertise is influential on development of the accounts. The reviewed countries have all mandated their national statistical offices to gather, develop and publish the natural capital accounts. The national statistical offices are each independent institutions with established reputations for robust and reliable data.

Many of the reviewed countries' national statistical agencies (in the UK, Mexico, Canada and Australia) located the natural capital or environmental accounts team within their economics division. This reflected the long-term intention in those countries to create linkages between the two areas for a more complete view of the economy.

In respect of place-based data and ecosystem extent accounts, some national statistical offices benefit from strong linkages to official geographical mapping institutes. For example, in Mexico the national statistics agency, INEGI includes both functions. Weak linkages between statistics and geographical information can be a barrier to advancing place-based statistics.

7.2 Collaboration

The development of natural capital accounts in many cases benefitted from collaboration with international experts, other agencies and/or academics.

For example, in Mexico, the NCAVES pilot on valuation of ecosystem services revealed 'the need to work in close coordination and collaboration with the experts in environmental economics, ecology and geospatial information within a more formal structure. Although since the beginning of the project there has been an interinstitutional working group ... the experience and knowledge of experts could also be broadened and include factors such as the SHCP [Ministry of Finance and Public Credit], the Ministry of Economy and the Bank of Mexico' (INEGI, 2021b: 169). This reflects a long history of cross-government cooperation on biodiversity as demonstrated through Conabio. Conabio has the mission of promoting, coordinating, supporting and carrying out activities aimed at understanding biological diversity, as well as its conservation and sustainable use for the benefit of society (CONABIO, undated).

A key benefit of collaboration is the ability for policy and decision makers, and researchers, to offer guidance to statisticians and to enter into a dialogue with them regarding what kinds of data and what manner of data presentation would be most useful. In the Netherlands such a dialogue is taking place between the lead ministry, the Ministry of Agriculture, Nature and Food Quality, and potential users of the natural capital accounts data such as local governments and engineering consultancy firms to consider how to make the data meet their needs.

7.3 Leadership from Central Government

Leadership is key to the establishment, implementation and use of natural capital and ecosystem accounting. Leadership from central government is evident in some form in all the countries examined. In some countries, political commitment to nature, the environment or natural capital is evident in the policy and regulatory frameworks, particularly so in Mexico and the UK. Some countries give a specific place to the consideration of environmental data in policy making processes (UK, Mexico, Australia). This leadership enables proper resourcing and coordination of the accounts and acts as a good platform for awareness and making use of resulting data.

7.4 Spatially based data

National level data is useful to inform high level discussions on the ambition of nature policy or the success of its implementation but is not well suited to supporting environmental management. Place-based data at higher resolution can support local environmental management and decision making. Availability and mapping of local data can also increase the interest and engagement of the public with the data.

Maps and interactive tools are useful to visualise data and to bring disparate statistics on individual areas together, helping the user see the data of relevance to them and to make connections between data sets. In the UK, the ONS found across all areas, 'charts that allow the user to get information that is personalised or local to them, like calculators or maps, tend to get more interaction' (Broad, 2021). Similarly, statisticians in StatCan found that the environmental data that generated most media interest was the urban greenness indicator where the performance in different communities and localities can be compared. In sections 4.2 and 5.2 we saw examples of mapped monetised ecosystem service values across the Netherlands and Mexico. Germany also provides a good example of interactive maps of ecosystem condition and extent data (Statistisches Bundesamt, 2024).

7.5 Monetisation

While efforts in monetisation of natural capital and ecosystem services must have several caveats attached, the estimated values are useful. Official statistics on monetary values of nature can facilitate inclusion of nature in evaluation and appraisal techniques such as cost benefit analysis or cost effectiveness analysis. This can inform environmental management decisions or decision-making across sectors more broadly. Other options for reflecting biodiversity in decision support methodologies, like biodiversity points, also require a lot of source data and have similar limitations.

Monetisation has the potential to deliver some very clear and relevant findings which could influence policy. For example, the findings of the ONS for the UK, that the non-market benefits from woodlands (e.g. of carbon sequestration, pollution removal and recreation) in 2020 greatly exceeded the value of timber and woodfuel provision in both annual value and asset terms (see section 3.2) is a finding that could reshape perceptions and influence policy and action.

Some caution is needed on interpreting monetised values and their trends for a variety of reasons. The monetised values of ecosystem services do not claim to capture the full value of nature. Because UN SEEA ecosystem accounting is based on ecosystem service value to people, natural assets in closer proximity to population centres can have a higher value in this approach than similar assets in more remote locations. For example, the ability of a natural asset to regulate air pollution is more useful to people when it is located near urban areas. Furthermore, increases or decreases in monetary values can be due to price fluctuations or fluctuations in extent and condition. Finally, in some countries, such as the UK, fossil fuels are included in natural capital assets and ecosystem service values.

7.6 Combining Environmental with Other Data

Bringing natural capital or ecosystem accounting data together with other statistics has the potential to offer a richer understanding of wellbeing, wealth and quality of life across regions. Mexico, Netherlands, UK and Canada combine environmental data with other data sets to enhance the understanding of developments in the economy or society.

Mexico has measured ecologically adjusted Net Domestic Product since 1998. Known in Mexico as PINE, this statistic adjusts Net Domestic Product for depletion of natural resources and environmental degradation. The figures for these are drawn from modules of the environmental economic accounts. PINE was designated as an indicator to assess the sustainability of economic growth. Other countries are moving in this direction.

In the UK, the Office for National Statistics (ONS) is developing a statistic on inclusive income. The aim is to complement rather than replace national accounts based measures of economic progress. The Gross Inclusive Income (GII) measure expands the definition of ‘the economy’ to include the unpaid household production and additional ecosystem services from natural capital. GII will include investment in, as well as ecosystem services from, all natural capital assets identified in the SEEA environmental economic accounts. The UK’s natural capital accounts do not yet disaggregate changes into investment, and capital consumption and therefore more research is required to properly reflect natural capital in GII. Net inclusive income (NII) builds on GII by accounting for depreciation in produced, human, and natural capital (ONS, 2022a). Adjusted inclusive income (AII) could reflect e.g. externalities amongst other adjustments.

Netherlands’ national statistics office, CBS, brings together a range of economic, social and environmental statistics to understand the progression of ‘broad prosperity’ or wellbeing over time. Some of the environmental statistics included are exposure to managed natural assets within protected areas, quality of inland bathing waters, nitrogen deposition, urban exposure to particulate matter (PM2.5) and percentage of population experiencing ‘environmental problems’.

Canada’s national statistics office, StatCan, collates a quality of life hub, bringing together information and statistics on prosperity, health, society, the environment and good governance in Canada. The environmental statistics include air quality, drinking water, walkable communities, access to public transit, conserved areas, Canadian species index, water quality in rivers, greenhouse gas emissions, marine and coastal ecosystems and natural capital.

7.7 Regularity of Statistics

The regularity of statistics can influence their uptake by policy and decision makers and their use in environmental management. The UK produces its natural capital and ecosystem accounts on an annual basis. Other countries such as Netherlands produce the ecosystem accounts on a three yearly basis. Most countries which have produced ecosystem accounts have not yet achieved regular production, having produced their accounts on a pilot or project basis (Hein *et al.*, 2020a).

Consultation with international statisticians and experts brought out different perspectives on this issue. If ecosystem accounts are only produced on a three yearly basis it will be less attractive to policy or decision makers to include in their analysis because at a given point in time a statistic could be as much as five years out of date.¹³ The economic national accounts are produced on an annual or even quarterly basis despite some underlying data being available less regularly e.g. population data is five yearly. It was noted that public or media interest is diminished for statistics that are seen to be old news. There were some concerns from other experts that data may not change significantly on an annual basis but this was countered by concern that for effective management, more regular data is required. Payments for ecosystem services, in particular, are likely to require data more often than every three years. The current direction of EU legislation in this area, as noted in chapter two, suggests annual ecosystem service accounts which would satisfy policy usefulness but ecosystem condition and extent accounts only to be updated every three years which would seem to address the concern on difficulties in collecting such data, or seeing meaningful change on a more regular basis.

¹³ This often occurs where three-yearly reporting is coupled with a two-year time lag to publication of statistics. From Interview with Carl Obst (2023).

7.8 Alignment of Ecosystem Accounting Data

Alignment of ecosystem accounts with other data needs and other reporting channels is important both to facilitate and enhance the gathering of relevant data for ecosystem accounts and also to increase their usefulness to data users and policy makers. For example, requirements from the EU related to monitoring and reporting greenhouse gas emissions, under the EU Land use, Land-use Change and Forestry (LULUCF) regulations will introduce a requirement for ‘geographically explicit land use conversion data’ (European Union, 2023: 26). The European Commission notes the intention to enhance ‘the quality of monitoring, reporting and verification (MRV) of emissions and removals, thanks to new land monitoring technologies, techniques, and equipment, such as digital mapping and Earth observation, and datasets generated by the EU’s Common Agriculture Policy’ in support of carbon farming schemes and land management practices (European Commission, Undated). Pragmatically synergies could be exploited between these reporting requirements and natural capital accounts.

Section 2.4 illustrated the various initiatives ongoing to develop and enhance corporate and sub-national reporting on impacts on nature. Alignment of these initiatives with national efforts would allow for better shared understanding and transparency of trends in ecosystems and help improve the robustness of accounts. This is another area where leadership from central governments domestically and internationally can encourage and support that enhanced alignment across ecosystem accounting and nature related disclosures and reporting initiatives.

7.9 Use of Data

As a relatively new statistic, it is too early to assess evidence of impact on environmental outcomes. Nevertheless, in some countries, the use of environmental data in decision making is encouraged or required under national policy or legislation. On the other hand, where use of the statistics is not anchored either in policy or legislative frameworks, or in official guidance on appraisal and evaluation practices, they can be under-utilised. This can lead to additional analytical effort where other methodologies are developed to reflect nature in policy, planning and decision making.

Overall, monetised ecosystem account data seems to be easier to integrate to existing policy and decision making processes, with caveats attached, though the physical data is important for management choices.

7.10 Conclusions

Natural capital accounting and in particular ecosystem accounting is a relatively new discipline. Nevertheless, examination of just a selection of countries demonstrates a wealth of experience that can offer useful insights to inform further development of natural capital accounting in Ireland. It is clear from the countries examined, that the usefulness and use of natural capital accounting does not appear spontaneously but requires intention and support from central government to develop.

In summary, other countries’ experience in natural capital accounting point to the need for policy clarity and guidance alongside the accounts. This should define what the accounts will be used for, for example whether it is aimed solely at supporting national and regional governments to monitor ecosystems and nature or whether it also has more specific roles such as: to inform planning at a more local level, to inform biodiversity credits or even payments for ecosystem services, or to be incorporated into the policy making process.

This experience points to the importance of a supporting policy framework and leadership from the ‘parent’ department and central government. In the UK, DEFRA and the ONS jointly led the early development of natural capital accounting methodology with valuable guidance from the natural capital committee set up by DEFRA. This leadership continued with DEFRA leading on integration of natural capital accounting to the UK’s environmental policy and legislation. In Canada, the environment ministry co-sponsored the statistics agency’s successful request to the Treasury to fund the new Census of Environment programme. In the Netherlands, the relevant ministry funded the early development of the natural capital accounts. In Mexico, constitutional amendment, legislation, national development plans and policy have consistently promoted the status of the environment and development of appropriate statistics.

Adopting the UN SEEA central framework and UN SEEA ecosystem accounting standards reduces the already very large workload in the development of natural capital accounts, statistical concepts and frameworks, and ensures their comparability. The UK, Netherlands, Mexico, Australia and Canada follow UN SEEA guidance to the extent that local conditions and data availability allow.

There are value and insights to be gained by combining natural capital accounts with other economic, geographic or social data to provide greater insight on inequalities or sustainable economic progress in a country.

A key conclusion drawn from these international case studies is that measurement alone without policy clarity and enabling governance, will not enable natural capital accounting to impact on decision-making.

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