



An Chomhairle Náisiúnta Eacnamaíoch agus Shóisialta
National Economic & Social Council

Ireland's Environmental Data: Inventory, Assessment and Next Steps

*A study for NESC by EnvEcon Limited and Flannery Nagel
Environmental Limited*

No. 136 April 2014

National Economic and Social Council

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1. The main tasks of the National Economic and Social Council shall be to analyse and report on strategic issues relating to the efficient development of the economy and the achievement of social justice.
2. The Council may consider such matters either on its own initiative or at the request of the Government.
3. Any reports which the Council may produce shall be submitted to the Government, and shall be laid before each House of the Oireachtas and published.
4. The membership of the Council shall comprise a Chairperson appointed by the Government in consultation with the interests represented on the Council, and
 - Four persons nominated by agricultural and farming organisations;
 - Four persons nominated by business and employers' organisations;
 - Four persons nominated by the Irish Congress of Trade Unions;
 - Four persons nominated by community and voluntary organisations;
 - Four persons nominated by environment organisations;
 - Twelve other persons nominated by the Government, including the Secretaries General of the Department of Finance, the Department of Jobs, Enterprise and Innovation, the Department of Environment, Community and Local Government, the Department of Education and Skills.
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7. The numbers, remuneration and conditions of service of staff are subject to the approval of the Taoiseach.
8. The Council shall regulate its own procedure.



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PART TWO:
Consultants’ Report

Ireland’s Environmental Data: Inventory and Assessment
A study for NESC by EnvEcon Limited and Flannery Nagel Environmental Limited

COUNCIL COMMENTS

1.1 Introduction

In September 2013, the Council approved a proposal for a short exploratory study on Ireland's environmental data. The overall aim of the project was to provide a strategic, reflective and probing look at existing environmental data and indicators in Ireland and to explore their future role in the transition towards a low carbon society. Consultants EnvEcon Limited and Flannery Nagel Environmental jointly conducted the research and completed their final report on the 18th December, 2013.

This note sets out the Council's initial response to the report. It invites Council members and wider stakeholders to reflect on the key issues raised, with a view to a future discussion on this important area at a later date. The note is structured as follows. Section 1.2 outlines NESC's recent sustainable development work. Section 1.3 provides an overview of the objectives to the research, as well a brief summary of key contextual issues. Section 1.4 provides a longer-term perspective on the future role of environmental data. Section 1.5 presents some of the key conclusions of the research and Section 1.6 identifies areas where the Council believes further discussion would be valuable.

1.2 NESC's Sustainable Development Work

Two years ago, the government asked NESC to extend its remit to integrate a sustainable development perspective more fully into its work, with support from the Department of the Environment, Community and Local Government. Thus NESC had to engage more actively with the much-discussed need to integrate environmental considerations into core economic and social policy. The work completed to date gives an indication of the range and variety of environmental policy issues being considered and the empirical way it is being examined, such as through primary research, reviewing stakeholder experience and taking a close look at existing processes and practices:

- In 2012, the Council published observations on the Framework for Sustainable Development, *Our Sustainable Future* (Department of Environment Community and Local Government, 2012).
- Also during 2012, in response to a Government request, the NESC Secretariat prepared two reports on climate change, see *Ireland the*

Climate Change Challenge: From How Much To How To and a series of supporting background papers, (NESC Secretariat, 2012). Based on that work, the Secretariat was invited to give evidence to the Joint Oireachtas Committee on Environment, Culture and the Gaeltacht in May, 2013.

- In 2013, in its report *Ireland's Five-Part Crisis, Five Years On: Deepening Reform and Institutional Innovation* (NESC, 2013), the Council examined action on greening the economy and society, as one of four important areas of policy and institutional reform. While endorsing the much-stated normative need to integrate environmental concerns into core economic and social policy, NESC took an empirical approach, asking where such integration is advancing and where it proves harder (in addition to the Council's report, see also the NESC Secretariat's paper *Greening the Economy* (Moore *et al.*, 2013).
- Two projects were commissioned in 2013, the present one, and a further one on international approaches to community engagement and social acceptance of wind energy and related infrastructure.
- A Roundtable discussion on the Challenge of Environmental Policy Integration was hosted at NESC in November, 2013. Senior policy makers from across Government, research organisations and third level institutions participated. The Roundtable included inputs from NESC Secretariat followed by responses and a facilitated discussion around three themes: the challenges of environmental integration; the role and value of environmental data for greater integration; and institutional mechanisms connecting environment and economy.

The Council considers that integration of economic, social and environmental perspectives is an important challenge for Irish policy, a task which has been difficult to fully achieve nationally or at a European level. As argued by the Council in *Ireland's Five Part Crisis, Five Years On*, 'in the case of both society and environment, it is relatively easy to enunciate the need for an integrated approach, but hard to make this real and comprehensible. There is a need to own and explore how this integration will actually happen' (NESC, 2013:41).

The broader challenge of Environmental Policy Integration (EPI) is one which the Council will return to as there are complex political, procedural and conceptual questions which arise when public policy seeks to both balance environmental, social and economic factors (policy content) and to give a clear and principled priority to environmental considerations in how these are delivered (governance) (Turnpenny *et al.*, 2010).

One facet of environmental, social and economic integration is the availability and use of timely, accurate and accessible data on the environment. A grounded

examination of the current data provision and practices for data use and management, as well as future policy requirements, can help to shed light on the wider policy integration challenge.

1.3 Commissioned Research

NESC asked the consultants, EnvEcon Limited and Flannery Nagel Environmental to set out the context and challenge for Ireland in the compilation and use of environmental data for future needs and to provide a strategic, reflective and probing look at existing environmental data and indicators in Ireland. The project included an overview (data map) of existing environmental data and interviews with key stakeholders to inform a critical discussion of current use, gaps and future direction for environmental data for Ireland.

1.3.1 Objectives of the Research

As well as proving a catalogue or map of existing data availability, the research specifically aimed to address the following questions:

- i. To what extent, and how, is existing environmental data being utilised within the policy system? Why is some data used more than others?
- ii. What could be done to achieve optimal utilisation of existing data sources at a policy level as well as for wider research?
- iii. What are the contending views on the critical next steps for environmental data in Ireland and the most important data gaps in progressing towards greening the economy? Are there other gaps, (apart from those identified by the Central Statistics Office (CSO), and Eurostat)? What other challenges need to be addressed (for example, lack of data, data collection inefficiencies and ineffectiveness, data inconsistencies, incomparable data)?

Before noting the results of this work and posing questions for further discussion, it is valuable to set the wider context for this particular research on environmental data and the role of data in greening Ireland's economy.

1.3.2 The Context for Examining Ireland's Environmental Data

In recent years, a number of trends have placed increasing emphasis on the significance of environmental data.

Firstly, there has been real progress in generating new data and indicators and in developing an over-arching set of ambitions for the development of Irish environmental data. This includes:

- The CSO have led the way, along with the EPA (Environmental Protection Agency), SEAI (Sustainable Energy Authority of Ireland), and the ESRI (Economic and Social Research Institution), among others, in playing an instrumental role in producing and analysing a wide array of metrics to date.¹ Ireland has been compiling environmental accounts since 1999 with the first ESRI satellite environment accounts commissioned by the CSO (Scott, 1999). CSO data now includes environmental accounts and indicators, sustainable development indicators, and environmental accounts are a priority of its 2011-2014 Strategy (National Statistics Board, 2012).
- European Union environmental policy and directives have been a major driver of the collection of environmental data in Ireland. This has generated many data requirements, most recently on economy-wide material flow accounts, environmental taxation and air emissions accounts. The National Statistics Board notes that ‘environmental data is becoming increasingly important in the policy development context, not just within the environmental policy area itself but across a range of complex and often cross-cutting areas including sustainable development and energy security, efficiency and diversity’ (:22). This is reflected in the current European Union (EU) policy drivers which emphasise indicators for resource efficiency and the green economy², both with enormous economic and jobs potential but also extend beyond environmental policy, to social and economic.³
- Another feature of CSO’s recent work is that it has incorporated more data on environmental ‘practice’. In its 2011 report, *The Irish Statistical System: The Way Forward*, the CSO argues that ‘policy and practice can no longer operate effectively without a body of timely and relevant statistical information based on practice as well as empirical investigation. This requires effective compilation and use of administrative data’ (CSO, 2011:13). It emphasises the role

¹ Previous work by (Comhar, 2007) and NESI in 2002 reviewed the role and value of sustainable development indicators. These were subsequently developed and the CSO produced the first set of results in 2013. (NESI, 2002)

² Green growth, according to the OECD, means ‘fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our wellbeing relies’ (OECD, 2012a: 9)

³ While the economic value of the green economy globally has been estimated to be \$5tn in 2010, it has not yet been possible to estimate this figure for Ireland but the job and growth potential are considerable (DJEI, 2012).

of linking datasets and integrating data to track the effectiveness of policy on targeted population sub-groups over time.

- The range and wealth of environmental data expands beyond national accounts. Some data sources have a regional dimension such as Dublin’s sustainability indicators, or specific once-off studies such as the EPA-funded research on marine ecosystem services (Shephard *et al.*, 2013). Most of this data is used locally, or to evaluate initiatives and may have wider potential.⁴ A further potential source is the data from environmental impact assessments. Finally, there are interesting local projects such as Burren Life, that have produced data, conservation work and a socio-economic analysis of the local area (Van Rensburg *et al.*, 2009).
- Environmental data gathered by civil society organisations and firms may be increasingly significant, both internationally and in Ireland.⁵ Initiatives such as the Global Reporting Initiative and the Carbon Disclosure Project promote sustainable practices through self-reported data. The energy efficiency data gathered by firms and other organisations under the National Waste Prevention Programme, run by the EPA, such as the Green Hospitality Award, can play a role in quality assurance. There is growing interest in the potential value of data which is gathered by trained volunteers, sometimes referred to as ‘citizen science’. Crowe (2012) outlines existing and potential indicators on birds in Ireland. Some of that data is provided by organisations such as Birdwatch Ireland, who organize volunteers to provide data which the EPA co-ordinates and which are then reported to Eurostat.⁶ Another example is the Coastwatch Survey run by Coastwatch Ireland.
- In Ireland and elsewhere, environmental policy has become much more engaged in working with firms and others to assist them to measure environmental processes and outcomes and to formulate plans for improvement. In this kind of work, significant amounts of fine-grained data, on dimensions such as energy use and resource efficiency, are generated. For example, the EPA’s National Waste

⁴ There are data protection restrictions on some data use which is an issue also faced by the CSO who consider that data infrastructure development which facilitates data-sharing for statistical purpose is a priority (CSO, 2011). Forthcoming data-sharing and governance legislation should help to address some of these concerns.

⁵ For an account of the role of such information as a public policy tool, see Overdevest and Mayer (2007)

⁶ The Pan-European Bird Monitoring Scheme wild bird indicator (<http://www.ebcc.info/index.php?ID=510>) from which the Farmland Bird Indicator has been extracted and promoted by Eurostat in reporting under the EU Sustainable Development Strategy

Prevention Strategy generates data for firms, hospitals, households and other organisations.

Secondly, at international level a major focus of conceptual, policy and data development over the past decade and a half has been the task of moving the system of economic accounting beyond GDP in order to encompass more fully both environmental and social issues.⁷ However, there are different perspectives as to how this could be achieved including the ‘capital approach’ to sustainability and sustainable development and those which also include broader physical measures (Atkinson, 2009, Stiglitz *et al.*, 2009).ⁱ Important and complex questions arise concerning the implications of the capital approach for national and international sustainable development strategies, as conventionally formulated, and for conventional tools, such as cost-benefit analysis, impact assessments and sustainability assessments.

The OECD and European Environment Agency (EEA) have taken an active role in developing green economy indicators which are not yet in wide use⁸. The OECD has played a key role in this area, with its work on indicators emphasising outcomes, and a focus on different forms of capital: human, natural, economic and social. The OECD considers the main question to be what kind of growth and for whom? High value, in their view, should be given to sustainability, quality of life and democratic voice (OECD, 2012b). The 2013 report from the EEA, *Towards a Green Economy in Europe*, points to the importance of appropriate indicators to effective policy monitoring and the challenges that exist to achieve this at a European level (EEA, 2013). At national level, NESC’s 2009 report *Well-being Matters: A Social Report for Ireland* outlined the value of such indicators and the key role that well-being has as a central measure (NESC, 2009). Healy and Reynolds argue that such new indicators or indexes are urgently needed to measure the real progress of society and that ‘shadow accounts’ be developed to include the cost of activities such as the use of declining natural resources (Healy & Reynolds, 2009: 167).

This body of work, alongside work of the European Commission have led to the development of a range of environmental data and indicators, including those which try to value natural capital⁹ and ecosystem services. Notable is the Economics of Ecosystems and Biodiversity (TEEB) initiative, an ongoing wide-ranging valuation of ecosystem services, jointly undertaken by United Nations Environment Programme (UNEP), several countries and the Commission (European Commission, 2009).

⁷ As outlined by the European Commission in 2009 (European Commission, 2009) and Beyond GDP <http://www.beyond-gdp.eu/index.html>

⁸ While green economy indicators do include measures of sustainability, broader and more comprehensive sustainability indicators remain active both at European level and nationally.

⁹ Natural capital, like financial capital, is argued to yield dividends in the form of benefits and services, but in today’s economy, the capital itself is being eroded (Juniper, 2013)

Some countries are advancing this work in practice. The UK has begun to put a value on its ecosystems with a first National Ecosystem Assessment in 2011 and production of the State of Natural Capital in 2013. It has also established a Natural Capital Committee in the Department for Environment, Food and Rural Affairs (DEFRA). This is not yet happening in Ireland but *Delivering Our Green Potential* argues (Department of Jobs Enterprise and Innovation, 2012) that the value of ecosystem services and biodiversity to the economy should be captured and monitored so as to ensure sustainable drawdown and protection of these natural assets¹⁰. However, challenges remain. The National Biodiversity Data Centre collates a large body of data on Ireland's biodiversity. However, unlike the UK which has had a natural habitat 'map' for several decades¹¹, this information is not yet complete for Ireland. Indeed, there is a lack of baseline data for natural systems. This makes it hard to put an economic value on biodiversity and ecosystems assets.

Thirdly, Ireland has a number of policy statements and strategies for green growth and sustainable development which impact on environmental data decisions; these include *Delivering Our Green Potential* (Department of Jobs, Enterprise and Innovation, 2012), *Our Sustainable Future* (Department of Environment Community and Local Government, 2012) as well as *Actions for Biodiversity 2011-2016* (Department of Arts Heritage and the Gaeltacht, 2011), and *Harnessing Our Ocean's Wealth* (Department of Agriculture Food and the Marine, 2012).

In this context, the Council considered it timely and relevant to ask how existing data and indicators *are used* within the policy system and to think about how it is envisaged that new data *would be used* when they become available, and to ask how significant they would be as an *enabler* of more effective policy and greater sustainable practices.

1.4 Thinking About the Role of Environmental Data in Transition to a Low Carbon Society

While the current research project begins with an examination of existing data generation and use, the goal is to explore the role of data in the ongoing greening of the economy and society. Looking to 2020 and beyond, the transition to a low carbon society requires increasingly sustainable practices, as outlined in the NESC Secretariat's work on climate change. Figure 1, borrowed from the EPA, presents this transition as the challenge of moving towards a low-carbon, circular economy through different phases including a focus on energy efficiency, clean technology, eco-design and the sustainable use of natural resources.

¹⁰ In 2008, an Irish study, *The Economic and Social Benefits of Biodiversity*, valued our national ecosystem services, in terms of their productive output and human utility, at over €2.6bn per year, a conservative estimate (Bullock *et al.*, 2008)

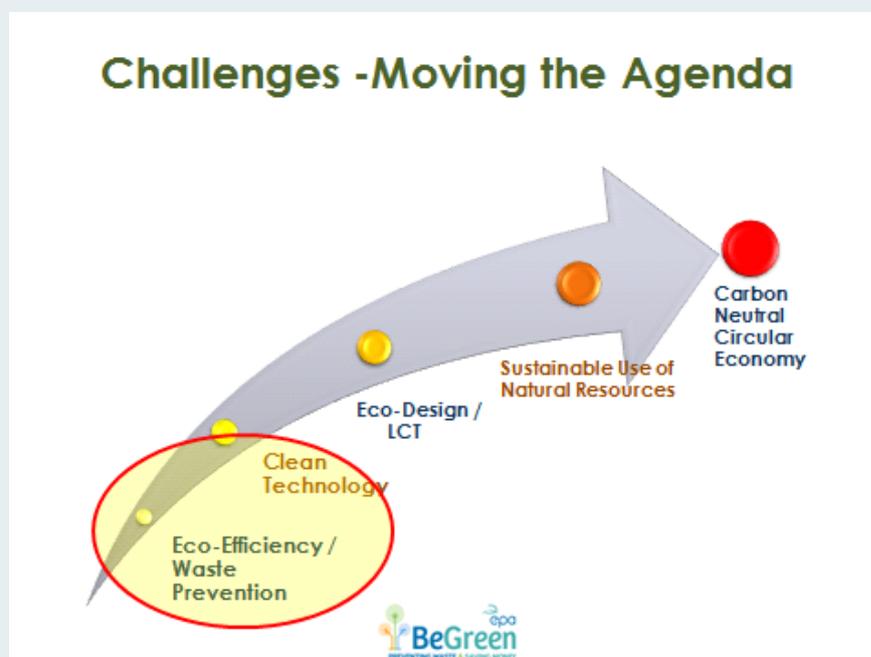
¹¹ http://magic.defra.gov.uk/About_MAGIC.htm

The oval in the lower left hand of Figure 1 represents the range of activities in which the EPA (and other agencies) currently engage with firms, hospitals and others helping them to measure and improve their energy efficiency and other environmental dimensions. Such work is essentially focused on helping organisations to do what they do in the most resource-efficient way possible. This involves a huge amount of learning, both in the target organisations, and in the agencies such as EPA and SEAI.

But it is widely accepted that movement to a really sustainable, circular, carbon-neutral, economy over time will require more: that decisions of firms and public bodies factor the value of natural assets and the cost of environmental degradation into the very design of technologies, platforms and systems and consumers respond with their purchasing support to make such action commercially viable. Consequently, just focusing on resource efficiency will not be sufficient to encourage the wider economic system to change.¹²

An important question is: what data generation and data use will be most important in driving, enabling, monitoring and understanding the movement up the arrow in Figure 1?

Figure 1: Future Directions for Environmental Change



Source: (EPA, 2013)

¹² Financial Times, September 1st 'Fresh Perspectives from the High Seas- Interview with Dame Ellen MacArthur.

One view is that for producers to design products and systems that are truly sustainable critically requires additional data which show them the true value of natural, social and economic capital. Only then can they bring sustainability considerations into their decisions on both *what* to produce and *how* to do so. A closely related argument is that these values must then be made effective through environmental taxes and/or policy imposition of caps, as in cap-and-trade schemes. This argument, that the key next requirement is the generation of new higher-order, top-down, valuation of natural capital and resources, and policy action that alters prices accordingly, is one that must be taken seriously. As noted above, it reflects a rigorous economic-theoretic conception of sustainable development and the economists' focus on the role of price incentives in shaping the allocation and use of scarce resources.

But, for a number of reasons, it might also be worth asking whether the kind of fine-grained, organisation-level, data generated in the policy and organisational processes in the oval in Figure 1 might provide the foundation for moving *up* the arrow. Accurate higher-order, top-down, valuation of natural capital and resources might not be forthcoming and there may be political resistance to environmental taxes that reflect the true value of resources. In that case, it is worth considering whether the kind of Environmental Managements Systems that organisations use to monitor their material uses and set performance targets for improvement could be the basis for more ambitious sustainable development goals? There is interesting research on whether the performance targets set by firms and other organisations using Environmental Managements Systems provide the basis of a performance-driven regulatory system, especially where progress towards meeting the targets is regularly monitored and periodically verified by qualified third parties (Coglianese & Nash, 2001).¹³ Indeed, research on international governance—where there is, by definition, limited inter-state agreement and no top-down authority capable of imposing environmental taxes that reflect 'true' resource values—is informative. There is evidence that, in at least in some environmental and social spheres, a combination of firm-level data and inspection, on the one hand, and non-governmental organisations (NGOs) pressure and private standard setting, on the other, can drive improvement beyond single organisations and can acquire regulatory characteristics (Abbott & Snidal, 2009; Overdevest & Zeitlin, 2012; Abbott, 2012). The resulting systems involve firms, NGOs and states in various combinations, but usually have organisation-level measurement at their heart. Others have argued that, eventually, a combination of firm-level data, consumer and investor pressure, IT, and a measure of official support, can drive firms towards more sustainable practices and activities (Goleman, 2010; O'Rourke, 2005; Overdevest & Mayer, 2007; Karkkainen, 2001; Fung & O'Rourke, 2000; O'Rourke & Macey, 2003; Fung *et al.*, 2007). Both because of their inherent potential, and

¹³ Indeed, not only might organisational-level data be a resource for environmental policy, but environmental regulation can be framed in such a way that it forces the generation of data, what Karkkainen labels 'information-forcing regulation' (Karkkainen, 2006).

because of the possible limits of top-down environmental valuation and it seems important to consider these possibilities.

NESC is interested in widening the Irish discussion of these issues with this project and beyond. It is important to note that this perspective and wider context brings to bear a number of considerations that have not figured sufficiently to date in Irish discussion of environmental data:

- First, any suggestion for greater use of data and indicators, or for generation of additional ones, has, implicit within it, some view of the policy process (as it is or as it might be) and some idea of the kinds of policies that might be used to promote sustainable development.
- Second, in Ireland and elsewhere environmental policy has evolved considerably in recent decades and continues to do so, with a changing balance between regulatory and market-based instruments and greater engagement of non-state actors, particularly firms and NGOs, in many aspects of policy, each of which requires (and generates) somewhat different kinds of data and indicators. Ultimately, it is how data is used that will determine its value.¹⁴ This may require additional focus on the capacity for analysis and interpretation to draw insights, a practice which varies across the public system.¹⁵
- Third, in the era of ‘big data’ developments in IT create huge potential for data generation and use. Satellites, automatic measurement stations and the internet make it increasingly possible to monitor the environment in real time (Eurostat, 2009). Smart phone applications are likely to play an increasing role in informing consumers on the green credentials of products,¹⁶ in energy efficiency practices and could play a role in ‘citizen science,’ whereby data is generated by trained volunteers in monitoring biodiversity, for example.¹⁷ It also creates enormous potential for organizations and firms to effectively gather and use data for resource efficiency purposes. This raises opportunities and

¹⁴ Some interesting initiatives are the EPA funded BRIDGE Project and AquaATT which aim to enhance communication between environmental researchers and environmental research users, and in particular environmental policy makers in Ireland.

¹⁵ Departments vary in their data use. Innovative examples can be found at the Department of Children and Youth Affairs which prioritises both the longitudinal data set *Growing Up in Ireland*, as well as developing child well-being indicators. The Revenue Commissioners recently outlined the potential of data mining and predictive modelling (Cleary, 2013)

¹⁶ See for example Goodguide <http://www.goodguide.com/>

¹⁷ Donnelly *et al.* (2013) outline the potential of citizen science in monitoring biodiversity in Ireland and conclude that some of the data could be used to fulfil Ireland’s statutory obligations for nature conservation.

challenges for the effective management of quality data systems. It is important also to consider the balance between these sources and official and expert data in capturing environmental trends and informing action.

- Fourth, in considering the role of data in driving the transition to a sustainable economy and society, account must be taken of the fact that public participation in decision-making and access to environmental information will increase because Ireland has ratified the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, usually known as the Aarhus Convention. It grants the public rights regarding access to information, public participation and access to justice, in governmental decision-making processes on matters concerning the local, national and transboundary environment. It focuses on interactions between the public and public authorities.
- Fifth, while comprehensive systems of environmental data, accounts and indicators may turn out to be important for further greening of the economy and society, there may also be a critical role for other forms of data from public and private organisations, capable of monitoring performance and compliance as well as prompting exploration of possibilities.
- Finally, Ireland's budgetary resource constraints suggest that careful thought be given to identifying the particular data and indicators than can most facilitate policy development and delivery in the decade ahead.

Informed by these factors, the Consultants' report and this discussion provides a initial reflective and exploratory account of where Ireland's environmental data and indicators have got to, how they are used and what further developments would most enhance policies for greening the economy.

1.5 Initial Reflections on the Consultants' Report

While the Consultants' report itself provides a full account of its findings, the main ones are summarised briefly below. This further highlights particular issues which the Council has an interest in putting forward for further discussion.

The report and its National Environmental Data Map, (NED-Map), provide a unique overview of Irish environmental data sources and key insights into the use and value of environmental data from their stakeholder consultations. The value of the NED-Map, with 265 data items and indicators, organised by their type and focus is that it assembles in a clear and accessible way, the vibrancy and diversity of current

environmental data sets. It represents a snap-shot of current data sources, given there may be other sources which were not captured due to time restrictions. Although a static list of sources at present, it has further potential value as a resource for current and future use, particularly if it was routinely updated. The research report is concise and accessible, drawing out a range of perspectives from 25 stakeholder interviews as to the current use of data, current gaps and critical next steps. It makes tentative recommendations for further action.

Defining the Scope of Environmental Data and the Greening Economy

Emerging strongly from the report was the view from stakeholders that greater clarity is required as to what constitutes and does not constitute environmental data. There was support for broadening the range of data to include social and economic aspects. Stakeholders consulted consider that bringing such clarity would support greater integration of environmental with economic and social matters.

The report also points to the value of a more focused definition on greening the economy. It points out that 'it is difficult to integrate what is not nationally understood' (:32). In contrast, the report suggests that taking a broader view as to what constitutes environmental data would be beneficial, to encompass more fully areas of sustainable development, such as health and tourism. In both respects, the report concludes that greater clarity in definition and scope across the policy system would be useful.

The Council is particularly interested in the report's concluding point that further policy focus on the green economy and the prioritisation of data that supports it is would be a positive way forward. There might be scope for building on *Delivering Our Green Potential* (Department of Jobs, Enterprise and Innovation, 2012) and *Our Sustainable Future* (Department of Environment, Community and Local Government, 2012) in areas such as data and indicators, institutional capacity and further measures for policy integration.

The Potential for Environmental Data: Greater Access and Policy Relevance

As the NED-map shows, the variety and detail contained in existing Irish environmental data is impressive. Although not exhaustive, the mapping sheds light on the extent of the environmental data and indicators in current use and the complexity of defining the limits of what such a mapping should contain. Some of the sources are rich, multi-annual and contain sub-data sets, including regional and local data, while others are once-off data-sets.

In seeking to determine what data is used in the policy system, the report concludes that a range of key data sources and indicators are used by the stakeholders consulted. However, it makes clear that the key impetus for developing and reporting environmental data and indicators are the reporting requirements from EU regulations.

In line with European indicator sets, many of the indicators are necessarily descriptive in nature in that they provide measurements in relation to

environmental quality, consumption and production. However, other indicator types include data on policy effectiveness, measures of performance and reaching targets and efficiency improvements—all valuable tools in policy-making and review. A further point is that it is the interplay between indicators for Ireland that can be revealing, rather than considering them separately. Further that comparison with other countries, such as the work of Eurostat, can give added insights into the significance of particular data and indicators. The report highlights that it is not yet clear what balance of types of indicators is best suited for Ireland leading to 2020.

The report warns that too much should not be expected from the provision of more indicators and that not all are of equal importance for the green economy. Interviewees raised the issue that specific types of data, interpretations of existing data, and the extent of the data may not fully meet policy needs. It points to the benefits of departments and agencies identifying the most policy-relevant data on the one hand, and to establishing whether there are data deficits, on the other. It points to the value of a cost benefit exercise for future data gathering, followed by an extended open evaluation and consultation in regard to data prioritisation. The Council would be interested in further discussion on this as a potential way forward, noting, however, that such an exercise would only be effective if underpinned by policy drivers. It is worth noting that while the CSO is instrumental in reviewing environmental data and indicators, setting out current and forthcoming data sets as well as identifying gaps, it remains for the policy system to set the future direction for Irish environmental data and deliver on its potential.

Data Gaps and Governance Issues

The report outlines a number of data gaps identified by those interviewed and surveyed, significantly on the economic value of ecosystems, including in relation to material flows. A key gap noted by those interviewed in the study was in relation to valuing natural capital and ecosystem services. Methodologies for this exist such as TEEB and the report suggests further exploration of this would be fruitful. It may be important to consider how Ireland could move more quickly in this direction. Some of the challenges in doing so were outlined at the start of this paper including the absence of baseline biodiversity data. It makes sense to measure our biodiversity with longitudinal analyses, which are costly. However there is much to be gained from investment in such work, as has been shown with the Growing Up in Ireland and Tilda data sets which provide rich data to inform policy, research and practice.

The report also raises data governance questions including capacity issues combined with the limited scope for examining the wider added value of data, other than fulfilling legal reporting requirements. While the integrity of data sets and indicators is a critical factor, the skilled interpretation and use of data is also important across the policy system. This issue would require some careful consideration. The report also refers to the sharing of data as a challenge, and those interviewed raised a common theme for all environmental integration developments, namely shared understandings, clear protocols and greater cooperation to support working together. Stakeholders suggested an over-arching focus on data which crosses departmental or agency lines as a way to further integration. It would be valuable to consider what type of supports would be most

effective and to share learning from the close cooperation already underway between the CSO, the EPA, SEAI and NPWS (National Parks & Wildlife Service), for example.

A central conclusion in the report is that, given the growing range of indicators and data produced for reporting requirements, particularly under EU directives and procedures, greater use could be made of these. It points to greater access to existing data sets as one significant factor, leading to the tentative conclusion that greater open access to existing and future data would be in Ireland's interest competitively. It could foster innovation and more broadly support sustainable development and further greening of the economy. It points to the development of a national-scale open data resource, similar to the NYC OpenData initiative. Such an open data resource would build on the NED-Map and link in with the CSO, so that it complements what it already makes available. The Council would welcome further discussion on this resource and its potential to support greening the economy. It would be important to tease out what would need to be put in place, alongside open access to existing data, to bring about that further development. How can organisations, firms and households and their local carbon and resource efficiency endeavours become part of Ireland's environmental data narrative? Is there a broader set of objectives that would draw them alongside the public and statutory agencies and departments that are already working in this space?

1.6 Key Questions for Future Discussion

The Council welcomes this valuable report on the role of environmental data in Ireland. It represents an initial probing into this area, given the brief time in which this study was completed. Nonetheless, it provides a concise and clear account of the challenges and opportunities ahead. The Council invites further debate on the key issues arising from this work:

- *How to bring greater clarity in the definition and practice of greening the economy across the policy system—what are the necessary steps to support progress in this area? What should the range, scope and boundaries of environmental data and indicators be to underpin this? What is the most effective mechanism to integrate environmental, social and economic indicators for policy use? Would more policy effectiveness indicators, tailored for specific green economy and society initiatives, be valuable?*
- *Conducting a cost benefit exercise for future data options, followed by an extended open evaluation and consultation in regard to data prioritisation. Would this be of value and if so, how could it be linked to policy development for greening the economy and support greater use of environmental data?*

- *Developing a methodology for valuing natural capital and ecosystem services such as TEEB within Ireland.* If this is to be a data priority for Ireland, what can be done to support this development?
- *Developing a national scale open data resource, similar to the NYC OpenData initiative which includes environmental as well as economic, social and cultural data.* Would such a comprehensive resource provide a competitive advantage to Ireland as well help further environmental policy integration, and if so, is there scope for public and private support to progress it further?
- *Do stakeholders recognise the picture presented in this research on the use of environmental data in Ireland?* If so, what ideas can be developed which extend and develop current data use beyond legal reporting requirements?
- *Addressing data governance issues including the sharing of data, capacity issues and the limited scope for examining wider added value of data, other than fulfilling legal reporting requirements.* How can departments, agencies and other institutions be supported to tackle some of these governance challenges?
- *Utilising administrative and organisational level-data—in developing Ireland’s environmental data and data use, should a significant focus be on the metrics, monitoring systems and targets adopted by firms and other organisations.* If so, how might this develop and how might it be used to enhance the integration of environmental concerns into public policy and the achievement of a more sustainable path of Irish development?

The Council considers these issues, themes and questions worthy of continuing debate and invites key stakeholders and those interested in the future of environmental data to reflect on these. A workshop will be convened in the coming months which will enable further debate on these issues.

i. The capital approach, which has a clear foundation in economic theory, seeks to identify sustainable paths of future development, defined as paths in which future welfare or well-being, and the 'capital' assets that sustain them (including human capital, knowledge and natural capital) are not depleted. It suggests that sustainability assessments should ultimately take the form of an asset check. In other words, this would entail asking about the relationship between a given strategy, policy or project and its effects on the assets, including natural assets, that comprise the wealth of the economy (Atkinson, 2009: v) . Development of this approach suggested that sustainability is achieved when savings, defined in an appropriately broad way labelled 'genuine net saving', are positive. Informed by this approach, the World Bank has been publishing estimates of genuine savings as part of its World Development Indicators since 1999. Its important 2006 report, *Where is the Wealth of Nations: Measuring Capital for the 21st Century*, takes this approach further and provides global estimates (The World Bank, 2006).

The International Commission on the Measurement of Economic Performance (known as the Stiglitz Commission), established by President Sarkozy, largely endorsed the measures of genuine net savings proposed by the World Bank and others. However it argued such measures could not capture all critical dimensions of environmental sustainability, since there are no reasonable market values for many of the assets that matter for sustainability. Consequently, it proposed a dual approach to measuring sustainability. First, a genuine savings indicator, 'greened' as far as possible on the basis of current knowledge but whose main purpose would be to serve as an indicator of economic sustainability. Second, a set of physical indicators to monitor the state of the environment and to focus on important dimensions of environmental sustainability that remain difficult to capture in monetary terms (Stiglitz et al., 2009).

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Ireland's Environmental Data: An Inventory and Assessment



A study for NESC by EnvEcon Limited and Flannery Nagel Environmental Limited



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Decision Support



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Executive Summary

This study examines the perceived value and use of environmental data in Ireland across diverse public and private organisations, and explores the extent to which environmental data are currently available and utilised in the policy process. The report offers recommendations with respect to enhancing the value and assimilation of environmental data nationally, with perspectives provided on a direction for national environmental data in the context of supporting Ireland’s policy drive towards a sustainable economy.

Why does data matter for the Economy?

Amongst others, two reasons why a market economy fails to protect the environment relate to information asymmetries and high transactions costs. With regard to information asymmetries, a lack of data leads to obvious information failures as does a lack of knowledge of whether data exist at all. At the same time, even if one knows a certain data set exists, high transaction costs, such as the data being difficult or costly to obtain, or being in an inaccessible or incomprehensible format will result in a suboptimal use of the information. A competitive economy and a well-functioning society needs strong information flows with minimum transactions costs. The effect of ‘greening the economy’ can yield positive outcomes on a number of levels:

1. The first is the most fundamental – unless we protect our planet’s life support systems, there will be a much diminished economy to sustain.
2. It can deliver positive social benefits in areas such as tourism, health and general well-being.
3. A high quality environment is a passport to markets and opportunities.
4. Under EU Law, Ireland has to meet very demanding, legally binding obligations across a spectrum of issues where a green economy can support progress.
5. Meeting these environmental obligations can also be a source of enterprise and employment.
6. Open access to environmentally relevant data can be a driver of general economic activity and also supports the ambitions of the Aarhus Convention, which are to improve public access, awareness and participation in regards to environmental data, decision making and policy.

Study Methodology

The methodology for this project was structured around three major components of work.

1. Development and enhancement of a national environmental data/indicator map
2. Stakeholder engagement and consultation with regards to environmental data

3. Expert review and integration of stakeholder insights to generate recommendations

The key deliverables are the [National Environmental Data Map \(NED-Map\)](#) and this report. In the following section of this summary the recommended priorities are outlined from this work.

Priorities for data collection and use – the ‘What’

1. Stakeholders must identify the most policy relevant data, particularly those essential to strengthen negotiating power at EU level; query and map the policy imperatives already embedded in Directives and emerging needs. An interaction between government departments, agencies, and other actors in the policy process can provide clarity and benefits in this regard.

2. Public bodies must close data gaps of national importance and correct perceived ‘crowding out’ whereby climate and energy data are prioritised at the expense of other key areas, e.g. there are key data gaps identified for biodiversity, transport, waste, air, as well as gaps that inhibit forecasting and certain policy insights.

3. Data providers should identify data that are not policy relevant, but may have other clients – these data should still be made available to citizens, researchers, businesses, local government, and many others. Evidence shows that data considered by the provider to be lacking in usefulness can result in great value in the hands of others.

Priorities for data collection and use – the ‘How’

4. A common set of principles should be followed by data providers: Set the default to ‘open’ with regard to data access; strive towards greater consistency in data provision; consider offering a single point of access for environmental data; only the marginal cost of its collation/dissemination should be charged; explore an alliance between public and private entities encouraging the exchange of data, and establishing protocols for data collection, storage, security, provision and use; develop a consistent protocol for the provision of environmental data; use data to drive the green economy, in terms of designing policy, meeting legislative obligations, and in identifying and capturing commercial opportunities.

5. Government should consider developing a national scale open data resource - similar to the The NYC Open Data initiative. Isolating environmental data from broader data types e.g. economic, technological is not in the best interests of good policy formulation and a comprehensive and inclusive data policy initiative is to be preferred. Open data has been shown to stimulate business activity and is rapidly becoming a competitive advantage for technology cluster development. The CSO expertise with regard to data protection issues should be shared.

6. Better collaboration is required between agencies and departments to reduce duplication of resources and to facilitate data requests in regard to waste data, fuel supply and movement, a National Emissions to Air Inventory and lifecycle CO₂ modelling.

7. Utilise the NED-Map as the precursor to a broader national initiative that addresses data availability and access for a variety of research, reporting and green business innovation purposes and integrate it with further socio economic data dimensions.

8. Data providers should acknowledge the spatial dimension of environmental data, e.g. with regard to identifying economic opportunities and targeting local policy actions.

9. Time series data and Timing matter - for most, environmental data with a long-time trend analysis is particularly important. However, such trend data needs to be established and then maintained. Time series data is essential for biodiversity/habitats studies, or epidemiological studies linking environmental pollutants with health impacts in people. The timing of releases should be regular as this is important given dependencies between data users.

Priorities for data collection and use - the Why?

10. Define the ‘Green Economy’ and Mobilise data in support of it – there is an important literature emerging on understanding what the green economy is, and its implications. Under certain conditions, there is likely to be a net output, employment and environmental dividend to fostering green economic activity in Ireland given that:

- Two important sectors of our economy – tourism and food – are very dependent on the reality of a ‘green’ image, and in both cases this is the most important thread in their promotional efforts abroad, where they seek high quality, discerning, ‘niche’ customers.
- Ireland is an export-dependent economy, where high environmental standards can be an important (even essential) characteristic for goods or services in terms of a competitive edge.
- Ireland faces very demanding legally binding environmental obligations across a range of issues, including climate change, air and water quality, conservation of nature etc.

Data that is credible, and delivered at the appropriate time and place, is a driver of business opportunities generally, but specifically as regards resource and environmental policy. At business level, competitiveness demands that our costs are as low as is consistent with both high product and environmental standards. And the availability of open data is becoming increasingly essential to maintain competitive advantage. If environmental performance does not reflect very high standards, then competitive advantage will leak away. Data that benchmarks performance, by sector, region and nationally, are essential to both inform and alert us to emerging problems.

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1. Introduction

This study, “Ireland’s Environmental Data: an Inventory and Assessment”¹, examines the perceived value and use of environmental data in Ireland across diverse public and private organisations, and explores the extent to which environmental data are currently available and utilised in the policy process. Perspectives and insights from stakeholders are considered and the availability of environmental data across key thematic topics has been mapped. Barriers to accessing pertinent data that are required by decision makers are identified and the most significant environmental data gaps are highlighted.

By exploring which environmental data are relied upon by public and private bodies representing varied sectors, the study aims to catalyse the discussion regarding the significance of environmental indicators across socio-economic as well as environmental-policy areas. The report offers recommendations with respect to enhancing the value and assimilation of environmental data nationally, with clear perspectives provided on a direction for national environmental data in the context of supporting Ireland’s policy drive towards a sustainable economy.

Study Context

Our Environment can be defined as those aspects of our life support systems that we share in common – air, oceans, fresh water, wildlife, atmosphere, the aesthetic quality of our buildings, cities and rural areas. Managing these shared endowments requires us to operate successfully at several levels. Some challenges can only be addressed at global level. These include maintaining the ozone layer to protect us from the damaging effects of too much ultraviolet light (UV-B wavelength range), stabilising greenhouse gas emissions, so as to maintain the temperature of our planet at levels that allow productive and enjoyable life for our growing population, and protecting biodiversity and species diversity to facilitate ecosystem balance and the added benefit of access to a gene pool from which to develop new medicines and antibiotics. At

¹ This project had the working title “The Role of Data for Greening the Economy”. Greening the economy is used here to refer to the ways in which the environmental agenda has been integrated into Irish policy and how this can be taken further towards sustainable development, a circular economy and carbon neutrality. See the NESC Secretariat Paper for further details- Moore, O’Connell and O’Donnell (2013) Greening the Economy: Challenges and Possibilities for Integrating Sustainability into Core Government Policy. Dublin : National and Economic Council
<http://www.nesc.ie/en/publications/publications/nesc-secretariat-papers/>

regional level, we need to control the emissions to air of pollutants that cross frontiers and may cause acid rain and result in health and economic damage, as well as controlling sea pollution to protect our marine resources. At national level, we need to protect our own health, economy, our reputation and our well-being by being effective custodians for our local water, air and natural endowments. The evidence base needs to allow us to judge trends and current performance across these areas, and specifically to what extent we are meeting our international and EU obligations, and whether we are fulfilling our potential as regards those aspects of economic performance that either depend on a high quality environment, or are central to its achievement – the ‘green economy’.

Information and the Green Economy

The ‘green economy’ effect can work on a number of levels. The first is the most fundamental – unless we protect our planet’s life support systems, there will be a much diminished economy to sustain. This seems to be most stark in the case of climate change – if we manage our global commons so that average temperature rise drifts above 4°C, then the next generation could be faced with disruption and disarray that makes normal economic and social activity difficult to impossible for large swathes of the world’s population. In this case ‘greening’ becomes irrelevant because the opportunity has passed².

The second level relates to the role which greening the economy can play in delivering positive social benefits. These can include improvements that offer additional ‘selling points’ and attraction for the tourism sector, or improved environmental conditions resulting in better health or general well-being outcomes for citizens.

The third level is the importance of a high quality environment as a passport to markets and opportunities. Two major sectors in the Irish economy – tourism and food – are especially dependent on the image and reality of Ireland as being ‘green’; there would be a very significant and sustained loss of jobs and profits if our environmental quality diminishes and the perception takes hold in the global market place that the reality is less than the image.

The fourth relates to the fact that, under EU Law, Ireland has to meet very demanding, legally binding obligations across a spectrum of issues, including limiting greenhouse gas emissions, limiting emissions that diminish air quality, protecting nature (biodiversity) and water quality

² See: *Turn Down the Heat – why a 4C warmer world must be avoided*, World Bank, 2012, for evidence in support of this proposition

and reducing waste going to land fill. And meeting these obligations requires that key sectors – households, industry and commerce, transport, agriculture and natural resources – do their bit to contribute. In terms of influence on economic performance, a key consideration is to meet these obligations in ways that minimise the costs - this usually implies imposing a levy or charge for emissions, and allowing the polluter flexibility as to how to adjust.

The fifth level is to explore how meeting these obligations can also be a source of enterprise and employment. The ideal trajectory is that firms develop businesses that meet local requirements, and this experience provides a platform from which an export business develops. The more typical trajectory is that Irish government, households and business buy the technologies and systems that are needed from enterprises in other countries that have moved first to develop a competitive advantage.

A sixth strand relates to the role of open access to data as itself a driver of economic activity. IBM and others have said that they located their laboratories in Dublin in part because of the fact that data from Dublin would be open to them, and would provide a test bed for their research. New York City has used open access as a stimulus to encourage and facilitate the development of many innovative applications for citizens as has the UK Government. It is also important to note that improved records, access and quality of environmental data will support the ambitions of Ireland in respect of the Aarhus Convention. This recently ratified convention sets out a series of rules to promote the participation of citizens in environmental matters, and to improve the enforcement of environmental law. Of particular relevance, the Convention will afford citizens the right to request environmental information from public bodies, and simultaneously requires those public bodies to both maintain and make available environmental information. An improved system and structure for national environmental data may therefore offer a useful tool in this context.

Environmental data at EU level

Environmental data and information are widely collected, analysed, exchanged and used across the agencies of the Europe Union for multiple purposes. One use is to help European policymakers better develop and implement environmental policies, and to subsequently assess the success of the measures at national level. Another requirement is data gathering to enable forward planning for emergency preparedness and international cooperation. Quality and timely information on the trends, pressures and drivers within the European Environment are required. Legal obligations applying to member states require reporting to the various EU

Bodies, including the European Environment Agency (EEA) and Eurostat. Environmental information is needed to empower citizens, so they can effectively influence public policy, and make informed decisions about the environment and matters that affect their lives. Furthermore, as the environment is a public good, citizens have a right to open information, such as the air quality in their neighbourhood or the water quality of local beaches. European businesses also use environmental information, for example, to track their impacts on the environment; to predict future supplies of resources needed for operations; or as an incentive to develop innovative solutions for environmental problems.

A common barrier with accessing data is the difficulty in finding what is required, or understanding the information provided. EU policymakers in particular have faced and voiced many challenges in accessing information necessary for evaluating their policies. To simplify the data exchange and facilitate better sharing of data the EEA launched the development of a 'Shared environmental information system (SEIS)'³ in 2009; with the aim to create a decentralized but integrated web-enabled, Europe-wide environmental information system. A further document outlining the implementation outlook was more recently launched in January 2013. SEIS is based on seven principles, including that information should be managed as close as possible to its source; collected once, and shared with others for many purposes; be easily accessible to all users and fully available to the public. The Central Statistics Office (CSO) has made good strides in developing environmental accounts framed by the UN system (System of Environmental Economic Accounting- SEEA). These can provide a basis for further development of data standardisation, integration and sharing⁴.

To make a shared information portal possible, a key condition is a shift from limited access to open access and open governance. Other European and global initiatives contributing to the implementation of SEIS include the INSPIRE (INfrastructure for SPatial InfoRmation in Europe) Directive which aims to improve the accessibility and interoperability of spatial data. These developments are highly relevant and mirrored in Ireland in the need to improve data accessibility and to meet the challenges of measuring sustainability.

³ <http://ec.europa.eu/environment/seis/>

³ Stiglitz, Joseph, Amartya Sen and Jean Fitoussi, Report by the Commission on the Measurement of Economic Performance and Social Progress

⁴ <http://www.cso.ie/en/releasesandpublications/environment/>

Sustainability and Societal Wellbeing beyond GDP

It has long been recognised that traditional economic measures of economic progress ignore many aspects of economic and social advancement. At the same time, micro measures such as household or individual income are similarly limited. Such narrow indicators of *economic progress* ignore “non-market” goods and activities such as public goods (e.g. environmental quality and social cohesion), household production and the value of leisure time. As indicators of *social progress*, they ignore important social aspects such as inequality and social capital.

The concept of a sustainable economy encompasses environmental and social assets as part of a nations’ capital, beyond a focus on GDP. A parallel literature examines subjective wellbeing as an indicator of individual welfare⁵. Relevant recent work includes Stiglitz, Sen and Fitoussi (2009) and the EU report ‘Beyond GDP.’⁶

To measure sustainability, a multidimensional definition must be explored, with the Commission identifying the following key aspects that should ideally be considered simultaneously:

- i. Material living standards (income, consumption and wealth);
- ii. Health;
- iii. Education;
- iv. Personal activities including work;
- v. Political voice and governance;
- vi. Social connections and relationships;
- vii. Environment (present and future conditions); and
- viii. Insecurity, of an economic as well as a physical nature.

The Commission Report further notes that measuring sustainability poses the challenge of having to assess indicators in the present with a view on their future value to society, thereby involving assumptions, modelling and projections. In addition, some aspects of environmental sustainability are significantly intertwined with other socio-economic aspects, such as climate change, transport models, rail and road infrastructure and car ownership.

⁵ Stiglitz, Joseph, Amartya Sen and Jean Fitoussi, Report by the Commission on the Measurement of Economic Performance and Social Progress

http://www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf

⁶ <http://www.beyond-gdp.eu//index.html>.

As Ireland aims to achieve green growth and transition to a low carbon economy (Forfás, 2009, Government of Ireland, 2012), it is essential that policies to promote these agendas are based on a sound understanding of the factors that influence a sustainable economy, and underpinned by access to the information required to inform and measure progress. While some progress has been made⁷, lack of adequate data can constrain a nation's ability to identify emerging environmental problems that affect economic wellbeing. It is therefore imperative that the availability and use of environmental data in Ireland is optimised, in order to enable symbiosis of data interrogation across the above key dimensions, where relevant.

Study Objective

This study examines the current scope and use of Ireland's environmental data in the policy, research, regulatory and commercial spheres, as well as identifying views on future directions for data presentation, management and accessibility. The tasks of the project have been to establish a data map of currently available and environmentally relevant data, and to augment this with a key stakeholder consultation that collates the views of Ireland's principal environmental data generators and consumers. In this study a very broad definition of environmental data is applied, to include official data (such as those produced/collated by CSO, EPA, SEAI and others) as well as unofficial data (for example energy efficiency data from firms and households or regional sustainability indicators).

This project has set out to address the following questions:

- 1) To what extent, and how, are existing environmental data being utilised within the policy system? Why are some data used more than others?
- 2) What could be done to achieve optimal utilisation of existing data sources at a policy level as well as for wider research?
- 3) What are the contending views on the critical next steps for environmental data in Ireland, and the most important data gaps in progressing towards greening the economy? What other challenges need to be addressed (for example lack of data, data collection inefficiencies and ineffectiveness, data inconsistencies, incomparable data)?

⁷ See Brereton et al (2008) and Moro et al (2008) for research demonstrating the link between environment and subjective well-being.

The three core elements of the project are therefore the development of a data map, the engagement with stakeholders and the completion of this report, containing the analysis and discussion of the study objectives and resultant recommendations.

Data Map

The data map was developed from the current knowledge base, anchored on the CSO Environmental Indicator report (2012) and the CSO Sustainable Development report (2013). To this base, approximately 145 additional data sets and indicators have been added from various sources, such as the EPA, Teagasc, SEAI and the ESRI. The data map is presented as a searchable, scalable and updateable Excel spreadsheet. It includes the primary thematic data category (e.g. air/ land use), the titles of relevant documents, categorisation by indicator types, reference to the data sources, and identification of the primary and secondary users of each series. With 265 individual data items and environmental indicators listed, the data map will support the identification and linking of data sources and will enable the dynamic updating and enhancement of records over time. It will also facilitate further gap analysis and allow users to identify where the available data are insufficient for their needs. The data map is provided as a stand-alone Excel file⁸ and is discussed in Section 3.

Stakeholder Engagement

The real value of data is determined by the use to which they are put. A key aspect of this project was engagement with 28 stakeholders. The stakeholder engagement process investigated the perspectives of Ireland's key data generators and users, identified data accessibility and gaps, and assessed data quality and future requirements and priorities. An overview of the stakeholder engagement is provided in Section 4, with further analysis and discussion provided in Section 5 as well as in the final conclusions of Section 6. An extended record of the stakeholder engagement is presented in Appendix 1 and full details and records of the process have been supplied to the NESC secretariat.

Report Structure

This report investigates the outcomes and trends evident from the data map, and examines the key findings from the stakeholder consultation. Analysis and discussion of the study objectives

⁸ Currently available at EnvEcon's [www.policymeasures.com](http://www.policymeasures.com/resources/detail/national-environmental-data-map-ireland-2013-version/) resource here:
<http://www.policymeasures.com/resources/detail/national-environmental-data-map-ireland-2013-version/>

are put forward in Section 5. The report offers recommendations on how to enhance the use and assimilation of environmental data nationally, with a view to supporting Ireland's policy goal of achieving a sustainable economy.

2. Methodology Overview

The methodology for this project was structured around three major components of work:

1. Development and enhancement of a national environmental data/indicator map;
2. Stakeholder engagement and consultation with regards to environmental data; and
3. Expert review and integration of stakeholder insights to generate recommendations.

The national environmental data map (NED-Map) took the form of an excel data file with extended categorisations for entries, and a structured filtering system. The NED-Map was populated on the basis of an extended desk review of mainstream and alternative data sources, coupled with input from the stakeholder engagement process. The final product details 265 data or indicators of relevance. The outcome is described in more detail in section 3, and a fuller account of the methodology is described in Appendix 2.

The stakeholder engagement process was conducted via a mix of telephone and face to face interviews, as well as a small number by email correspondence. The short timeframe of the project offered a limited window for this work, however, some 28 interviews with key organisations and individuals were completed. The outcomes of the interviews have been incorporated into Section 4, and the report discussion in section 5. They have also directly informed the principal recommendations of this report in section 6. Further details of the stakeholders, the engagement process and the outcomes are presented in Appendix 1 and 2.

The analysis, discussion and recommendations of this report represent the merged perspectives of both the stakeholders consulted and the authors. The work found many areas of agreement between the groups and this helped to structure the discussion and, thereafter, to determine the final recommendations.

3. National Environmental Data Map (NED-Map)

A key element of the project was the process of establishing a national environmental data map. This new combined set of data sources provides a current overview of available environmental data sources in Ireland. It offers stakeholders a single contemporary file from which to quickly ascertain the general types of data available, as well as guiding them in a structured manner to the specific records of individual data sets or analysis. This can offer value to current or potential users of environmental data, whilst also establishing a platform from which to develop a more comprehensive and detailed system over time through gap analysis, updating and expansion. This work drew upon the existing work by the Central Statistics Office and other bodies to compile an extended dataset of environmentally relevant data and indicators. This work was supplemented with a further review of alternative data sets and sources and insights from the stakeholder engagement exercise. The outcome was an Excel format data file which identified some 265 data items related to the environment. The NED-Map is not an exhaustive list of all data that may be considered relevant to the environment in Ireland, nor does it seek to capture all historical data. Instead the NED-Map includes recent and environmentally relevant data for Ireland in a framework that can be structured, edited, filtered and developed as necessary. In cases where a regular time series of data exist the NED-Map selects a representative data marker (e.g. 1990-2010 inventory) on the assumption that a user can thereafter navigate to other data in that same series. In some other cases the source given for a data entry may be a secondary source. In these cases it has usually been judged that the secondary source has added some additional value to the original data. The NED-Map data file has been submitted with this report to NESC/NESDO secretariat and is also available at the link below:

<http://www.policymeasures.com/resources/detail/national-environmental-data-map-ireland-2013-version/>

The overall structure of the extended NED-Map Excel file was developed based on consensus from the team as to what are the most efficient and useful ways to identify and distinguish between various data/indicators. It is acknowledged, in a number of cases, that entries could be categorised or tagged differently, however, the structure required decisions to be made which can, in any event, be updated as necessary over time where stronger cases are made for change. Stakeholder feedback was not provided on many of these points, and so the tags are based on an assessment by the authors.

Columns for relevance, release timing, comments, and source URL have been incorporated into the template, as well as a menu adapted by the team to tag recommended primary and secondary user groups based on the OECD model for identifying users of environmental data.

The structure and outline of the NED-Map file is intended to enable dynamic updating and enhancement of the data over time. The final NED-Map output could thereby support the linking and identification of data sources and enhance further work on data awareness, data accessibility and gap analysis.

3.1. Data Categorisation

An individual review of the 265 entries⁹ for each of the thematic categories suggests that there is a reasonable balance to the data captured in the NED-Map in terms of covering the defined themes. However, clearly the proportional share of entries in a given category is far from an ideal indicator of balance or indeed the depth of information available, its value or use. To offer a more rounded perspective on the data, the nature of the entries under each theme is qualitatively outlined in brief below. A broader discussion is offered in Section 5.

Air - Climate

Entries represent 16% of overall NED-Map

Individual pollutant or gas emissions are well captured for both air and climate and dominate the data entries thereunder. There is a high level of data regarding specific greenhouse gasses or air pollutants. These data are quite well developed and this is in part a feature of the well-established reporting requirements for such emissions to air. These data are similarly important to the research community in the context of climate change and air quality research and modelling, offering the means of investigating emission related human health and ecosystem damage. The main source of these data is the EPA.

Energy

Entries represent 15% of overall NED-Map

⁹ An additional four items were added (Bird Atlas 2007 – 2011 , Birds of Conservation Concern In Ireland (BoCCI), and Article 12 and Article 17 reporting requirements under the Birds Directive & Habitats Directive) in the process of preparing this report for publication and these are not included in the subsequent analysis.

The energy theme is comparatively well researched and monitored, with extensive fuel, price and standards data being regularly and quite rigorously produced. The information collected and included under this category is relevant and regularly reported. There are many important and relevant sub-themes within this category and the types of data range from production and consumption data, to import and export data, forecasts and projections. Various renewable energy sources are included alongside data relating to fossil fuels and electricity generation. This category also has some of the more innovative and well developed data with which to analyse or identify policy opportunities and policy effectiveness. For example there is the regular market price data, as well as information that relate directly to consumer trends and household emissions patterns, including household heating, cooling and Building Energy Ratings. SEAI and the EPA are the main contributors.

Environmental economy

Entries represent 13% of overall NED-Map

This category maintains a broad list of data related to a range of economic and environmental topics. There are several data inputs that cover environmental taxes, the carbon tax, environmental expenditure, and environmental subsidy, as well as, how each of these relates to or impact areas such as social welfare and income distribution. There are also important themes captured within this category such as green economy, green economy sectors, green economy policy and green jobs. The environmental economy category has perhaps the most diverse range of data sources, including Eurostat, the CSO, NESC publications, Governmental Departments and academic literature.

Water

Entries represent 7% of overall NED-Map

The water theme entries are principally focused on water quality assessments and take into account human health and safety as well as biodiversity and ecological concerns. This category encompasses a number of important policy areas relating to water, such as bathing water, nitrates, ground water and SUDs (sustainable urban drainage systems). There is also a comprehensive account of various water sources and resources, for example, lakes, rivers or coastal waters. The main data sources in this section are the EPA and City Councils.

Waste

Entries represent 11% of overall NED-Map

The waste entries in the NED-Map are numerous and benefit in particular from the inclusion of data from some Dublin area regional plans. The Waste Management Plan for the Dublin Region, 2012, produced a great number of data sets and indicators that have been included under this section of the template. There are specific barriers to be mentioned in the waste data category, primarily that the Waste Collection Permits Office shares information internally with the EPA but these data are not publicly available, which is the case also with waste export data from the Trans-frontier Shipment Office.

Biodiversity and heritage

Entries represent 9% of overall NED-Map

Similarly the Biodiversity theme includes a good number of entries, but draws off a handful of key reports. This category contains a list of data and indicators that encompass some of the more recent publications which deal with pressing policy areas related to the protection or conservation of Ireland's biodiversity and heritage. In the context of biodiversity there are particular challenges with regards to identifying the baseline of 'normal' or 'desirable' biodiversity. This is an area that is receiving increased attention within the research community nationally and internationally, and over time these baselines can be developed, and trends thereafter assessed. At present, within the category are various data sets that are relevant specifically to both habitats and species. Regional, national and international (EU) projects and studies are also recognised in the list of data. In most cases the data/indicators that have been included in this section have been produced by either local governments or NGO's.

Land use & agriculture

Entries represent 9% of overall NED-Map

These entries incorporate a blend of information from herd monitoring through to land use analysis, and agri-economic data. The range of specific data and indicators offers in-depth and up-to-date land use information, emissions related to agricultural practices and fertiliser use, as well as livestock numbers and statistics. Much of this category contains information that would be equally useful for analysis of the environmental economy. Teagasc and the Department of Agriculture, Food and the Marine are the main contributors in this category.

Social, health and well-being

Entries represent 8% of overall NED-Map

Not all of the data in this category would immediately register as environmentally relevant data. However they are important in the context of broader inter-disciplinary analysis relating to the environment. The range of individual indicators and data sets include employment, poverty rates, education levels, and social and behavioural barriers to specific policy initiatives. The primary source for this theme has been the CSO.

Transport

Entries represent 5% of overall NED-Map

Transport data includes some particularly strong data sets (e.g. with regards to fleet), and there is scope to extend the number of entries in the NED-Map. The range of data and indicators in this theme hold particular relevance for the air and climate categories given the strong correlation between transport fuel usage, transport technologies and overall emissions. There are several key sources that were relied upon for the development of this category; however, the CSO records were most useful.

Global indicators

Entries represent 4% of overall NED-Map

The global indicators category allows for the inclusion of broad global indicators and data that are important for a more comprehensive analysis of the total environment to be included in the NED-Map. Some of the global indicators include world population statistics, main global environmental challenges and global mega-trends in primary resource demand, such as water and energy. Although these data are not specific to Ireland it is useful in providing a connected analysis between national or regional environmental data and the data that is being collected and collated globally. The primary data sources used for the development of this category have been the UN and the OECD.

National models and other national resources

Entries represent 3% of overall NED-Map

This final category was included to acknowledge the role of several key models with regards to Ireland's scenario assessments and projections in an environmental context (e.g. [GAINS Ireland](#) or the [Irish TIMES](#) model). These data and models can play a particularly important role in national environmental policy, strategy and management. The category was also used to house

two key data resources in the form of the [geological survey of Ireland](#), and the [all-island research observatory](#).

3.2. Data Visualisation – Summary of total data/indicators

In this section some data visualisations are presented to offer an overview of the NED-Map content. Figure 3.1 illustrates the range of primary categories in the NED-Map and how individual entries are dispersed among them. The figure is purely to show the distribution of the entries in this specific work. As previously noted, the proportional distributions do not necessarily signify a meaningful deficit or abundance of data in a given theme. This type of assessment would depend, *inter alia*, on the opportunities, requirements and demands for data on a given theme.

Figure 3.1 – Primary thematic distribution of categories

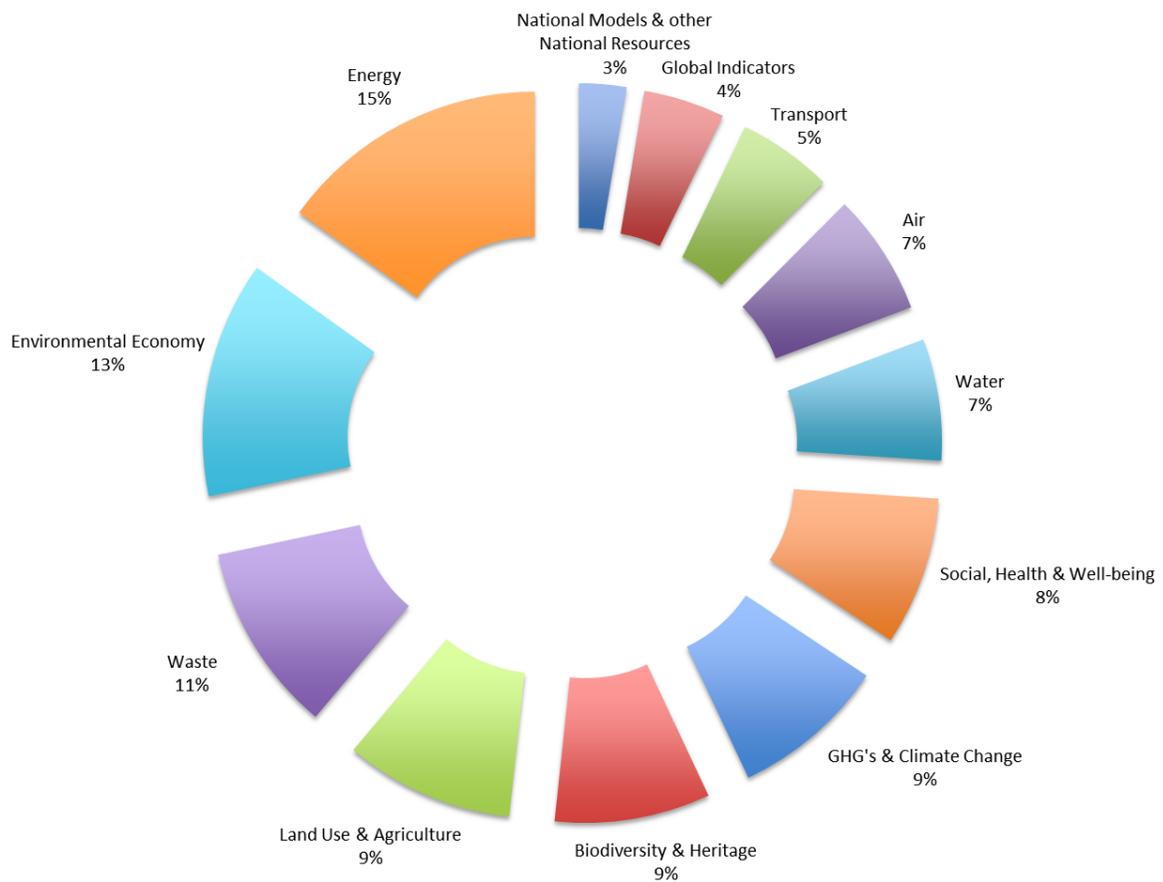


Figure 3.2 illustrates the dispersion of data/indicators by type. The description of types is included in a detailed menu as Appendix 1 of the Excel NED-Map. The dominant type of indicator at roughly 60% is ‘descriptive’, that is data and indicators which reflect trends or, as the EEA put it, “What’s happening?” Whilst the distribution may seem heavily biased towards descriptive data and indicators, this is consistent with the EEA indicator report where over 75% of the entries are in this class. This balance is discussed within section 5. The other categories are ‘performance’, which relates to whether we are reaching targets; ‘efficiency’, which evaluates improvements in efficiency; ‘policy effectiveness’ which determines whether policies and measures are working; and ‘total welfare’ which considers whether society is better off.

Figure 3.3 demonstrates the dispersion of data/indicators by Focus. A detailed description of Focus is included as a menu in Appendix 2 of the Excel NED-Map. In brief the indicators can be broadly defined as follows. ‘Driving Force’ indicators relate mostly to demographic, consumption and production activities. ‘Pressure’ indicators refer to developments in emissions and resource use. ‘State’ indicators describe the quantity or quality of various phenomena (e.g. temperature, species diversity, critical load maps). ‘Impact’ indicators highlight the relevance of changes in the environment e.g. health and ecosystem impacts. Whilst ‘response’ indicators include outcomes of policies to manage the environment e.g. changes in recycling rates, renewable energy sources and so forth.

Figure 3.2 – Distribution of data/indicator types

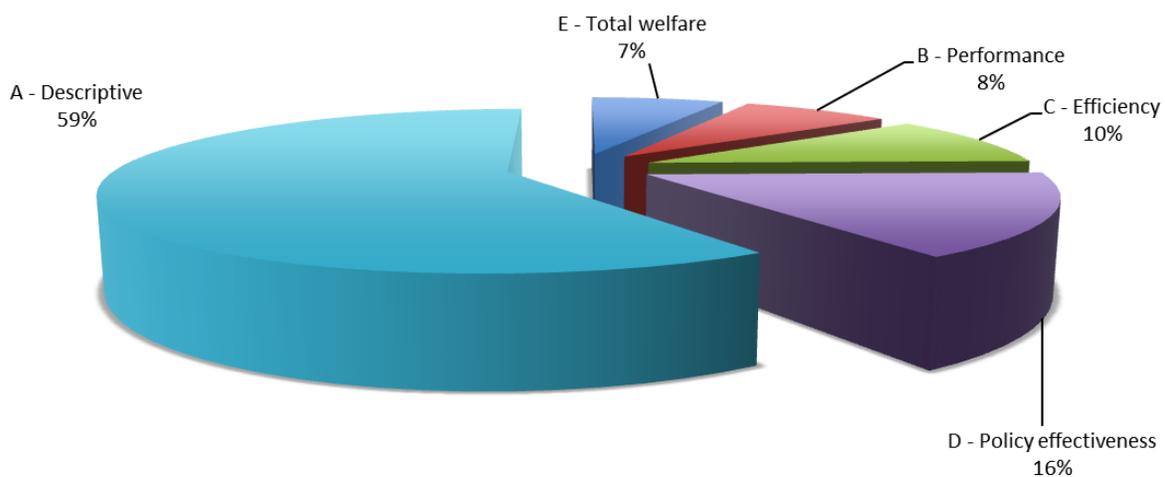


Figure 3.3 – Distribution of data/indicator focus

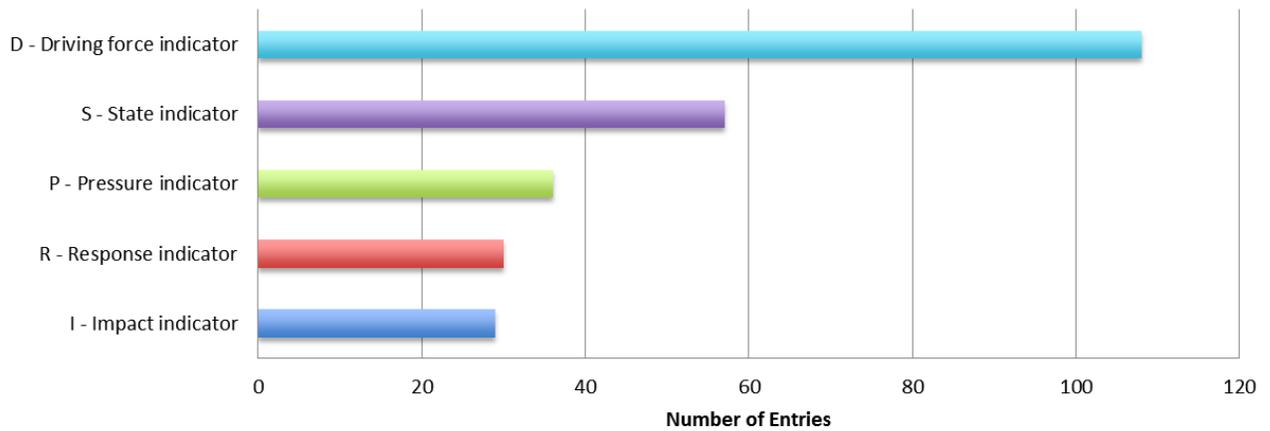


Figure 3.4 demonstrates the wide variety of main sources of data that are included in the NED-Map template. The dominant sources in the NED-Map are the EPA, CSO, SEAI and Eurostat.

Figure 3.4 – Distribution of main data sources

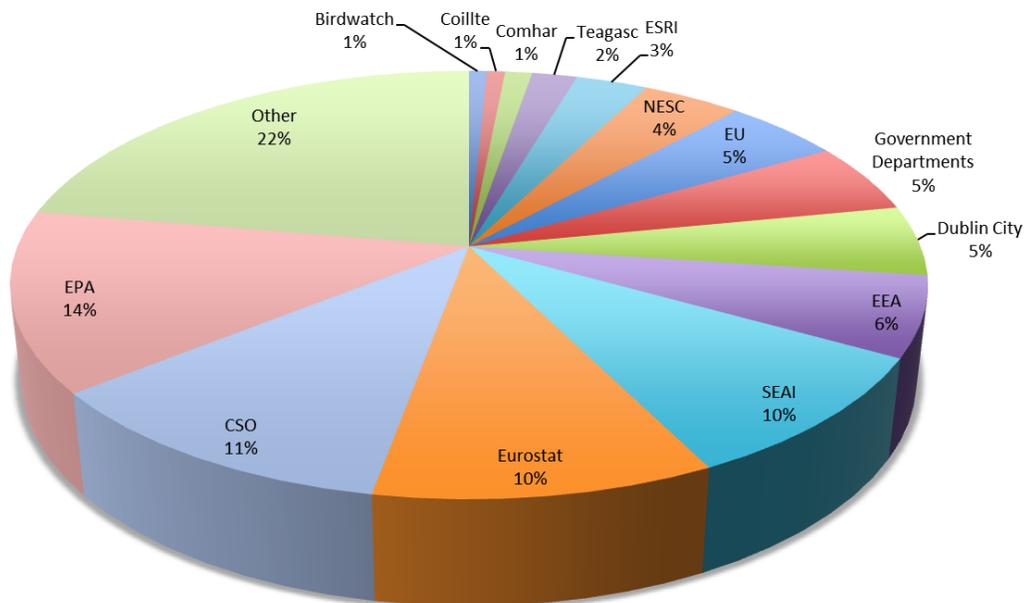


Figure 3.5 – Distribution of the primary data user groups

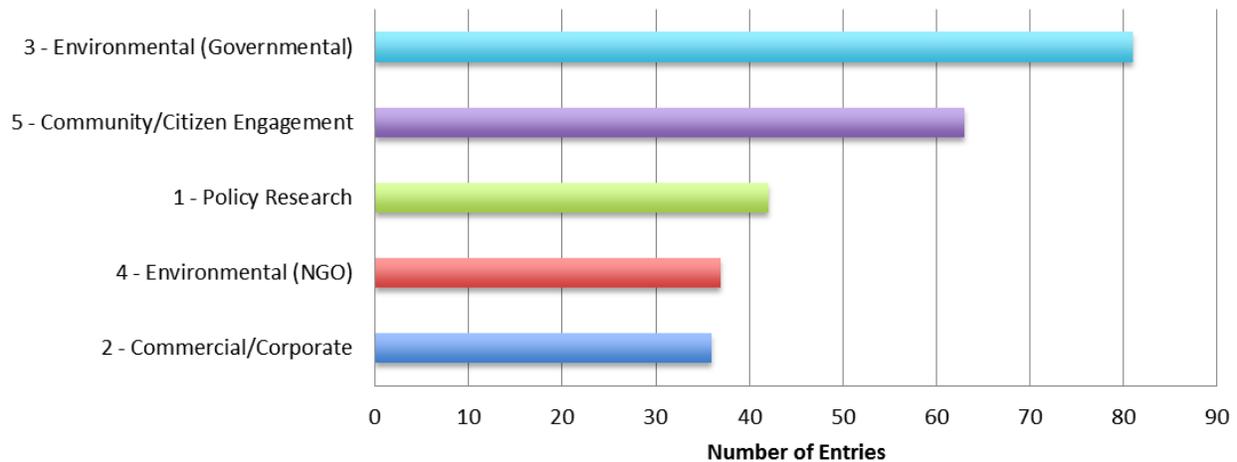


Figure 3.5 displays the number of data/indicators by their suggested or recommended primary user group. The menu of user groups and their potential uses for environmental data is included as Appendix 3 in the data map excel file. A more developed assessment of primary user groups would require an extended and detailed survey. For this study, the primary users have been determined through a combination of the stakeholder responses and in-house evaluation.

4. Stakeholder Engagement

The objective of the stakeholder engagement was to supplement the development of the NED-Map and obtain direct feedback from data generators and data users. A total of 36 organisations were invited to engage in the project and 28 interviews were performed, submissions were received by email by 3 organisations. Table 4.1 provides an overall summary of the breakdown between organisation types that were engaged in the project. A complete list of organisations involved is presented in Appendix 1.

Table 4.1 Summary of Stakeholder Engagement

	No's Contacted	Respondents
Government Departments	11	7
Government Agencies	8	7
Industry Representatives	5	2
Research Bodies	3	3
Private Companies	3	2
Local Authority	2	2
NGOs	4	2
Totals	36	25

All respondents were provided with a list of 10 questions relating to the project objectives with respect to:

- The value and current use of data (e.g. legal reporting requirements, policy research);
- The weaknesses or apparent gaps in existing environmental data; and
- The role and relevance of environmental data to the green economy.
- The future uses, emerging technological applications and potential market for environmental data.

Responses were provided to varying levels of detail, with some organisations for example providing complete details of data used and others providing general categories of data used. A number of themes emerged from the responses; these are outlined in brief below and are discussed in more detail in Section 5 Analysis and Discussion.

4.1. Data Governance

State agencies have a key role in the collection, collation, analysis and reporting of a wide range of datasets for legal reporting nationally and to the EU. Many organisations stated that their specific mandated roles prevented them from looking at the wider added value of specific sets of data they are gathering, such as considering whether other agencies may have a use for the data and actively sharing the data.

Communication between organisations in particular Government Departments and agencies does not easily facilitate the sharing of lists of data that each organisation has responsibility for. This in itself has often led to duplication of data gathering and the potential for inconsistency.

Linked to this theme is the in-house capacity of the various organisations to manage the data they have responsibility for. Most of the State agencies feel they have the required level of expertise, but consider that resource constraints limit the scope to engage in further non-essential data work, even if it could be of evident added value, or to extend tasks to potential collaboration beyond the main focus on the responsibilities at hand.

4.2. National Definitions of Environmental data, Green Economy and Green Jobs

Various stakeholders cited the lack of a definition of the scope of environmental data, the Green Economy and Green Jobs, particularly in the context of their roles and responsibilities. This was highlighted in view of each Government Department now having a role in driving progress towards the Green Economy, whereby it is likely that each Department may have their own interpretation of what 'environmental data' may encompass and include, what the 'Green Economy' is and what 'Green Jobs' are composed of. The concern was evident that the lack of clarity could lead to divergence of the meaning of Green Economy, with each Department working independently in producing various policies.

4.3. Data Access Barriers and Data Gaps

While data gaps were cited by most stakeholders, a recurring theme evident from most stakeholders was barriers to data access. Such barriers may be either through cost, difficulty in locating data that is known to exist, sourcing the data or confidentiality and data protection issues.

The majority of data gaps identified by stakeholders referred to data of specific relevance to their working area and responsibilities for example, soils maps, National Habitats Map and marine monitoring data. Stakeholders also emphasised where they felt gaps existed in data that would require the collaboration of a number of agencies to collate, for example, the economic value of Ecosystem Services, Material Flow and Resource Efficiency Benchmark and agricultural sector inputs and output (energy/fertilisers/slurries/farm waste). The identification of data gaps of overarching national importance to sustainability is the most relevant aspect to this study.

5. Analysis and Discussion

Amongst others, two reasons why a market economy fails to protect the environment relate to information asymmetries and high transactions costs. Lack of data leads to obvious information failures as does a lack of knowledge of whether data exist. At the same time, even if one knows a certain data set exists, if it is difficult to obtain the data, if it comes in a format that makes it difficult to use, or if one is prevented from using it for spurious reasons, this will result in a suboptimal use of the information. A competitive economy and a well-functioning society needs strong information flows with minimum transactions costs.

If a business, a researcher or a policymaker has to ask themselves

- Do the data exist?
- Who has it?
- Can I use it?
- Do I have to negotiate with someone for permission to use it?
- Is someone raising the issue of 'commercial sensitivities' reasonable?
- Does someone else have privileged access?
- Do I have to sign forms in hard copy and mail them?
- Am I going to have to wait for weeks to get it?
- Will it arrive in a format that I can use?
- Will it be specified correctly in the first place or has someone gone ahead and commissioned the data in a form that is unusable?

..... this will stifle innovation and lead to suboptimal outcomes.

The provision of high-quality and easily accessible data reduces information gaps and transactions costs and allows consumers, of both environmental goods and services and goods and services, the production of which have environmental consequences, to make more informed decisions about the consequences of their consumption.

The same principle applies to producers, where an extended economics literature has shown that environmental policies need not necessarily hinder the competitive advantage of firms and,

in some cases where improved information and knowhow is derived from responding to environmental regulation, the competitiveness of firms may be enhanced¹⁰.

High-quality data improve the potential for quality evidence-based policy, improve the chances of policy consistency and reduce the power of vested interests to influence debates inappropriately. In regard to the environment, the availability of data on the consequences of environmental policy and policy that can potentially affect the environment is critical in terms of environmental reporting requirements but also the development of negotiation strategies at European Union level.

Open data provides the opportunity for business to improve the quality, completeness and utility of their own data and to look for opportunities to develop new services (Deloitte, 2012). For example, insurers can incorporate mortality, health, traffic, transport, environment and crime data; retailers can use demographic, population wealth and well-being, property and footfall data. The UK government has now opened up over 8,000 unique datasets, most of them on the UK's official open data site (data.gov.uk), providing an estimated value to the economy of £16 billion in 2011 (Deloitte, 2012). At city level New York also provides a model through its open data initiative.

It is important to recognise that it must not be left to the discretion of the public service to decide where data would be useful for business or for improving public services. There are many examples – most notably in the development of apps for smart phones – of how data has been used for purposes that would never have been imagined by the providers.

The production of environmental data and its primary uses, as identified by the various organisations and stakeholders engaged, varied from legal obligations for the reporting of specific data, to national obligations for maintaining statistics, to policy support formulation, to informing investment decisions, future demand projections and business sector members, or the development of sustainability indicators. Also the by-products of administrative processes – for example deriving vehicle kilometres travelled and emissions estimates from NCT odometer readings.

An issue to be considered is that stakeholders do not necessarily take the cost of collecting and publishing data into accounts in setting out their 'wish lists' of data requirements. There is

¹⁰ See Porter (1991) and Porter and van der Linde (1995) for the development of this hypothesis which, in turn, stimulated a large body of research in this area summarised in Ambec et al. (2013).

therefore an upward bias that will tend to lead to the inclusion of data whose contribution to the achievement of environmental goals is low.

In performing the analysis and providing a discussion, the study was to address a key question in relation to current use of data. Specifically, to what extent, and how, is existing environmental data being utilised within the policy system? Why is some data used more than others?

As discussed in Section 4 a series of questions were posed to all stakeholders focusing on data used, gaps and data issues. A number of themes emerged from the responses as follows:

- Roles and Responsibilities;
- Definitions;
- Data Used and Uses;
- Data Access;
- Data Gaps; and
- Future Role and Use of Data.

Their relevance to the key question above is discussed in turn below.

5.1 Governance of Data Generators and Users

In discussing the detail of the data generated or used, each organisation provided an overview of their roles and responsibilities with regard to the use or collection of data. The use of data includes the following;

- Legal obligations for reporting requiring the collection, collation and analyses of specific data, e.g. EPA, SEAI;
- National obligations for collating and maintaining statistics, e.g. CSO as mandated under the Statistics Act;
- Research, e.g. CIT, ESRI;
- Supporting policy formulation, e.g. EPA, SEAI;
- Enforcement, e.g. NWCPO, Air and Noise Unit of Dublin City Council;
- Future demand projections, e.g. fuel use, transport demand;

- Investment decisions, e.g. Dept. Of Environment, Community and Local Government;
- Informing business sector members, e.g. IBEC and EAI;
- Development of sustainability indicators, e.g. Dublin City Council; and
- Business representatives perform research to improve engagement with their sectors and to make submissions or represent business in relation to a proposed policy or legislation.

In terms of policy formation, the state agencies have a key role in the collection of data and establishing policy reporting to the respective Government Departments. Few stakeholders made any specific reference to data not informing policy and most were in general agreement that data was being used in some way to inform environmental and socio-economic policy. The issue is whether the data is available to the extent necessary to effectively support policy. For example, without an agreement as to what green jobs are defined as in an Irish context, how can a specific number be assigned to job creation or even job loss due to a green economy, as some 'green jobs' may replace others in other sectors or may be double counted. Most agreed that this made their roles very difficult to perform.

The obligations on Ireland with respect to international reporting of environmental data have increased substantially. The EIONET CDR (central data repository) offers some perspective on the official reporting obligations that exist in an environmental context under both EU and United Nations frameworks. Reports to Eurostat, and other specific EU reports, such as pollution emission reporting (PRTR), greenhouse gas reporting and waste reporting are key drivers of environmental data capturing. In addition to these official channels, there are also informal or bilateral data requests that place additional demands on national data agencies on a more irregular basis. Data driven by environmental legislation and associated reporting is not always suitable for other purposes and may not be responsive to emerging demands from a policy context. Many of the State agencies, such as CSO, SEAI, EPA, and Teagasc also rely on each other for the provision of data to enable legal obligation reporting; for instance SEAI energy statistics are the basis for the EPA calculations of energy-related greenhouse gas and other air emissions to the environment. Such roles are supported by Memoranda of Understanding to enhance data collection functions. Agencies such as EPA, SEAI and Teagasc cited research as important in validation of the progress of national programmes such as the National Waste Prevention Programme run by the EPA and the Agricultural Catchment Programme funded by the Department of Agriculture, Food and Marine and run by Teagasc. Particularly strong collaborations were evident between:

- Teagasc, EPA, CSO, SEAI, Forfás;
- Biodiversity Ireland, Heritage Council, OSI, DAFF; and
- SEAI, CSO, Business Energy Use Survey (BEUS).

Many organisations, in particular state agencies, stated that their specific mandated roles prevented them from looking at the wider added value of specific sets of data they are gathering, such as considering whether other agencies may have a use for the data and actively sharing the data. There has been very little analytical attention provided to institutional structures. Some agencies see themselves as serving a particular sector or agencies and not a wider audience, including the public. This has impacts for any potential integration of environmental sustainability in policies where departments and agencies would need to look beyond their responsibility in the environmental dimension.

Communication between organisations, in particular Government Departments and agencies, does not easily facilitate the sharing of lists of data for which each organisation has responsibility. This in itself has often led to duplication of data gathering and the potential for inconsistency.

Linked to this theme is the in-house capacity of the various organisations to manage the data for which they have responsibility. Most of the State agencies feel they have the required level of expertise but consider that resource constraints limit the scope to engage in further non-essential data work, even if it could be of evident added value, or to extend tasks to potential collaboration beyond the main focus on the responsibilities at hand. One stakeholder recommends that there needs to be an active network of inter-agency cross-working to enable knowledge sharing as well as education and open-governance is required for integration of environmental and socio-economic aspects. Several organisations stated that they have a lack of expertise in emerging areas required for a green economy, such as

- Environmental economists and environmental accountants;
- Ecosystem Service Evaluation expertise;
- Environmental Product Declaration and Life Cycle assessment expertise;
- Environmental Investment Evaluation expertise; and
- Green Procurement expertise within the public procurement departments.

5.2. Definitions

Defining 'Environmental' data and its uses

Various stakeholders cited the lack of a definition of the scope of environmental data, the Green Economy and Green Jobs, particularly in the context of their roles and responsibilities in non-environmental areas, such as health, enterprise or transport as a particular difficulty and understanding what non-environmental data is of relevance or use to their reporting systems. If we take biodiversity for example, this area has more complex systems and is global multifaceted that do not fit into any one government department. Some of these issues also relate to a lack of knowledge or understanding of what data exists and to what level of detail, in general, it is produced directly by various organisations.

Much data is not categorised as environmental data but is of significance to environmentalists. For example the data used in studying the interaction of the economy and employment with the environment cannot be isolated as simply 'environmental'.

The production of environmental data and its primary uses is wide and varied and some aspects of environmental sustainability are significantly intertwined with other socio-economic aspects, such as climate change, transport models and car ownership. It would seem sensible to not limit the boundaries of future work in this area to narrowly-defined environmental data. This point is further explored in the final recommendations.

Stakeholders referred to data they use which is not environmental specific but has a particular bearing on environmental research as follows:

- Household composition and size to be used in relation to collation of waste generation figures, fuel use, BER ratings;
- Health data including mortality to be used in relation to climate events such as cold snaps, heat waves, pollution incidents (particulates/smog/low level ozone);
- Tourism data- visitors to natural beauty spots, use of Greenways;
- Employment data related to the potential employment opportunities created by the green economy.

A recurring theme was the establishment of ‘relevant’ environmental data sets and indicators, including data sets that are not directly categorised as environmental data but intertwined with socio-economic aspects.

Most stakeholders felt there was a lack of general governmental agreement as to what constitute environmental data. This limits our ability to settle on a suitable definition of the Green Economy and an associated set of indicators. This issue relates strongly to the requirement to integrate data across thematic areas and topics.

Defining a green economy and green jobs

The most frequent comment from the stakeholders was the overriding need for an agreed definition of the Green Economy. The majority of respondents questioned the distinctions between ‘a green economy’, ‘a low carbon economy’ and “a sustainable economy’. Many called for a definition of a green economy at a national level that incorporates the goal of sustainable development and takes account of definitions used by UNEP/OECD. Indeed, the lack of an agreed government definition of a ‘green economy’ has been cited as an issue for the integration of environmental and socio-economic aspects of sustainability in Government policy and the lack of a ‘value’ placed on the role of the environment – it is difficult to integrate what is not nationally understood. Inherent within the definition of a ‘green economy’ is the need to understand the value and role of environment. From a behavioural aspect, stakeholders from a research background stated that the term ‘sustainability’ is more inclusive than environmental and offers a less abstract meaning than ‘green’. Amongst the respondents, there appeared to be a certain cynicism with the term ‘green’ that results in a negative view towards green policy.

While there are no hard-and-fast definitions – nationally or internationally - of these overlapping concepts, it would be desirable to agree a working definition through consultation with Government departments that could shape the indicators to be used nationally and encourage the symbiosis of environmental and socio-economic data. This would also lead to a better understanding of what is meant by ‘green jobs’ and the extent to which they are double-counted or otherwise with jobs in other sectors. With many policy documents covering different sectors and citing various job numbers, it is important that the numbers and categorisations are consistent across government.

There is a challenge when working from macro-type indicators, such as the green accounting of the CSO and micro-indicators such as individual environmental indicators. The former top-down approach provides a consistency but requires necessary simplification and, while valuable, is limited in its use. Micro or bottom-up approaches generally have a wider variety of uses but suffer from the issues raised previously such as inconsistency, overlaps/double counting, and lack of comparability.

5.3. Data Used and Uses

The stakeholders provided a general overview of data used rather detailed specific lists. Furthermore, the stakeholders were not always in a position to provide an overview of all data used by their organisation¹¹. The stakeholder feedback provided was complemented by the NED-Map development process which offered some insight into the uses of data by identifying the context of the source (e.g. policy briefs, official reporting).

The most common main environmental data types used included:

- Air quality and associated emissions data;
- Water quality data;
- Waste Generation data;
- Fuel consumption and usage data;
- GHG emissions, EU ETS data, emission factors and emissions inventories; and
- Biodiversity data.

The socio-economic and ‘other’ data used were identified as:

- Fuel sales and use;
- Vehicle registration;
- Employment data;
- Oil data;

¹¹ For example, responses were provided in one case by the Nitrates, Biodiversity & Engineering Services Unit of the Department of Agriculture, Food and Marine and in another from the Climate Change Expenditure Evaluation Unit of the Department of Public Expenditure & Reform. In both cases it was recognised that the experts in those units could not necessarily represent the full remit of data uses across the organisation. However, due to the severe time constraints for the interview process it was not possible to run a larger survey.

- Gas/Electricity Prices;
- Herd monitoring data;
- Household data;
- State expenditure on all R&D;
- Health data;
- Tourism data relating to environmental quality;
- Governance data – e.g. Employment in environmental services at local authority level;
- UN Trade Statistics;
- Commercial rates;
- Vehicle registrations;
- Company Registrations; and
- Electricity network distribution.

In general, the main environmental data used from the first list above were often used in an official reporting capacity, though they also played observed roles in research, modelling and policy related work. Water and air quality data also had specific relevance with regard to public service information provision. From the second list on socio-economic and other data that was used, it was noted that much of the data therein was used to perform analysis on business operations and the flow and movement of goods or waste.

Education was however, one area in particular where environmental data seemed to be offering additional value. The Green Schools programme serves as a generator and user of environmental data, and is operated and co-ordinated by the Environmental Education Unit of An Taisce, in partnership with Local Authorities and supported by the Department of Environment, Community and Local Government, and the Department of Transport, Tourism and Sport. In a similar vein, the Department of Education and Skills is developing a National Strategy for Education for Sustainable Development (ESD) which is one of the commitments in Our Sustainable Future - A Framework for Sustainable Development in Ireland published by the Department of the Environment, Community and Local Government in 2012. Such initiatives indicate how data can feed into other national objectives such as education and retraining.

Another observation from the work was that the uses and sources of data highlighted particularly strong collaboration and integration between certain Government Departments and their agencies. For example there is good collaboration between Teagasc, EPA, CSO, SEAI, and Forfás. However, the wider elements of the socio-economic departments and agencies do not appear well integrated in regards to environment generally. Arguably this is somewhat

demonstrated by the absence of some Departments from the Cabinet Committee on Climate Change and the Green Economy which reports to An Taoiseach.

5.4. Data Access and Cost

Data access refers to the barriers in locating or accessing data. Issues with data access were noted as having been experienced by all stakeholders to varying degrees. The barriers to access were commonly cited as being due to licencing costs to access and use data, data confidentiality restrictions, data protection or general inaccessibility of data. From the NED-Map process, it was noted that all data referenced were somehow accessible, though the degree of access was identified as a potential issue. For example, whilst a report may present a table of data, the raw data or underlying methodologies were often unavailable in parallel with the report. Whilst some of these data may be acquired by special request, the absence of data files to be manipulated or interrogated suggests further improvements may be made in terms of both functional data sets, as well as generated reports.

Specific comments on data access from stakeholder included:

- OSI licencing fees and Met Éireann data access costs were cited by 25% of the respondents as an issue;
- Many State agencies pay fees for using and accessing data from other organisations as opposed to open sharing of resources;
- Some data can only be accessed through published reports, which may only be available to particular subscribers or research bodies; and
- Fundamental data access issues were identified by many stakeholders. Specifically, finding data which is embedded in reports, 'hidden' on websites or not available in a collated and functional format.

In relation to the above it was noted that several data *generators* discussed quality and interpretative concerns in the context of providing greater access to data. Fears were expressed that data would be misquoted, misinterpreted or misunderstood if open access is provided. This possibility is inherent in all published data, but the onus must be on the issuers to educate and clarify with regard to released data sets. The greater access to underlying data could also for

example support the identification of issues and errors, and generally enhance engagement with environmentally relevant topics.

Overall the experiences of the authors, along with the feedback provided from numerous stakeholders, highlight particular constraints and restrictions relating to data accessibility, sometimes combined with a lack of knowledge of what data exist and where¹². In some cases there are restrictions on the sharing of data due to uncertainties about their quality or concerns regarding the rights and responsibilities of an organisation in regard to data privacy and protection. This is certainly a complex area, and there are justifiable reasons whereby certain data may not be released (e.g. genuinely commercially sensitive data or data which facilitates personal identification). However, it is important to work towards a secure system and guidance for data management, that does not simply default to a position of offering no or limited access.

5.5. Data gaps – Priorities

The NED-Map process offered some insight on potential gaps, though the focus was more on the identification of what existed, rather than what was missing in that process. The main data gaps identified were by stakeholders and were initially presented as general data types rather than specific sets. The priorities identified as gaps to address were as follows:

- Integrated data systems need to be prepared that offer the available information;
- The lack of spatially referenced data should be addressed¹³;
- Breaks in data records are to be avoided (i.e. records not over sustained periods of time);
- The Economics of Ecosystems and Biodiversity (TEEB) is cited as an example of a proactive coalition that is developing methods for natural and social capital valuation in business. The United Nations system for Environmental Economic Accounting is also relevant here; and
- Irregular data release to be addressed (i.e. variable or unpredictable release periods).

¹² In this regard the NED-Map will offer some additional value

¹³ Though the authors would acknowledge the progress in spatially referenced data (e.g. AIRO) available. There are some ongoing issues with the free availability of easily manipulated spatial data.

More specific data gaps identified demonstrate the requirement for improved integration, collaboration and resource sharing between data generators and include the following:

- Studies on the economic value of ecosystem services (i.e. value of clean water, good soil, uncontaminated air);
- Accessible cost-benefit analyses and parameters;
- Material Flow & Resource Efficiency Benchmark Data from the industrial, manufacturing and services sectors;
- National consumption patterns;
- Studies on the economic value of residential and commercial green investments;
- Indicators for green jobs and green product exports;
- A National Habitats map / National Biodiversity studies;
- National Embodied Carbon Inventory with whole system CO₂ modelling;
- Low carbon economy indicators and analysis;
- Detailed agricultural sector inputs & outputs (energy/ fertilisers – slurries/ farm waste);
- Import and export patterns¹⁴; and
- Marine monitoring relevant to the new programme for Harnessing Ocean Wealth.

These gaps were identified in the context of a general lack of integration of environmental, socio-economic data and policy, as well as a corresponding absence of a definition for a ‘Green Economy’.

It should also be noted that these gaps were ranked differently by different groups. The length of the list from just the selected stakeholders in this study points to the need for an evaluation of the costs and benefits of additional data gathering and research that could then be followed with

¹⁴ Including for example specific studies e.g. The impact of coffee consumption, or waste shipment to other countries for recycling or disposal

an extended open evaluation¹⁵ and consultation in regards to data prioritisation and which gaps are of significant national importance for the progression of the Green Economy.

5.6. Future Role of Data

In considering the future of role of data in the context of the study objectives, a number of headings have been set out to capture the responses from the stakeholders as well as the perspectives from the project team. These are presented below.

Prioritisation of national efforts in regard to data

The ongoing management and updating of data, extending the time series and reviewing methodological approaches should be considered. Thought needs to be given to the number of data sets that are likely to be maintained nationally, and what cost savings might be achieved in avoiding duplication to allow resources to generate more quality data for less. Measurement of the demand for and use of existing series would help set priorities. We do not fully know how much use is made of the plethora of existing series and by whom. While environmental data are in general ‘public goods’ and should be made available free of charge, an attempt should be made to gauge the demand for specific series, especially those that are costly to maintain. Given that almost all series are now accessed electronically the technology exists to monitor the volume of use being made of individual data sets.

Data, environmental modelling and forecasting

Environmental models are used to inform policy choices, manage and support national negotiation of environmental targets and to analyse the increasingly complex issues faced in the policy arena. The models must adapt to changing data and outlooks, as well as evolving to reflect advancements in scientific research. The appropriate calibration of such systems often requires data of increased detail and broader scope than may currently be available through official national data channels. As an example, the GAINS Ireland model¹⁶ is an integrated assessment model for climate and air related policy and analysis. This model integrates detailed historical data, and forecasts, for atmospheric emissions across all sectors of the economy in terms of

¹⁵ The short timeframe for this study did not offer the possibility of affording stakeholders greater time to respond, nor did it allow for a widespread national consultation that offered an opportunity to all potential stakeholders in the public and private domains.

¹⁶ <http://www.envecon.eu/work/project/gains-ireland-modelling/>

activities, costs, and abatement control technologies/strategies. It further incorporates scientific knowledge on air pollutant interactions and pollution dispersal to determine associated impacts (e.g. health, ecosystem damage). Building this type of capacity generates great demands for regular and robust data. The support and development of national environmental data is therefore of great importance to the operation of these type of models, which have the capacity to influence negotiated environmental targets and to offer support in regard to forming credible dynamic strategies to meet environmental challenges.

Indeed the importance of data use in forecasting and modelling is evident in many environmental and socio-economic areas. Forecasts of energy demand are required for the National Grid management, forecasts of agricultural output feed into national methodologies for emissions projections, and similarly water use forecasts are necessary for water infrastructure planning. In brief, it is important that the relevance and availability of robust and transparent forecasts are acknowledged in the ongoing development of national environmental data.

Open access data

The New York City Open Data initiative (<https://nycopendata.socrata.com/>) is a leading example of how an open data initiatives can spur innovation across multiple and diverse thematic areas such as health, environment, transport and business. In the UK, the Open Government Partnership has developed an open data resource (<http://data.gov.uk/>). It is primarily designed to be ‘machine-readable’, so it can be inserted directly into computer programmes written by those outside government.¹⁷ Deloitte (2012) estimate that a total of 49 countries now have more than 220 distinct official or unofficial open data websites, which provide downloadable public datasets at a national, local or city level. Sites in the UK, the United States and Canada provide the bulk of this data. The Sunlight Foundation – a non-profit organisation dedicated to encouraging open government, has published guidelines for open data policies, a summary of which is produced in Annex 4.

Indeed, open data is an increasingly important means of managing, processing and deriving value from ‘big data’. Big data has accompanied the rapid technological advancements in the last decade, as well as the increased penetration of smart devices, and willing participation of the public as generators and potential users of data. In an environmental context, the citizen science

¹⁷ http://data.gov.uk/sites/default/files/library/20131031_ogp_uknationalactionplan.pdf

angle, whereby citizens can for example gather and submit local data to a central point, may revolutionise data collection and address the significant resource challenges posed by large scale monitoring and sampling exercises (e.g. the iSPEX air monitoring system <http://ispex.nl/en/>).

Develop values for the Environment

The majority of Stakeholders agreed that a significant issue is the lack of data on the ‘value’ or, what is sometimes known as a “surrogate price” for environmental goods and services. In a market economy, goods and services are allocated by the price system which reflects their supply and demand. Many environmental goods are not exchanged in markets so it is difficult to compare environmental impacts with other costs and benefits and, this often leads to an over-exploitation of environmental assets. The cost of environmental inaction can, in part, be evidenced by the millions of euro Ireland has paid in fines relating to infringement proceedings from inaction on EU environmental directives.

While there have been a number of studies which provide data on the value of environmental externalities, these tend to be context specific and difficult to apply more broadly. Significant progress has been made in Ireland in the area of climate change where the Department of Public Expenditure and Reform’s Climate Change Expenditure Evaluation Unit gathers and collates relevant data¹⁸. The Economics of Ecosystems and Biodiversity (TEEB)¹⁹ was cited by a stakeholder as one example of a proactive coalition that develops methods for natural and social capital valuation in business.

Stakeholder suggestions for moving towards environmental accounting included, filling gaps in material flow accounting to demonstrate efficiency or inefficiency of the economy and provision of cost-benefit analyses in relation to measures for regulatory compliance to identify which are most effective ways of addressing environmental concerns or commitments. The United Nations Statistics Division has developed a system for Environmental Economic Accounting which follows a similar structure to that of National Accounts. This system has been referred by many stakeholders as the starting point for a review of how environmental accounting can be developed nationally to assign a capital value to our ecosystem goods and services. Good

¹⁸ Revised Estimates Volume <http://per.gov.ie/wp-content/uploads/REV-2012-Final.pdf>

¹⁹ <http://www.teebforbusiness.org/>

progress has been made by the CSO²⁰ in relation to providing a macro-view of environmental performance and the work of the World Bank and others on Wealth Estimates and Adjusted Net Savings²¹ provides a more comprehensive view of the progress of nations beyond GDP measures. At the same time, the European Commission amongst other has funded a large number of studies on environmental valuation which provides the opportunity for the use of so-called ‘benefits transfer’, i.e. using environmental valuations from one context and applying it in another²².

Needs for analysis and interpretation of data

There is a need for people to understand the value of data, and in many cases this requires 3rd party interpretation to add value to the figures. As identified in section 3, much of the data nationally and internationally is ‘descriptive’ or ‘trend’ data. One reason for this is that observational data is more straightforward than data which must interpret say policy effectiveness or welfare impacts. Much of the existing data collection is driven by perceptions of what constitutes a good environment, what are the ingredients of a high quality of life, and trade-offs between conventional economic goods and environmental quality.

The data within the NED Map are predominantly ‘hard’ or ‘objective’ or ‘scientific’ in nature. But the concepts of the Green Economy and Sustainable Development are essentially concerned with subjective perceptions, values and trade-offs. To progress in a meaningful manner we will need to collect data on people’s values as well on ‘objective’ environmental indicators. Furthermore, resources must be turned to generating ‘insights and interpretation’ to go alongside the purely descriptive data. Topical examples are the debate about the amenity value of burying pylons and the balance of costs and benefits of ‘fracking’ in Ireland.

Data and the green economy

High quality data, widely accessible and properly interpreted, are essential to good decision making in all policy areas. The drive for a greener economy does not differ in this regard from other areas of economic policy, such as attaining full employment and maintaining low inflation. The tendency to blame poor decision making on lack of data or on poor quality data is often

²⁰ <http://www.cso.ie/en/releasesandpublications/environment/>

²¹ <http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/ENVIRONMENT/EXTEEI/O,,contentMDK:20487830~menuPK:1187769~pagePK:148956~piPK:216618~theSitePK:408050,00.html>

²² http://ec.europa.eu/environment/enveco/economics_policy/

misplaced. In many areas the available evidence is already sufficient for better decisions to be made; the problem lies with a lack of understanding of the trade-offs involved and / or the difficulty of using data to change perceptions based on prejudices and vested interests. While the collection and dissemination of more and better data in relation to the environment is essential to the better formulation of policy in areas that have only recently come to the fore in public debate – such as the nature of the phenomenon of climate change and its impact on wellbeing – too much should not be expected from the provision of more indicators. In brief, not all indicators are of equal importance for the green economy. Some should carry much more weight than others. In the environmental area we generally lack benchmarks and yardsticks – such as monetary values or production baselines – that would allow us to aggregate to a very accurate level the diverse indicators and arrive at, for example, a figure for GDP adjusted for environmental damage and unsustainable development policies. As discussed previously, progress has been made in these areas by the World Bank and others internationally and the CSO nationally. Further progress at a more refined level would be beneficial.

6. Principal Recommendations

In this final section the principal prioritised recommendations with regard to the future direction and developments for national environmental data are presented.

These are advanced very tentatively. The time available to access data, literature and to speak and otherwise interact with key data generators and users was short. They are in the nature of points for discussion rather than definitive recommendations, and tend to look forward to what could be rather than what is. They can be categorised in three groups – the ‘*what*’ - data that should be gathered and prioritised; secondly the ‘*how*’ – how it should be presented and accessed; and finally the ‘*green economy*’ – achieving an effective interface between rationale, evidence, performance and policy.

6.1. Priorities for data collection and use – the ‘What’

1. Identify the Most Policy Relevant Data

Government departments and agencies know well which data (and associated analysis and research) are essential to strengthen their negotiating power at EU level. The stakes are often high, time is usually short, people are tired; the right data available at the right time are an essential currency in effective negotiation, and no Minister will want to be caught short. It is clear that these data are a top priority. It would be a useful future exercise to query and map the policy imperatives already embedded in Directives and the like, and the emerging needs as the concept of the European Semester (6 monthly reviews of national performance) are extended to include environmental and resource performance. It may be that there are data of great policy relevance that are not understood by the policy process, but that could be mobilised. An interaction between government departments, agencies, and other actors in the policy process could provide clarity and potential benefits in this regard.

2. Fill Data Gaps of National Importance

Some of those consulted complained of a sort of ‘crowding out’ process whereby climate and energy data were prioritised, and other key areas, e.g. biodiversity, were in relative terms poorly served. We did not have the time to test the validity of these propositions, but they deserve follow up work to assess whether other key areas are suffering from data deficits, and, if so, how

and to what extent they should be filled. A selection of areas where gaps were commented upon included:

Transport

Further work on transport specific (not just energy driven) demand-side data and forecasting

Waste

Some issues were noted with irregular data for this sector. A greater focus on national scale data and analysis for the sector was requested.

Air

A specific call for an integrated national emissions to air (air/climate) inventory was made.

Biodiversity

A general review of the approach to biodiversity monitoring and management may be useful given the increased attention on this area and ecosystem services in Europe.

Forecasting

Forecast data generally, as well as improved access to underlying data, methodologies and assumptions was noted as key for environmental policy, planning, reporting and management.

Policy / Insights

Calls were made for additional work offering policy information, or additional insights to generated data that could be more readily interpreted. The www.policymeasures.com resource framework may offer some scope to advance this particular topic.

3. Release Data that are not policy relevant, but may have many other clients

As a complement to the above, there are data that are not used in policy. These should be identified and the current or potential users identified. Citizens, recreationists, researchers, businesses, local government, and many others can be major beneficiaries – it would be useful to better understand these demands and interests. This process would require a broader and far longer time frame for engagement than was possible under this scoping study. If there are no beneficiaries now or likely to be in the future, then it raises a question as to whether the data should continue to be collected.

6.2. Priorities for data collection and use – the ‘How’

In the context of data collection, access and use, a number of headline concepts emerged. These are as briefly outlined below, with extend discussion under points 4 to 8.

- Set the default to ‘open’ with regard to data access
- Strive towards greater consistency in data provision
- Consider offering a single point of access for environmental data
- Where data has already been collected at taxpayers’ expense, only the marginal cost of its collation/dissemination should be charged to bona fide users.
- Explore an alliance between public and private entities encouraging the exchange of data, and establishing protocols for data collection, storage, security, provision and use.
- Develop a consistent protocol for the provision of environmental data across the public service incorporating consistent data organisation, definitions of contents, file formats, image data, descriptive statistics and supporting documentation
- Use data to drive the green economy, in terms of designing policy, meeting legislative obligations, and in identifying and capturing commercial opportunities

4. Consider the development of a national scale open data resource

The NYC Open Data initiative is highlighting the potential innovation that can be driven by providing unrestricted access to ‘big data’. Whilst ‘green’ or ‘environmental’ data is important, there is little reason not to further exploit the potential of such a system nationally with regards to the provision of access to the full spectrum of nationally generated data. Localised initiatives such as Dublinked are highly promising, but a more ambitious strategy could be pursued. Isolating environmental data from broader data types e.g. economic, technological, spatial is not in the best interests of good policy formulation and a comprehensive and inclusive data policy initiative is to be preferred. In a recent report, Deloitte (2012) point to the importance of governments encouraging businesses to engage with open data by providing better explanations of the context surrounding public data resources, particularly around their scope and quality. They also point to the importance of facilitating businesses in drawing on the relevant department or agency’s in-depth experience to ensure that the data can be used in an appropriate way to champion innovation. This will, in turn, facilitate private sector entities to enhance the quality and consistency of public services.

In regard to the issues surrounding access to potentially sensitive data, the Central Statistics Office has considerable experience in regard to anonymizing sensitive data sets (notably the Census of Population) and using administrative data records for analytical purposes (notably records of employment and income obtained through the income tax system). Similarly, the Department of Agriculture, Food and Marine can anonymise datasets in relation to land parcel identification. The expertise of such organisations should be shared in order to support and maximise the accessibility of available data sets in the environmental area.

5. Achieve Better Collaboration between agencies

There is considerable collaboration across some Departments and agencies – the link between the EPA and SEAI is especially notable. Better collaboration to reduce duplication of resources and data requests were suggested in the following areas in the stakeholder engagements:

- Waste data reporting should have one dedicated web access point
- DTTAS, Revenue & Excise in collaboration could generate and provide better information on fuel suppliers and movement
- EPA, DCC and research bodies requested to develop a National Air Emission Inventory
- Collaboration between Departments is required to carry out whole system CO₂ modelling
- Better sharing of information even within departments is essential to avoid duplication of studies and effort

6. Utilise the NED-Map and report as a Basis for a National Initiative

The NED-Map provides an interim guide to environmental data and indicators in Ireland, and could serve as the precursor to a broader national initiative that addresses data availability and access for a variety of research, reporting and green business innovation purposes. We recommend to integrate the development of NED Map with further socio economic data dimensions to optimise the symbioses of data interrogation across the key societal dimensions. The CSO main data dissemination database already provides researchers with convenient access to a large array of data spanning economic, social and environmental topics. This framework should be expanded to include many of the items listed in the NED Map.

7. Ensure data is spatially referenced

It is important to recognise the spatial dimension of environmental data, for example with regard to identifying green economy opportunities and the targeting local policy actions. The need for spatial data for work by Teagasc, as well as for urban planning purposes was highlighted by stakeholders. Initiatives such as the All Ireland Research Observatory (www.airo.ie) are valuable, but more can be done with regard to spatial data mapping, and providing less restricted access to underlying data.

8. Build Time Series data and ensure timely releases

An important benefit from sustained and rigorous collection of data is the opportunity that it affords for modelling processes and research in identifying the effect of interventions. Several respondents discussed the limitation of data effectiveness, if it is gathered by once-off studies. For most, environmental data with a long-time trend analysis is necessary to get real value from the figures, but such long-time trend data needs to be established and prioritized. For example, time series data is essential for biodiversity / habitats studies, or epidemiological studies linking environmental pollutants with health impacts in people.

In a related vein the timing of data releases is relevant for some stakeholders, and greater regularity would be beneficial. In particular there are cases where some data users require data for reporting themselves, but can be constrained by the release timing of ‘upstream’ data from other bodies.

9. Establish a system for Ecosystem Accounting

There is a deficit with regard to data and systems available to support the assessment of the value of environmental and ecosystem goods and services. Material flow accounting to demonstrate the efficiency or inefficiency of the economy and associated cost-benefit or dis-benefit analysis of specific measures is required. We need to understand what society draws from the soils, rivers, forests and bogs for example (ecosystem service) and put a value on our natural capital to enable better management of the draw down on available resources.

Methodologies for valuing ecosystem goods and services are important in this context. The Economics of Ecosystems and Biodiversity (TEEB) is cited as an example of a proactive coalition that is developing methods for natural and social capital valuation in business.

6.3. Data and the ‘Green Economy’

There is an important literature emerging focussed on understanding what the green economy is, and its implications. Zysman and Huberty (2011) make the following points: so far, green growth does not have the transformative impact of railways, electricity and ICT – these not only transformed transport, energy delivery and communications respectively, they transformed everything; But green growth, where for example renewables replace fossil fuels, does impact the energy sector, but they have no further transformative impacts - a green electron has the same transformative impact as a brown electron, i.e. the effects are confined to the sector. And green jobs replace brown jobs, with limited if any impact on aggregate employment. But they also note that there can be significant transformative impacts in particular locations. The Irish case has interesting features where there is likely to be a net dividend.

10. Define the Green Economy and Prioritise Data that support it

An overriding question for most stakeholders was what the definition of a Green Economy is. Indicators for the potential size of job creation in a Green Economy, and how it would benefit companies needs to be understood. To enable that type of data to be furnished and to drive policy, the definition and understanding of what a Green Economy entails, and how it overlaps with other sectors, needs to be crystallised. This should be pursued through inter-governmental roundtable discussions at a high level – perhaps the Cabinet Committee on Climate Change and the Green Economy, as well as within each Department and its agencies in an integrated approach. It is recommended that the roundtable discussions consider sustainability indicators for each aspect of societal wellbeing, as well as incorporating EU/ Eurostat indicators relevant for Ireland, and drawing on the earlier work by Comhar which, using a combination of best international practise and the realities of data availability, identified a set of sustainability indicators for Ireland.

Under certain conditions, there is likely to be a net output, employment and environmental dividend to fostering green economic activity in Ireland for the following reasons:

Two important sectors of our economy – tourism and food – are very dependent on the reality of a ‘green’ image, and in both cases this is the most important thread in their promotional efforts abroad, where they seek high quality, discerning, ‘niche’ customers. Also we are a uniquely export dependent economy, where high environmental standards can be an important (and at

times essential) characteristic for goods and services in providing a competitive edge. A second reason is that we face very demanding legally binding environmental obligations across a range of issues, including climate change, air and water quality, conservation of nature (biodiversity) etc. We have to act anyway, it is not an optional extra, so we should explore whether necessity can be the mother of invention, and create businesses, driven first by local demand, which provides an expertise and track record that can be sold internationally.

Data that is credible, and delivered at the appropriate time and place, is a driver of business opportunities generally, but specifically as regards resource and environmental policy, as noted above. At business level, competitiveness demands that our costs are as low as is consistent with both high product and environmental standards. In this context, data signals opportunity. Where we are not complying with our policy obligations, then smart technology combined with smart policy can combine to generate solutions that meet our obligations at low cost, that generate jobs and profits, and that provide a platform for an export business. At household level, once we know how much energy, water and waste disposal are costing, anyone providing a solution that will reduce our bill will have a business, and the same principle applies to wider enterprises. There are serious gaps in regard to the green economy baseline – the economic activity that is generated by opportunities, and its performance in terms of domestic and export markets, jobs etc. It is essential to establish this baseline, and keep it up to date, so that progress can be mapped, and the influence of any policies introduced to support activity can be meaningfully assessed. At a wider level, achieving growth in the quality markets by a number of sectors, notably food and tourism depend on making and keeping a high quality environment a daily reality. If environmental performance does not reflect very high standards, then competitive advantage will leak away, and accusations of ‘green wash’ will emerge which will be difficult to surmount in key markets. Data that benchmarks performance, by sector, region and nationally, are essential to both inform and alert us to emerging problems.

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Glossary of Acronyms and Abbreviations

Abbreviation	Description
NED-Map	National Environmental Data Map
CSO	Central Statistics Office
EEA	European Environmental Agency
EPA	Environmental Protection Agency
ESRI	Economic and Social Research Institute
NWCPO	National Waste Collection Permit Office
OECD	The Organisation for Economic Co-operation and Development
SEAI	Sustainable Energy Authority of Ireland
UCC	University College Cork
NEC	National Emissions Ceiling
NMVOC	Non-Methane Volatile Organic Compounds
PM	Particulate Matter
E-PRTR	European Pollutant Release and Transfer Register
ETS	Emissions Trading Scheme
SUDs	Sustainable Urban Drainage Systems
SRTM	Shuttle Radar Topography Mission
SWBD	SRTM Water Body Data
WFD	Water Framework Directive
CITL	Community Independent Transaction Logs
BER	Building Energy Rating

ACA	Architectural Conservation Area
GAINS Model	GHG's and Air Quality Integrated Assessment Model
FAPRI	Food and Agricultural Policy Research Institute
ISus Model	Ireland's Sustainability Model
TREMOVE Model	Economic transport and emissions model (transport demands, modal shifts, vehicle stock, and emissions)
SEIS	Shared Environmental Information System
NCT	National Car Test
ESD	Education for Sustainable Development
GDP	Gross Domestic Product
INSPIRE	Infrastructure for Spatial Information in Europe
UNEP	United Nations Environmental Programme
BEUS	Business Energy Use Survey
IBEC	Irish Business and Employers Confederation
CIT	Cork Institute of Technology
AQUATT	Specialists in scientific knowledge transfer and management.
EIONET-CDR	European Environment Information and Observation Network – Central Data Repository
OSI	Ordinance Survey Ireland
DAFF/DAFM	Department of Agriculture, Food and the Marine (previously the Department of Fisheries and Food)
AIRO	All Ireland Research Observatory
TEEB	The Economics of Ecosystems and Biodiversity
DCC	Dublin City Council
DTTAS	Department of Transport, Tourism and Sport

DJEI	Departments of Jobs, Enterprise and Innovation
DEFRA	UK Department for Energy, Food and Rural Affairs
NTFSO	National Trans Frontier Shipment Office
NPWS	National Parks and Wildlife Services
NERC	UK's National Environmental Research Council
NERI	Denmark's National Environmental Research Institute

Appendix 1 Stakeholder Engagements

Table A1.1: Stakeholders Engaged

Organisation Type	Name
Government Department	Dept. Environment, Community & Local Government
	Dept. Agriculture Food & Marine
	Dept. Transport Tourism & Sport
	Dept. An Taoiseach
	Dept. Jobs, Enterprise and Innovation
	Dept. Public Expenditure & Reform
	Dept. Communications, Energy & Natural Resources
State Agencies	Environmental Protection Agency
	Central Statistics Office
	Sustainable Energy Authority of Ireland (and SEAI SSU)
	National Biodiversity Data Centre
	Teagasc
	Forfás
	Enterprise Ireland
Industry Representatives	IBEC
	Electricity Association of Ireland
Research Organisations	Economic and Social Research Institute
	AQUATT
	CIT
Private Companies	Bank of Ireland
	Ecocem
	Bank of Ireland
Local Authority	Dublin City Council- Air and Noise Unit
	Dublin City Council- National TFS Office
	Offaly Coco - National Waste Collection Permit Office
NGOs	Friends of the Earth
	SWAN Ireland

Key Points from Stakeholder Engagement

Data Governance, Definitions and Uses

Roles and Responsibilities

Questions 1 through to 4 issued to stakeholders focused on:

- The nature and type of environmentally relevant data with which the organisation works with including data sources;
- The value and necessity of the data; and
- Where used, including publication references;

Most stakeholders engaged responded to these questions. Respondents generally provided an indication as to the datasets their organisation has responsibility for generating directly (through direct surveying or monitoring) and other associated datasets that may be used in aiding with legal obligation reporting or research.

In providing the detail of the data generated or used by respondents each organisation provided an overview of their roles and responsibilities with regards to data, this in itself is an important aspect as the report highlights issues in relation to organisational roles and responsibilities that lead to problems with data access and presentation.

The results highlighted the following key areas of roles and responsibility in relation to the production and use of data by the various organisations engaged:

- Legal obligations for reporting requiring the collection, collation and analyses of specific data;
- National obligations for collating and maintaining statistics, e.g. CSO as mandated under the Statistics Act;
- Research;
- Supporting policy formulation;
- Enforcement;
- Future demand projections, e.g. fuel use, transport demand;
- Investment decisions;
- Informing business sector members; and
- Development of sustainability indicators.

The legal obligations of reporting refers to reporting nationally and to the EU on a particular dataset, specific references include CSO role on reporting to Eurostat and European Statistics Office, EPA's role in reporting National Waste Statistics, the Department of Agriculture , Food and Marine in reporting on Nitrates Derogations for example.

Many of the State agencies, such as SEAI, EPA, and Teagasc also rely on each other for the provision of data to enable legal obligation reporting; e.g. SEAI energy statistics are the basis for the EPA calculations of energy-related greenhouse gas and other air emissions to the environment.

Seven stakeholder organisations cited legal obligations as the main reasons for generating, using or reporting on data, not surprisingly since this includes:

- Department of Environment;
- Department of Agriculture;
- SEAI;
- EPA;
- Dublin City Council (Air Quality and Noise Mapping Unit and The National Transfrontier Shipment Office);
- The National Waste Collection Permit Office (Offaly County Council); and
- CSO.

Research in various forms is performed by 14 organisations, with 4 organisations performing specific research functions such as ESRI, SWAN Ireland, CIT and AQUATT. Business representatives perform research to improve engagement with business members and to make submissions or represent business in relation to a proposed policy or legislation. Government departments and State agencies cited research as important in validation of progress with certain programmes or to inform national programmes such as for example the National Waste Prevention Programme run by the EPA and the Agricultural Catchment Programme funded by the Department of Agriculture, Food and Marine and run by Teagasc.

Defining ‘Environmental’ Data (relates to responses to que 1)

The questionnaire submitted to stakeholders stated that the study was using a very broad definition of environmental data to include official national data (such as that produced/collated by CSO, EPA, SEAI and others) as well as unofficial data (for example energy efficiency for firms and households or regional sustainability indicators). Stakeholders were referred to the CSO Review of Environmental Data and the CSO Environmental Indicators Report, 2012. These were suggested to help in defining the type of data that stakeholders develop or use on a regular basis.

Many stakeholders responded to this question with a request for a definition of environmental data in the context of a green economy and cited this as a need in order to define what a green economy in a national context.

Five stakeholders referred to data they use which is not environmental specific but has a particular bearing on environmental research as follows;

- Household numbers- used in relation to collation of waste generation figures, fuel use, BER ratings;
- Health data including mortality–used in relation to climate events such as heat waves, pollution;
- Tourism data- used in the context of visitors to nature areas or in relation to green tourism; and
- Employment data – used in context of understanding potential employment opportunities with a green economy.

Defining Green Economy and Green Jobs (relates to responses to que 1)

The questionnaire submitted to stakeholders provided an explanation as to what a green economy is, referring to the ways in which the environmental agenda has been integrated into Irish policy and how this can be taken further towards sustainable development.

The majority of respondents questioned whether a green economy or a low carbon economy was the same definition and if this is a sustainable economy. Many called for a definition of a green economy in an Irish context that incorporates sustainable development and takes account of definitions used by UNEP/OECD. This definition would need to be defined through consultation with each Government department and this in turn could shape the economic and sustainability indicators in an Irish context, from which sub-indicators would be defined.

Data Generated and Used

Many of the organisations have a role in producing datasets to either inform policy and to comply with national and EU legal reporting, other organisations have no role or function in producing datasets and may only be users of data for research purposes for example.

Nine organisations have no specific role or function in producing datasets, but will be data users, such as private companies and research organisations. The remaining have a role and responsibility in collecting, collating and analysing data.

Some stakeholders provided lists of data that informed specific statistical reports and other referred to their website and publications area.

The next stage of the analysis was to assess what data is being used, as opposed to generated. Stakeholders provided a general overview of data used rather than conclusive lists of data used, secondly stakeholders engaged are from a varied range of organisations, some with specific environmental roles and others relating to other service sector areas and therefore may not be in a position to provide an overview of all data used by that organisation. For example, responses were provided by the Nitrates, Biodiversity & Engineering Services Unit of the Department of Agriculture, Food and Marine and from the Climate Change Expenditure Evaluation Unit of the Department of Public Expenditure & Reform, to cite just two examples. Table A1.2 demonstrates the main data used by the stakeholders engaged and includes the key source of data.

Table A1.2: Data Use and Sources

Organisation	Data Used	Source
Dept. Transport, Tourism & Sport	Fuel sales Energy Balances Fuel use Vehicle registration	Revenue SEAI
Dept. An Taoiseach	Varies significantly, can include water, waste, climate, air	Various agencies, mainly EPA, SEAI, CSO
Dept. Jobs, Enterprise & Innovation	Employment data in cleantech/environmental jobs-	CSO Enterprise Ireland Forfás Eurostat EPA
Dept. Agriculture, Food & Marine	Water quality reports, and State of the Environment Reports Biodiversity data (birds)	EPA Department of Agriculture, Marine and Natural Resources EPA Teagasc CSO Birdwatch Ireland NPWS
Dept. Public Expenditure & Reform	Climate change data expenditure	Various Government departments
Dept. Communications, Energy & Natural Resources	Various energy use reports GHG Inventory	SEAI EPA
Biodiversity Ireland	Various biodiversity data	Birdwatch Ireland NPWS EPA

Organisation	Data Used	Source
		Teagasc DAHG DJAR Heritage Council An Taisce Bord Bia Coillte Revenue
SEAI	Oil data Gas/Electricity Prices Household data Fuel usage	DCENR CER Eirgrid Networks Coal importers/suppliers, solid fuel, renewables
EPA	Waste generation and resource use GHG Local authority-Air and water data	Teagasc OPW Met Eireann TFS office/National waste Collection Permit Office CRO OSI SEAI Local authorities Forest Service Dept. of Agriculture, Food & Marine Dept. Of Arts, Heritage & Gaeltacht
CSO	Various Government depts.	Revenue EPA SEAI Birdwatch Ireland Coillte Dept. Agriculture, Food and the Marine Dept. Arts, Heritage and the

Organisation	Data Used	Source
		Gaeltacht Dept. Environment, Community and Local Government Department of Transport, Tourism and Sport Forest Service Met Éireann Office of Public Works Sea Fisheries Protection Authority NTFSO
Forfás	State expenditure on all R&D	DJEI CSO EPA IDA EI
Teagasc	Automated weather data regarding agriculture Land parcel identification IPPC data	Met Éireann CSO DAFM EPA
Enterprise Ireland	Facility and sector specific performance (resource and utility) data, such as energy data, waste generation data, water use data IPPC licensing data	EPA SEAI
Friends of the Earth/NUIM	Biodiversity Climate related/met data Environmental quality data- GIS data sets Health data Hydrology- river flow data Digital terrain models Spatially aggregated economic data	OPW EPA Local authorities National Biodiversity Data Centre (Waterford) Teagasc Ordnance Survey Met Éireann

Organisation	Data Used	Source
	<p>Land cover/land use</p> <p>Forestry/agricultural data</p> <p>Spatially related geo political data on basis of local authority boundary data</p> <p>Tourism data relating to environmental quality</p> <p>Governance data on no. of people employed in environmental services at local authority level</p>	CSO
SWAN Ireland	Water quality	EPA
Ecocem	<p>Fuel Mix</p> <p>Embodied Energy for construction materials</p> <p>Emission factors</p> <p>IPCC licences for cement installations</p> <p>Annual Industrial Environmental Reports (for cement installations)</p> <p>UN Trade Statistics</p> <p>Emissions Inventory for VER's</p>	<p>CER</p> <p>Bath Inventory of Embodied Energy for construction materials</p> <p>DEFRA</p> <p>SEAI</p> <p>CSO</p> <p>EPA</p> <p>UN Trade Statistics</p>
Bank of Ireland	<p>Datasets on EU ETS</p> <p>Data around EU Emissions Trading Scheme.</p> <p>Industry analysis, fuel usage.</p>	<p>EPA</p> <p>CER</p> <p>Eirgrid</p> <p>DCENR</p>
Dublin City Council (Air & Noise Unit)	<p>Air quality data and EU air quality data, the Eionet.</p> <p>Commercial rates</p> <p>Vehicle registration</p>	<p>EU</p> <p>Eionet</p> <p>CRO</p> <p>DTTAS</p>
Dublin City Council (Green business Officer)	<p>Internal data on air/water quality</p> <p>International Benchmarking sources</p>	<p>CSO</p> <p>DCC</p>

Organisation	Data Used	Source
TFS Office and NWCPO	Waste data Vehicle registration Company Registration	Eurostat Waste collectors CRO DTTAS
ESRI	Water Air/GHG Household data Industrial production- energy use Agricultural activities, livestock numbers Waste data	CSO EPA SEAI Revenue Teagasc International sources
CIT	Waste flows, material flows, benchmarks for industry Water usage Energy usage	EPA CSO ESRI
AQUATT	Marine/water data	BIM EPA
IBEC	IPPC General data Waste water discharge licences Water Rates Commercial rates	EPA - licensing (website) Direct contact with all Las
Electricity Association of Ireland	Air emissions data, CO ₂ emissions, SO _x /NO _x EPA Licensing data Network distribution,	EPA SEAI CER ESB networks and Eirgrid

Summary Analysis of Data Used

The most common environmental data used referred to include:

- Air quality and emissions;
- Water quality;
- Waste Generation;

- Fuel consumption and usage;
- Climate data including GHG emissions, EU ETS, emission factors and emissions inventories; and
- Biodiversity data.

The main socio economic data referred to includes:

- Fuel sales and use;
- Vehicle registration;
- Employment data;
- Oil data;
- Gas/Electricity Prices;
- Household data;
- State expenditure on all R&D;
- Health data;
- Tourism data relating to environmental quality;
- Governance data - numbers employed in environmental services at local authority level;
- UN Trade Statistics;
- Commercial rates;
- Vehicle registration;
- Company Registration; and
- Electricity network distribution.

An analysis of the data referenced shows the extent of non-environmental data used; most of these data are used by agencies and government departments that do have a specific environmental role and function, with the exception of SEAI who generate statistics on energy use for example.

- Key sources of data are the Government agencies, with the EPA referenced 18 times, CSO 9 times and SEAI 8 times;
- Least referenced (1-2) Revenue, Dept. of Finance, Dept. Of Public Expenditure, Dept. Of Justice, Department of Tourism, BIM; and
- No reference made to GSI, Dept. Of Social Protection.

Use of the Data

Three organisations referred to the generation and use of data to project future demand. Investment referred to by 4 organisations - the context is important:

EPA- To enable prioritisation of capital investment programmes, e.g. waste water treatment plants;

DTTAS- investment in relation to transport demand;

DJEI- investment in the context of what investments are occurring in industry that may lead to jobs, investments referring to improved insulation; and

SEAI- investment in context of programmes.

Follow up- on line data systems developed by various organisations, e.g. agfood.ie enables farmers and their agents to submit on-line Nitrates derogation applications (since 2013, not mentioned by Dept. AG.

Weaknesses and Challenges in Accessing Data, Data Gaps and Collaboration (que 5-8)

Questions 5 through to 8 issued to stakeholders focused on:

- The weaknesses, gaps or other challenges which exist in regards to specific data relevant to the stakeholders work;
- What data types are needed by the stakeholders organisation, but currently not available, and where suggested studies could furnish the data;
- Whether the organisation has the required in-house capacity to deal with environmental data; and
- Whether the organisation has sought external assistance in developing specific datasets, where national information is not available.

Data Access Barriers

All of the stakeholders responded to these questions, in particular every stakeholder was able to discuss Question 5, barriers experienced in trying to access data that was believed to be available. The reasons why data was perceived to be difficult to access can be summarised under the following bullet points:

Sourcing data

- Lack of clarity of how to link to the required data, outdated search engines;
- Raw data is hidden in appendices of reports, that have to be downloaded, searched, and data extracted as relevant (i.e. EPA AER reports containing licensees emissions data);
- While specific reports and information may be available it may be difficult to find listings of data that can be downloaded;
- A lot of research papers and technical data are difficult to understand for the non-expert, and should be accompanied by a non-technical synopsis; and
- Some data is outdated, or cannot be combined with data from other bodies, such as regional water quality data with river basin catchment zoning.

Most of the respondents voiced a need for a national central data portal which could pull information from various other websites through a common entry point.

Several data generators discussed quality concerns, regarding data being misquoted, misinterpreted or misunderstood if access is provided openly. One suggestion was to tie the data access to an obligatory short web- training session before access is granted (i.e. to spatial data, for instance).

Barrier in accessing data due to cost:

- OSI licensing fees and Met Éireann data access costs were cited by 25% of the respondents;
- Some data can only be accessed through published reports, which may only be available to particular magazine subscribers; and
- One public organisation stated that they used to charge for data access, but made a decision that it should be freely available to tax payers.

Data accessibility and protection

The experiences of the authors, along with the feedback provided from numerous stakeholders suggest there are some particular constraints and restrictions with regards to data accessibility. In some cases this can amount to restrictions on the sharing of data due to uncertainties or concerns regarding the rights and responsibilities of an organisation with regards to data privacy and protection:

- 21% of respondents had concerns that data was not made available due to confidentiality or commercial sensitivity reasons, where these may not necessarily exist;
- Three respondents from public bodies, raised the concern, that they would appreciate more guidance as to what data is confidential, and how to navigate the divergent needs of data availability and data protection.

This is a complex area, and there are justifiable reasons whereby certain data may not be released (e.g. genuinely commercially sensitive data or data which facilitates personal identification). However, it is important to work towards a secure system and guidance for data management, that does not simply default to a position of offering no or limited access.

Data duplication and inconsistency

- Several respondents mentioned the administrative burden placed upon them or their targets, due to similar reporting requests at different times of the year, and in different formats. This particularly concerned waste data reporting (waste licensees, waste permit holders, waste carriers, transfrontier shipment of waste) and climate change/ greenhouse gas reporting;
- The difficulty with data consistency was raised, particularly in the realm of carbon footprint and life cycle analysis, as the use of carbon conversion factors and scoping of studies is often not comparable;
- The lack of data regarding residential fuel choices, fuel suppliers, transport choices and fuel tourism were discussed by two organisations, due to concerns

that while this information cannot easily be extracted, there will soon be an EU reporting requirement regarding Energy End use data; and

- Environmental accounting reports to Eurostat should be used nationally to look at green economy drivers.

Data Gaps (que 5-8)

Many data gaps were identified, and studies were suggested which would provide missing data of national importance. The main ones referred by several respondents, and requiring significant collaboration and resources include the following:

- Studies on the economic value of Ecosystem Services (i.e. value of clean water, good soil, uncontaminated air);
- Material Flow & Resource Efficiency Benchmark Data from the industrial, manufacturing and services sectors, national consumption patterns;
- Studies on the economic value of residential and commercial green investments, green jobs and green product exports, taxonomy of the green economy;
- National Habitats map /National Biodiversity studies;
- National Air Emissions Inventory (both air quality and carbon emissions);
- National Embodied Carbon Inventory / whole system CO₂ modelling/ low carbon economy;
- Agricultural sector inputs & outputs (energy/ fertilisers—slurries/ farm waste);
- Definition of what ‘Green Economy’ entails and how it can be measured;
- Import and export patterns, and the impact of these, such as the impact of coffee consumption, or waste shipment to other countries for recycling or disposal; and
- Marine monitoring under the new programme for Marine harnessing ocean wealth.

Lack of Trend Analysis

Related to the data gaps are the lack of trend analysis.

- Several respondents discussed the limitation of data effectiveness, if it is gathered by once-off studies. For most environmental data a long-time trend analysis is necessary to get real value from the figures;
- The suggestion was made by several respondents, that better trends could be captured if there was a national EIA repository, as all major developments have required EIAs over the past 20 years, and accessing/ using this data for further studies would be cost effective.

Organisational Capacity, Collaboration and External Assistance (que 5-8)

The main response to this question was affirmative, that adequate technical capacity is embedded in organisations. However organisational capacity was lacking, more resources are needed to fulfil the organisations data potential and added value in terms of data generation, analysis, and making it accessible to the public. Several organisations stated that they have a lack of expertise in emerging areas required for a green economy, such as:

- Environmental economists and environmental accountants;
- Ecosystem Service Evaluation expertise;
- Environmental Product Declaration and Life Cycle assessment expertise;
- Environmental Investment Evaluation expertise; and
- Green Procurement expertise within the public procurement departments.

In terms of pooling resources, a high percentage of the respondents mentioned collaboration with other organisations and departments. Particularly strong collaborations were evident between:

- Teagasc, EPA, CSO, SEAI, Forfás;
- Biodiversity Ireland, Heritage Council, OSI, DAFF; and
- SEAI, CSO, Business Energy Use Survey (BEUS).

Better collaboration to reduce duplication of resources and data requests were suggested in the following areas:

- Waste data reporting should have one dedicated web access point;
- DTTAS, Revenue & Excise in collaboration could get better information on fuel suppliers and movement;
- EPA, DCC and research bodies to develop a National Air Emission Inventory;
- Collaboration between departments is required to carry out whole system CO₂ modelling; and
- Better sharing of information even within departments is essential to avoid duplication of studies.

Regarding the use of external assistance, most respondents stated that they have commissioned studies on particular topics to external experts, or have contracted database/ website developers

to setup the external interface for their data systems. Some of the current website and databases mentioned during the stakeholder consultation as valuable resources included:

www.myplan.ie – the DECLG public information portal about local area plans, spatial information

www.dublinked.com –provides a collaboration of data form the four Dublin local authorities and private contributors, in enabling data-driven innovation and trialling new urban solutions.

www.epa.ie/safer - ‘Secure Archive for Environmental Research Data’ is a fully web-based interface to the EPA's Environmental Research Data Archive.

<http://www.biodiversityireland.ie/> - The national biodiversity data centre provides data and maps on Ireland's biodiversity.

Policy Suggestions

Several of the discussions gave rise to policy suggestions, or concerns which require government decision or approval. These included:

- Cabinet approval being required to develop the National Habitats map;
- The centralisation of procurement is not always beneficial for encouraging local green economy, where a local supplier, with lower delivery kilometres, could provide a product instead of a nationwide supplier;
- Concern that environmental policy is guesswork without adequate data, such as informed by a national Air Emission Inventory, or from more automated metrological stations, or more frequent water quality data;
- Transport Policy requires more data on freight destination studies. Also policy should look at whether ‘Green Agricultural Fuel’ incentives should cease, as they provides a strong encouragement for fuel laundering, with the resultant environmental and criminal impact; and
- The definition of Green Economy, what Green Jobs are and Green Investments needs to be clarified at government level.

Green Economy and Future Uses of Environmental Data (que 9-10)

Questions 9 and 10 focussed on the development of a Green Economy, whether current environmental data is sufficient to underpin this progression, and what data is likely to be required in future to support the process. The stakeholders were asked to focus on the following questions:

- In your view, is the data currently available sufficient for the development of the ‘Green Economy’? What are the gaps, if any?
- In your view, what type of environmental data (if any) could be developed that would be of most relevance in progressing towards greening the economy?
- Do you see your organisation using environmental data in the future (identify any future uses)? (I.e. emerging technological applications, potential new markets). What changes would you like to see in regards to the types of data, format of data and access to data in an Irish context?

Integrating Data and Systems across Thematic Areas and Topics

Many stakeholders reiterated points that had been discussed under previous questions, in particular the need to better define what a ‘Green Economy’ is, and how indicators of a green economy can best be identified and quantified. A recurring theme is the establishment of ‘relevant’ environmental data sets and indicators. In a broad sense there are considerable numbers of data sets that are not directly categorised as environmental data, but which are of particular significance to a thematic field. For the Green Economy it is vital to consider the interaction of economy, employment and environment. In each case these three areas may have independent and detailed data sets that do not directly transfer into one another, however, the challenge is to enable these strands to be brought together as integrated indicators.

While there is a general consent that a large amount of data is being generated in Ireland, it is the increased coordination between various organisations, and an agreement regarding which indicators are relevant and important to measuring a growing Green Economy that needs to be formulated.

Concern was voiced in the stakeholder engagement, however, that sharing and contribution of data with others does require additional resources and an understanding of the overarching purpose.

An example for moving a country towards sustainability was mentioned, regarding the Swedish Government model whereby the government adopted 12 principles of sustainable development, and these were actioned as tasks across various government organisations, thereby making sustainability a national government target, and embedding it in the National Development Plan.

With regard to collaboration and generation of ‘Green Economy’ indicators, it was suggested that the CSO could collate socio economic data, the EPA could add environmental data and

Forfás could analyse the green economy contribution of the indicator in question. Similar collaboration between the SEAI, CSO and DTTAS could apply to energy use in transport, in towns, and in buildings, that could for instance be overlain with BER data to gather information on the impact of improving the energy efficiency of the housing stock, as well as the quantity of jobs generated by 'green services' in refurbishing these houses. This could provide data for a study of how sustainability measures, 'Green Home' incentives and refurbishment grants are improving Ireland's overall carbon footprint.

A more cohesive approach would be more valuable rather than continuing to generate separate data sets and indicator reports across different organisations.

Environmental accounting is currently being driven by Eurostat reporting requirements; however this data for Eurostat or EEA may also be useful nationally in assessing green economy indicators and national resource efficiency.

Potential for Green Economy (que 9-10)

Several considerations were gathered from the stakeholders with regard to potential Green Economy contributors:

- Waste materials being exported could potentially be recycled in Ireland, if the facilities were in place. However it is an economy of scale issue, re market feasibility to develop recycling facilities. It is often cheaper or environmentally preferable to export the waste to established facilities abroad;
- Regarding waste datasets there is also a problem with the End of Waste Criteria. Once a material has been classified as having reached the 'End of Waste', it is no longer recorded as waste. If this applies to recyclable materials, they are not recorded during export. So there is a gap in material flow data. Customs Officers are having difficulty in assessing this material, and are being offered guidance by the TFS office;
- At farm level promoting sustainable practices is being undertaken by Teagasc through Farm Discussion Groups, requesting sustainability indicators in the National Farm Survey, and the use of Carbon Navigator tools. The effectiveness of these approaches in changing practices at farm level are yet to be monitored.

Overall it is understood that international markets are becoming more stringent in looking for evidence that sustainability measures are being implemented in Ireland, whether that be in agriculture, food production, or in the manufacturing sector. Stronger evidence is being sought by large international buyers, and internationally consistent indicators are being sought to make comparisons possible, such as Eurostat, LEAP, etc.

Currently there is enough generic data to support the assertion that Ireland is generally in a good place, but more detailed indicators will be required to drill down into subsector performance data.

Future Data Use (que 9-10)

The future data indicators are likely to be collaborative studies between various organisations pooling their expertise, or pooling their data available on open-source portals. This is happening on a national and at an international level:

- In Biodiversity an international movement has established the Intergovernmental Panel on Biodiversity and Ecosystems service, mirroring IPCC- the Intergovernmental Panel on Climate Change. This is focussed on a global data portal that can inform local policy with international studies;
- With regard to energy supply and residential use there are a number of dataset in existence that could potentially improve knowledge of energy supply and use and reduce data gaps and the burden of data collection on both the supplier and receiver. These include:
 - Building Energy Rating dataset;
 - Regulated markets meter operators;
 - Public Sector Energy Programme; and
 - Smart Meters.
- Data is required that can persuade decision makers on optimal expenditure programmes, by showing the economic benefit of investments in particular areas;
- Working together with other agencies in the future will be very important as they have the history and technical knowledge, thereby avoiding duplication, or using data without fully understanding it. Organisations like the CSO can help with management of big files of data; and
- It is critical to understand the effectiveness of incentives better, how they change consumer behaviour, or whether this expectation can actually be shown in studies, i.e. in transport integrated tickets, clean fuel incentives, etc.

As such it would seem sensible consider progression towards an open-data source system that can serve multiple areas of interest simultaneously, whilst also offering the potential for a broadening and enhancement of the quality of all related work.

Suggestions for Further Studies (que 9-10)

What is a Green Economy?

The most frequent comment from the stakeholders was that the overriding question is what the definition of a Green Economy is. It was mentioned that the Department of Finance needs to see indicators for the potential size of job creation in a Green Economy, and how it would benefit companies. To enable that type of data to be furnished and to drive policy the definition and understanding of what Green Economy entails needs to be crystallised.

- Defining a Green Economy for Ireland should be an action from this study, in the form of a roundtable discussion;
- To identify issues and opportunities for the government regarding a Green Economy. would be good action from the study;
- Under auspices of NESCF, a follow up action could be to gather together a small core set of policy relevant indicators that are targeted specifically to the green economy and to the emerging technology;
- The study should also look at international trends, measures, best practice on 1 or 2 other member states. OECD countries, where people have improved use of environmental data;
- Prioritisation of national efforts with regards to data and agreed indicators;
- Identify the needs for long-term environmental modelling. Analytical models are import to inform policy choices and manage and support national negotiation of environmental targets; and
- Forecast data -consideration should also be given to the role of forecast data, particularly in an environmental context.-Forecast data and scenarios development is useful for:
 - Developing more robust outlooks in future scenarios;
 - Identifying better estimates of scenario costs (e.g. abatement);
 - Identifying residual potential for action in specific sectors; and
 - Generating information to support green business innovation for solutions.

Information Use

- There is a need for all data generators and holders of data bases to better highlight/ publicise the existence of their data and resources;
- Emerging technology introduced changes in communication channels (websites/ smart phones/ twitter), and this should be used imaginatively to reach data users;
- The emphasis is on people wanting better access to information, both specialist interest researchers, and the general public; and
- People need to appreciate and understand the data, and in many cases this requires 3rd party interpretation to add value to the figures.

The solution would be a centralised open source search portal in Ireland that provides access to geographic/ environmental/ social/ health data:

- A combined intelligence access point, running off dedicated servers;
- Such a centralised portal will fulfil the legal mandate of the EU INSPIRE directive; and

A current Trial is set up ISDI – IRISH SPATIAL DATA INFRASTRUCTURE a cross agency trial involving the EPA, GSI, Marine Institute, Local Government computer services.

Other examples of Open access - The New York City Open Data initiative (<https://nycopendata.socrata.com/>) is a leading example of how an open data initiative can spur innovation across multiple diverse thematic areas such as health, environment, transport and business.

DCC referred to Data.gov.uk - this refers to the UKs National Infrastructure Information System, which is a central repository for UK government data relating to all societal aspects

End Stakeholder

Appendix 2 Extended Record of Methodology

The guidance provided by NESC in the original request for tenders specified the aims and elements necessary for successful completion of the project. Broadly the work entailed three major components:

1. Development and enhancement of a national environmental data/indicator map;
2. Stakeholder engagement and consultation with regards to environmental data; and
3. Expert review for the final report development.

The work was divided into six stages described below in greater detail.

Stage of Work 1 – Collating the Base Data and Structuring Data Categorisations

In the international literature on environmental data and indicators, a strong recurring theme is the need for an initial approach to data categorisation and tagging (EEA, 2012; OECD, 2008). The potential volume of disparate data and the overlapping of individual data sources across themes are two examples of the need for having a clearly defined approach to the organisation and tagging of relevant data. In Ireland this field of research has evolved from the work of *inter alia* Scott (1999), NESC (2002) and Comhar (2007). At present the foremost official data sources are the CSO reports on Environmental Indicators (2012) and Sustainable Development Indicators (2013). In an international context, the relevant benchmarks are set by the EEA (2012) which deals with environmental indicators, and the recent UN et al. (2012) work which deals with environmental and economic accounting.

The first stage of the methodology involved setting the boundaries of what should constitute ‘environmental data’ for the purposes of this study. On this point, the authors, in line with comments from a number of the stakeholders, opted for a somewhat broader definition than used within the recent CSO work.

As part of stage 1 the team built on the foundations of the CSO work to define an extended framework of environmental and sustainable development indicators which encompassed 120 unique data/indicator entries. The specific steps required to produce the stage 1 deliverable were the collation of the relevant national data sources and the identification and elimination of overlap. These data and indicators were then ported into an Excel spreadsheet to form the starting point for the **National Environmental Data Map (NED-Map)**. This initial work thereby established the baseline of data/indicators in a structured file system to be extended in the later stages of work.

The team also defined thematic categories and additional tags that would be used to enhance the accessibility and filtering options for the NED-Map. The categorisations of environmental data varied from source to source, but the most consistent categories emerged from the CSO, OECD, EEA, and Dublin City Council work and these were the templates used in the definition of

categories for the NED-Map Excel file. The result was 12 categories that encompass the principal elements of the Map and offer a coherent grouping of broader environmental data.

A number of additional tags for the environmental data/indicators have also been included in the NED-Map template. This involved reviewing and adapting the approaches from the EEA (2012) environmental indicator report and the UN (2012) environmental accounting system. Additional columns have subsequently been incorporated into the NED-Map template for 'Data/Indicator Focus' and 'Data/Indicator Type' with drop down menus to control the selection options to a set menu. Similarly tagging options have been included for primary and secondary users of data along the lines of the OECD approach, with further tagging options with regard to data relevance, release timing, comments, and source URLs for access. These tags and data entry fields are discussed in more detail within Appendix 3.

The **deliverable** from this stage of work was a structure and frame for the data map with clear categorisations and a base load of regular and relevant data. The work of populating, expanding and developing the initial NED-Map template was addressed in stages 2 and 3.

Stages of Work 2 – Review of Existing Main Sources

The review process in this second stage scanned the collated national environmental data sets by source. This initial review firstly considered the existing knowledge and research in this area (e.g. NESC, 2002; Comhar 2007; CSO 2012; Curtis et al. 2013). As noted the most substantial applied work in this context nationally has been the CSO Environmental Indicators Ireland 2012 report and the CSO Sustainable Development Indicators 2013 report. However, several mainstream sources have also been re-evaluated to identify potential additions to the NED-Map. The base load of data that was established in stage 1 of the methodology compiled 120 different sets of environmental data or indicators. As part of stage 2 this list was extended to just below 200 entries.

The main sources of data that have been further reviewed and recognised for this second stage were the EPA, SEAI, ESRI, NTFSO, NWCPO, NESC, EEA, National Biodiversity Data Centre, Teagasc, various National Government Departments and local Government. More specifically we identified a number of data sets and indicators from several Comhar reports, STRIVE research, the EPA indicator dashboard, ESRI working papers and publications, Teagasc quarterly research publications, and recent publications from NESC, Dublin City Council and other organisations.

The approach to reviewing, collecting and collating existing data from such a wide range of primary sources was a desk-based academic review, which explored sources for pertinent temporal, graphical or statistical data. The quality, relevance and timeliness of the data were considered before inclusion in the NED-Map template. Data gaps have been recorded and highlighted. Similarly, insights on ways of improving the collection and dissemination of environmental data have been noted. These flagged data gaps and notes are included within the discussions of Section 5 in this report.

Stages of Work 3 – Review of Select Alternative Sources

In order to demarcate elements of the work the team split the review of established mainstream sources of stage 2 from a review of alternative sources under stage 3. The same approach to the review was taken with the distinction that the alternative sources included lesser known and new data sources. These sources included academic literature and the outputs from national or international research projects.

Throughout stage 3 the focus was to investigate more deeply and scan more broadly for potential sources of useful environmental data and indicators to develop the NED-Map. The team conducted a search of the academic literature in thematic areas from biodiversity, to waste, water, transport and climate change, seeking nationally relevant data. This approach did not yield many new entries for the NED-Map. Specific challenges were identified with the environmental data in the academic literature. It became apparent that there is an understandable delay between when environmental data are produced and when academic studies are published.

The search of environmental research projects undertaken in other national institutes identified several interesting pieces of data for the template and shed light on areas for improvement and potential directions for further development. For example, the National Environmental Research Institute (NERI) in Denmark, the UK's Natural Environment Research Council (NERC), New York City's Open Data web portal and the UK Department for Energy, Food and Rural Affairs (DEFRA) have all demonstrated unique strengths ranging from improved accessibility through well-filtered systems to broader categorizations and the inclusion of multiple fields of study to advance environment data analysis.

Specific data were identified as part of the original proposal development as *existing data which could be incorporated into an extended NED-Map*. These included such indicators as waste related metrics, building energy rating data, and household related data (e.g. market share of energy label classes, smart meter information), data related to natural systems, natural assets, biodiversity and ecosystem services in Ireland. These have all been included from existing sources into the data template. Each source was reviewed to ascertain the potential value of the associated data within the NED-Map and was added to the template only if clearly relevant and suitable for the development of an extended NED-Map. In certain cases we have identified that the particular data set/indicator is likely to become increasingly valuable over time.

The overall approach for stage 3 then was to continue developing and progressing the data framework template so that it incorporates a more comprehensive list of the environmental data and indicators available in and for Ireland. The **deliverable** for this stage was a comprehensive and extended NED-Map with 265 environmental data/indicator entries.

Stages of Work 4 – Stakeholder Engagements

The team conducted a series of interviews during November and December 2013 with a cross section of relevant data stakeholders as advised in the RFT. A broad group of stakeholders was identified, including government and non-governmental organisations as well as private companies to represent economic interests, designed to provide feedback on the availability and value of firm-level data. A total of 36 organisations were invited to engage in the project and 23 took part, involving 28 interviews with 32 people. The table below provides an overall summary of the breakdown between organisations invited and engaged in the project.

Table A2.1: Summary of Stakeholder Engagement

	No's Contacted	Respondents	Individuals Engaged	No response
Government Departments	11	7	10	4
Government agencies	8	7	10	1
Industry Representatives	5	2	2	3
Research Bodies	3	3	4	0
Private Companies	3	2	2	1
Local Authority	2	2	4	0
NGOs	4	2	2	2
Totals	36	25	34	11

The objective of these consultations was to obtain feedback from data generators and data users with respect to:

- The value and current use of data (e.g. legal reporting requirements, policy research);
- The weaknesses or apparent gaps in existing environmental data;
- The role and relevance of environmental data to the green economy; and
- The future uses, emerging technological applications and potential market for environmental data.

A set of questions were developed as part of this task to guide a consistent feedback format from the consultation engagements. The outcomes are discussed in the report and have been presented in greater detail in Appendix 1.

Stages of Work 5 – Data Presentation

Stages 1 to 3 of the methodology produced the NED-Map - an Excel based data/indicator file for Ireland. The file has been submitted in conjunction with this report and offers an editable template for further refinement and development. As noted later in the recommendations of this report, the NED-Map provides an interim guide to environmentally relevant data and indicators in Ireland, and will ideally serve as the precursor to an environmental section within a broader national initiative to address data availability and access for a variety of research, reporting and green business innovation purposes. In addition to the Excel file, a series of figures reflecting the components within the data map have been produced. These figures offer an ‘at a glance’ appreciation of the balance of content type, themes and sources that make-up the map and have been presented in Section 3 of the main report.

Stages of Work 6 – Final Report Drafting Process

The production of the final report allowed for an in-house critical review of the work outcomes and stakeholder engagement process. This review generated the analysis and discussion points in section 5, leading to the principal recommendations in section 6. These reflect both the perspectives of the stakeholders and those of the authors.

Appendix 3 NED-Map Categorisations

Categorisations included within the excel version of the NED-Map are summarised as follows:

Category

The category represents the principal thematic association of the data or indicator and drew upon existing categorisation options from national and international approaches.

Alternative Category

Recognising the potential for cross-thematic relevance a secondary category was also tagged for certain data in the NED-Map. Whilst in some cases further cross-thematic connections could have been drawn, it was decided to cap this option at one alternative.

Data – Indicator

This field provides a general description for the data or indicator. For example, “*Air Quality – Ammonia Emissions in Ireland 1990-2010*”.

Data/Indicator Type

According to the EEA 2012, environmental indicators can play different roles depending on which environmental challenge they address. Therefore, the data/indicator type menu helps to distinguish indicators based on the stage of the policy cycle that they aim to inform.

Data/Indicator Focus

Also adapted from the EEA 2012, the data/indicator focus is intended to help structure thinking about the interplay between environmental and socio-economic activities. It is an additional method of flagging and distinguishing between various indicators.

Source and Source URL

These columns identify the main source responsible for the production of the individual data set or indicator. The source URL is to direct users to the nearest access point from which the data can be viewed or accessed directly.

Release Timing

The release timing identifies the regularity of each indicator and or the frequency that the studies are conducted.

Primary User Group

The user group presents an attempt to identify the primary sectors that would find a particular indicator most relevant. This list is by no means exhaustive and is based on the recommendations of our team. The indicators could very likely be relevant outside of this list.

Secondary User Group

The secondary user group offers an alternate suggestion sectors that may find a particular indicator useful or relevant.

Data Relevance

This field is populated based on the source and regularity of the indicator. Indicators/data that originated from main sources and are updated or produced regularly are deemed relevant.

Data Review & Feedback

This area offers users an opportunity to make comments or provide feedback for the development of environmental data in Ireland.

Appendix 4 Guidelines for Open Data Policies

What Data Should Be Public

1. Set the default to open
2. Reference and build on existing public accountability and access policies
3. Mandate the release of specific new information
4. Stipulate that provisions apply to contractors or quasi-governmental agencies
5. Appropriately safeguard sensitive information
6. Require exemptions to data release be balance-tested in the public interest
7. Require code sharing or publishing open source

How to Make Data Public

8. Mandate open formats for government data
9. Require public information to be posted online
10. Remove restrictions for accessing information
11. Remove restrictions on reuse of information
12. Require publishing metadata or other documentation
13. Mandate the use of unique identifiers
14. Require digitization and distribution of archival materials
15. Create a portal or website devoted to data publication or policy
16. Publish bulk data
17. Create public APIs for accessing information
18. Mandate electronic filing
19. Mandate ongoing data publication and updates
20. Create permanent, lasting access to data
21. Build on the values, goals, and mission of the community and government

How to Implement Policy

22. Create or appoint oversight authority
23. Create binding regulations or guidance for implementation
24. Create new legal rights or other mechanisms
25. Incorporate public perspectives into policy implementation
26. Set appropriately ambitious timelines for implementation
27. Create processes to ensure data quality
28. Create a public, comprehensive list of all information holdings
29. Ensure sufficient funding for implementation
30. Tie contract awards to transparency requirements for new systems
31. Create or explore potential public/private partnerships
32. Mandate future review for potential changes to this policy

Source: Sunlight Foundation (2013). Sunlight Foundation's Guidelines for Open Data Policies, version 2. <http://sunlightfoundation.com/opendataguidelines> (accessed 16 December 2013).

Building from the CSO 2012 and CSO 2013 reports, this data map aims to add value in the following ways: updated data indicators*, modified categories, additional columns for more information and more efficient use (particularly the user type menu and the data feedback/review), comprehensive and concise list of indicators, additional relevant indicators*, source links and URL's*.

Objective: To develop a more efficient and informative data map in order to improve the availability and accessibility of the Environmental Data, thereby, increasing its usage and relevance to various stakeholders.

User Guide: Use this spreadsheet to filter and zone in particular types of data/indicators. Filter arrows at the top of each column allow users to limit their view of indicators for easier scanning and digestion of the information. For further details on the tags, such as type, focus or user group, please refer to the Appendices. For a quick view of the overall data in visual format see the second tab for 'Data Visualization'.
When printing a copy please print onto A3 paper.

Data Category:						Principal Users & Data Uses (See User Group/Data Use Menu, Appendix 3.)				
Primary Category	Potential Other Category	Data & Indicators	Data/Indicator Type (See Type Menu, Appendix 1.)	Data/Indicator Focus (See Focus Menu, Appendix 2.)	Data Source & Source URL	Release Timing	Primary User Group	Secondary User Group	Data Relevance (Y/?)	Data Review & Feedback
1. Air	Social, Health & Well-being	Ireland: Particulate matter (PM2.5) emissions 1990-2011	A - Descriptive	P - Pressure indicator	EPA, 2011	http://www.epa.ie/media/airquality/particulatematter.pdf		1 - Policy Research	4 - Environmental (NGO)	Y
	GHG's & Climate Change	EU: Particulate matter (PM2.5) emissions 2009	A - Descriptive	P - Pressure indicator	EEA, 2009	http://dataservice.epa.europa.eu/ViewApp/		3 - Environmental (Governmental)	1 - Policy Research	Y
	Environmental Economy	Ireland: Sulphur dioxide emissions 1990-2010	A - Descriptive	P - Pressure indicator	EPA, 2010	http://www.epa.ie/environment/air/emissions/sulphurdioxide/		2 - Commercial/Corporate	4 - Environmental (NGO)	Y
	Environmental Economy	EU: Sulphur dioxide emissions 2010 and NEC 2010 ceiling	B - Performance	P - Pressure indicator	EEA, 2010	www.epa.europa.eu		3 - Environmental (Governmental)	1 - Policy Research	Y
	Land Use	Ireland: Nitrogen oxides emissions 1990-2010	A - Descriptive	P - Pressure indicator	EPA, 2010	http://www.epa.ie/environment/air/emissions/nitrogenoxides/		1 - Policy Research	3 - Environmental (Governmental)	Y
	Land Use	Ireland: Ammonia emissions 1990-2010	A - Descriptive	P - Pressure indicator	EPA, 2010	http://www.epa.ie/environment/air/emissions/ammonia/		1 - Policy Research	3 - Environmental (Governmental)	Y
	Transport	Ireland: NMVOC emissions 1990-2010	A - Descriptive	P - Pressure indicator	EPA, 2010	http://www.epa.ie/environment/air/emissions/nmvoc/		1 - Policy Research	3 - Environmental (Governmental)	Y
	GHG's & Climate Change	Ireland: Atmospheric deposition rates 1991-2010	A - Descriptive	P - Pressure indicator	Met Eireann, University College Dublin, Coillte			4 - Environmental (NGO)	1 - Policy Research	Y
	GHG's & Climate Change	Ireland: Ozone threshold exceedances 1998-2010	D - Policy effectiveness	P - Pressure indicator	EPA, 2010			3 - Environmental (Governmental)	4 - Environmental (NGO)	Y
	GHG's & Climate Change	AirBase	A - Descriptive	S - State indicator	EEA	http://ftp.eea.europa.eu/www/AirBase_v7/AirBase_IE_v7.zip		1 - Policy Research	3 - Environmental (Governmental)	Y
2. GHG's & Climate Change	Social, Health & Well-being	European Pollutant Release and Transfer Register (E-PRTR) data base	D - Policy effectiveness	S - State indicator	EEA	http://tinyurl.com/8tzuow		1 - Policy Research	3 - Environmental (Governmental)	Y
	Land Use	EU: Nitrogen oxides emissions 2010 and NEC 2010 ceiling	B - Performance	P - Pressure indicator	EEA, 2010	www.epa.europa.eu		3 - Environmental (Governmental)	1 - Policy Research	Y
	Land Use	EU: Ammonia emissions 2010 and NEC 2010 ceiling	B - Performance	P - Pressure indicator	EEA, 2010	www.epa.europa.eu		3 - Environmental (Governmental)	1 - Policy Research	Y
	Transport	EU: NMVOC emissions 2010 and NEC 2010 ceiling	D - Policy effectiveness	P - Pressure indicator	EEA, 2010	www.epa.europa.eu		3 - Environmental (Governmental)	1 - Policy Research	Y
	GHG's & Climate Change	EU: Ozone threshold exceedances April-September 2010	D - Policy effectiveness	P - Pressure indicator	EEA, 2010	www.epa.europa.eu		3 - Environmental (Governmental)	1 - Policy Research	Y
	Land Use	Annual mean nitrogen dioxide concentrations	A - Descriptive	P - Pressure indicator	EPA	http://tinyurl.com/9ozm7f6		1 - Policy Research	4 - Environmental (NGO)	?
	Social, Health & Well-being	Air Quality - Ground Level Ozone	A - Descriptive	P - Pressure indicator	EPA	http://www.epa.ie/media/airquality/ozone.pdf		3 - Environmental (Governmental)	1 - Policy Research	?
	Biodiversity & Heritage	Ireland: Emissions of pollutants under NEC Directive 2011	B - Performance	P - Pressure indicator	EPA, 2011			3 - Environmental (Governmental)	1 - Policy Research	Y
	Air	Ireland: Greenhouse gas emissions 1990-2010	A - Descriptive	P - Pressure indicator	EPA, 2010			1 - Policy Research	2 - Commercial/Corporate	Y
	Social, Health & Well-being	Emissions from households by direct and indirect channels	A - Descriptive	D - Driving force indicator	ESRI	http://www.esri.ie/UserFiles/Publications/WP426.pdf		5 - Community/Citizen Engagement	2 - Commercial/Corporate	?
3. Water	Social, Health & Well-being	Direct and Indirect Emissions of Carbon Dioxide per person by household type	A - Descriptive	D - Driving force indicator	ESRI	http://www.esri.ie/UserFiles/Publications/WP426.pdf		5 - Community/Citizen Engagement	2 - Commercial/Corporate	?
	Environmental Economy	Percentage shares of emissions by final demand sector	A - Descriptive	P - Pressure indicator	ESRI	http://www.esri.ie/UserFiles/Publications/WP426.pdf		2 - Commercial/Corporate	4 - Environmental (NGO)	?
	Social, Health & Well-being	Household size intensity of emissions	A - Descriptive	D - Driving force indicator	ESRI	http://www.esri.ie/UserFiles/Publications/WP426.pdf		5 - Community/Citizen Engagement	1 - Policy Research	?
	Social, Health & Well-being	Income intensity of emissions: ratio of household emissions per person	A - Descriptive	D - Driving force indicator	ESRI	http://www.esri.ie/UserFiles/Publications/WP426.pdf		5 - Community/Citizen Engagement	3 - Environmental (Governmental)	?
	Global Indicators	Greenhouse Gas Emissions - Distance to Ireland's Kyoto Limit	B - Performance	P - Pressure indicator	EPA	http://www.epa.ie/media/ghgkyoto.pdf		3 - Environmental (Governmental)	4 - Environmental (NGO)	?
	Air	Atmospheric Carbon Dioxide (Mace Head)	A - Descriptive	S - State indicator	EPA	http://www.epa.ie/media/Atmospheric%20Carbon%20Dioxide.pdf		1 - Policy Research	4 - Environmental (NGO)	?
	Global Indicators	Greenhouse Gas Emissions Projections to 2020	D - Policy effectiveness	D - Driving force indicator	EPA	http://www.epa.ie/media/ghgprojections.pdf		5 - Community/Citizen Engagement	3 - Environmental (Governmental)	?
	Global Indicators	Greenhouse gas emissions per capita 2009	A - Descriptive	D - Driving force indicator	EEA, 2009	http://dataservice.epa.europa.eu/ViewApp/		3 - Environmental (Governmental)	5 - Community/Citizen Engagement	Y
	Air	EU: CO2 emissions 2009	C - Efficiency	P - Pressure indicator	EEA, 2009	http://dataservice.epa.europa.eu/ViewApp/		2 - Commercial/Corporate	4 - Environmental (NGO)	Y
	Environmental Economy	Ireland: Greenhouse gas emissions by sector 1990-2011	A - Descriptive	P - Pressure indicator	EPA, 2010	http://www.epa.ie/media/ghgemissionsbysector.pdf		2 - Commercial/Corporate	3 - Environmental (Governmental)	Y
4. Land Use & Agriculture	Social, Health & Well-being	Ireland: Average annual temperature 1961-2010	A - Descriptive	S - State indicator	Met Eireann			3 - Environmental (Governmental)	1 - Policy Research	Y
	Water	Ireland: Annual rainfall 1941-2010	A - Descriptive	S - State indicator	Met Eireann			4 - Environmental (NGO)	1 - Policy Research	Y
	Global Indicator	EU: Greenhouse gas emissions 2010	C - Efficiency	P - Pressure indicator	Eurostat Statistics			3 - Environmental (Governmental)	1 - Policy Research	Y
	Environmental Economy	Impact of carbon levy on sectoral (non-ETS) CO2 emissions	D - Policy effectiveness	D - Driving force indicator	Comhar, 2007	http://tinyurl.com/oc4ada9		3 - Environmental (Governmental)	2 - Commercial/Corporate	?
	Land Use	Emissions from Residential Buildings, 2005-2020 (Mt CO2 eq)	A - Descriptive	S - State indicator	EPA, 2012; NESG, 2012	http://tinyurl.com/piltzdw		5 - Community/Citizen Engagement	1 - Policy Research	?
	Land Use	Emissions From Non-Residential Buildings (Mt CO2 eq)	A - Descriptive	S - State indicator	EPA, 2012; NESG, 2013	http://tinyurl.com/piltzdw		2 - Commercial/Corporate	1 - Policy Research	?
	Air	Greenhouse gas emissions as observed and as projected per gas and per sector	A - Descriptive	P - Pressure indicator	EPA, 2013	http://epa.ie/pubs/reports/research/econ/strieverport103.html		2 - Commercial/Corporate	4 - Environmental (NGO)	?
	Environmental Economy	Non-ETS Emissions 2005-2020 (Mt CO2 eq)	A - Descriptive	S - State indicator	EPA, 2012; NESG, 2012	http://tinyurl.com/piltzdw		4 - Environmental (NGO)	2 - Commercial/Corporate	?
	Environmental Economy	Carbon dioxide emissions by production activities	A - Descriptive	S - State indicator	EPA, 2013; Morganth, 2009	http://epa.ie/pubs/reports/research/econ/strieverport103.html		2 - Commercial/Corporate	3 - Environmental (Governmental)	?
	Energy	Implications of EU-Wide Emissions Reduction (2050 per cent)	C - Efficiency	P - Pressure indicator	EEA, 2011	http://tinyurl.com/pdfc9y		1 - Policy Research	2 - Commercial/Corporate	?
3. Water	Energy	Ireland: Progress towards renewable targets 1990-2011	C - Efficiency	R - Response indicator	SEAI, 2011			3 - Environmental (Governmental)	2 - Commercial/Corporate	Y
	Social, Health & Well-being	Ireland: Bathing water quality 1998-2010	A - Descriptive	S - State indicator	EPA, 2010			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y
	Land Use	Groundwater Quality - Nitrates	A - Descriptive	S - State indicator	EPA	http://www.epa.ie/media/groundwaterquality.pdf		5 - Community/Citizen Engagement	3 - Environmental (Governmental)	?
	Land Use	Sustainable Urban Drainage Systems (SUDs) Register and Map	D - Policy effectiveness	R - Response indicator	Dublin City Council	http://dublinlinked.ie/datasore/datasets/dataset-103.php	As Required	1 - Policy Research	3 - Environmental (Governmental)	?
	Social, Health & Well-being	WaterBase	D - Policy effectiveness	S - State indicator	EEA	http://www.epa.europa.eu/data-and-maps/data/waterbase-water-quantity-7		1 - Policy Research	3 - Environmental (Governmental)	Y
	Land Use	Coastline outline of Ireland, from NASA's Shuttle Radar Topography Mission (SRTM) Water Body Data (SWBD) dataset	A - Descriptive	S - State indicator	Dublinlinked	http://dublinlinked.ie/datasore/datasets/dataset-209.php		4 - Environmental (NGO)	3 - Environmental (Governmental)	?
	Social, Health & Well-being	Dublin City Central Laboratory Water Samples	C - Efficiency	R - Response indicator	Dublin City Council	http://dublinlinked.ie/datasore/datasets/dataset-024.php	As Required	3 - Environmental (Governmental)	4 - Environmental (NGO)	?
	GHG's & Climate Change	Rainfall monitoring from Greater Dublin Area Telemetry System	C - Efficiency	D - Driving force indicator	Dublin City Council	http://dublinlinked.ie/datasore/datasets/dataset-176.php	As Required	4 - Environmental (NGO)	1 - Policy Research	?
	Land Use	Drainage Network and Maps for Dublin City	D - Policy effectiveness	R - Response indicator	Dublin City Council	http://dublinlinked.ie/datasore/datasets/dataset-070.php	As Required	3 - Environmental (Governmental)	1 - Policy Research	?
	Biodiversity & Heritage	Invasive Flora Survey of Dublin City Council Waterways 2009	C - Efficiency	S - State indicator	Dublin City Council	http://dublinlinked.ie/datasore/datasets/dataset-109.php	As Required	4 - Environmental (NGO)	1 - Policy Research	?
4. Land Use & Agriculture	Biodiversity & Heritage	River Quality - WFD Ecological Status 2007 - 2009	A - Descriptive	I - Impact indicator	EPA, 2009	http://dublinlinked.ie/datasore/datasets/dataset-109.php	As Required	4 - Environmental (NGO)	1 - Policy Research	?
	Biodiversity & Heritage	High Ecological Quality River Sites	A - Descriptive	I - Impact indicator	EPA	http://www.epa.ie/media/highqualityriversites.pdf		4 - Environmental (NGO)	1 - Policy Research	?
	Biodiversity & Heritage	Lake Water Quality - WFD Ecological Status 2007 - 2009	A - Descriptive	I - Impact indicator	EPA, 2009	http://www.epa.ie/media/lakequality.pdf		4 - Environmental (NGO)	1 - Policy Research	?
	Biodiversity & Heritage	Transitional and Coastal Water Quality - WFD Ecological Status 2007-2009	A - Descriptive	I - Impact indicator	EPA, 2009	http://www.epa.ie/media/estuarinecoastalwaterquality.pdf		4 - Environmental (NGO)	1 - Policy Research	?
	Social, Health & Well-being	Urban Waste Water Treatment	A - Descriptive	R - Response indicator	EPA	http://www.epa.ie/media/urbanwastewatertreatment.pdf		5 - Community/Citizen Engagement	3 - Environmental (Governmental)	?
	Social, Health & Well-being	EU: Bathing water quality 2010	A - Descriptive	S - State indicator	EEA, 2010			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y
	Social, Health & Well-being	Ireland: Drinking water quality 1999-2010	A - Descriptive	S - State indicator	EPA, 2010			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y
	Biodiversity & Heritage	Ireland: River water quality 1987-2009	A - Descriptive	S - State indicator	EPA, 2009			4 - Environmental (NGO)	1 - Policy Research	Y
	Social, Health & Well-being	EU: Chemical status of groundwater bodies 2009	A - Descriptive	P - Pressure indicator	EEA, 2009			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y
	Environmental Economy	Ireland: Land use categories 1990-2009	A - Descriptive	D - Driving force indicator	EPA, 2009			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y
4. Land Use & Agriculture	Biodiversity & Heritage	Animal Information and Movement Systems	A - Descriptive	S - State indicator	Department of Agriculture, Food and the Marine	http://www.agriculture.gov.ie/animalhealth/welfare/animalidentification/movement/		4 - Environmental (NGO)	2 - Commercial/Corporate	Y
	GHG's & Climate Change	Emissions Associated with Agriculture: 2005-2020	A - Descriptive	P - Pressure indicator	EPA, 2012; NESG, 2012	http://tinyurl.com/piltzdw		5 - Community/Citizen Engagement	4 - Environmental (NGO)	?
	Air	Ireland: Forest cover 1980-2010	A - Descriptive	S - State indicator	Department of Agriculture, Food and the Marine			4 - Environmental (NGO)	3 - Environmental (Governmental)	Y
	Air	EU: Forest cover 2010	A - Descriptive	S - State indicator	Forest Europe, 2011			4 - Environmental (NGO)	3 - Environmental (Governmental)	Y
	Social, Health & Well-being	Housing Distributions in the Metropolitan Area	A - Descriptive	D - Driving force indicator	Fingal City Council	http://www.fingalcoco.ie/media/2_4_1_UP20W5_Appendices.pdf	As Required	2 - Commercial/Corporate	1 - Policy Research	?
	Air	Afforestation - Coniferous/Broadleaf Breakdown	A - Descriptive	P - Pressure indicator	Department of Agriculture, Food and the Marine	http://www.epa.ie/media/afforestation.pdf		4 - Environmental (NGO)	1 - Policy Research	?
	Environmental Economy	Land Cover in Ireland 1990-2009	A - Descriptive	S - State indicator	EPA, 2009	http://www.epa.ie/media/landcoverchange.pdf		4 - Environmental (NGO)	3 - Environmental (Governmental)	?
	Environmental Economy	Total House Completions	A - Descriptive	D - Driving force indicator	Department of Environment, Community and Local Government	http://www.epa.ie/media/totalhousecompletions.pdf		2 - Commercial/Corporate	1 - Policy Research	?
	Global Indicators	Distribution of SEA Plans/Programmes	A - Descriptive	D - Driving force indicator	EPA	http://www.epa.ie/media/seasector.pdf		2 - Commercial/Corporate	1 - Policy Research	?
	Social, Health & Well-being	Comparison of annual farm income and industrial earnings during the period from 1972 to 2012	E - Total welfare	I - Impact indicator	Teagasc	http://tinyurl.com/owp68g	Quarterly	2 - Commercial/Corporate	3 - Environmental (Governmental)	?
4. Land Use & Agriculture	GHG's & Climate Change	Greenhouse gas emissions from Irish beef production systems	A - Descriptive	P - Pressure indicator	Teagasc	http://tinyurl.com/ndcv3v	Quarterly	5 - Community/Citizen Engagement	4 - Environmental (NGO)	?
	Air	Abundance (%) and diversity of methanogenic genotypes in the rumen of cattle	A - Descriptive	S - State indicator	Teagasc	http://tinyurl.com/ndcv3v	Quarterly	2 - Commercial/Corporate	1 - Policy Research	?
	GHG's & Climate Change	Nitrous oxide emissions (expressed as kg CO2-equivalents) and N2O emissions factors for various land use types	A - Descriptive	P - Pressure indicator	Teagasc	http://tinyurl.com/6w3p66	Quarterly	4 - Environmental (NGO)	1 - Policy Research	?
	Air	Net carbon balance of various land use types	C - Efficiency	P - Pressure indicator	Teagasc	http://tinyurl.com/6w3p66	Quarterly	5 - Community/Citizen Engagement	4 - Environmental (NGO)	?
	Air	Ireland: Planting period in public forestry 1920-2010	C - Efficiency	D - Driving force indicator	Coillte	http://tinyurl.com/6w3p66	Quarterly	5 - Community/Citizen Engagement	4 - Environmental (NGO)	Y
	Air	Ireland: Public forest 2004-2010	A - Descriptive	S - State indicator	Coillte			5 - Community/Citizen Engagement	4 - Environmental (NGO)	Y
	Social, Health & Well-being	Ireland: Organic agricultural land 1997-2009	D - Policy effectiveness	S - State indicator	Department of Agriculture, Food and the Marine			2 - Commercial/Corporate	4 - Environmental (NGO)	Y
	Social, Health & Well-being	EU: Organic agricultural land 2009	D - Policy effectiveness	S - State indicator	Research Institute of Organic Agriculture FiBL	http://www.organic-world.net		2 - Commercial/Corporate	4 - Environmental (NGO)	Y
	Environmental Economy	Ireland: Fertiliser sales 1980-2011	A - Descriptive	D - Driving force indicator	Department of Agriculture, Food and the Marine			2 - Commercial/Corporate	3 - Environmental (Governmental)	Y
	Environmental Economy	EU: Fertiliser sales 2009	A - Descriptive	D - Driving force indicator	Eurostat Statistics			2 - Commercial/Corporate	3 - Environmental (Governmental)	Y
4. Land Use & Agriculture	Social, Health & Well-being	Fertiliser Consumption, 1989/1990 - 2010/11	A - Descriptive	S - State indicator	Department of Agriculture, Food and the Marine	http://tinyurl.com/roaeb8		2 - Commercial/Corporate	5 - Community/Citizen Engagement	?
	Environmental Economy	Ireland: Livestock numbers June 1980-June 2011	A - Descriptive	S - State indicator	CSO: Agriculture Livestock and Farm Numbers			2 - Commercial/Corporate	4 - Environmental (NGO)	Y
	Global Indicators	EU: Share of total livestock numbers December 2010	A - Descriptive	S - State indicator	Eurostat Statistics			2 - Commercial/Corporate	4 - Environmental (NGO)	Y
	Social, Health & Well-being	Ireland: Meat supply balance 2000-2011	A - Descriptive	S - State indicator	EPA, 2011			2 - Commercial/Corporate	4 - Environmental (NGO)	Y
	Environmental Economy	Ireland: Primary energy requirement and final energy consumption 1990-2010	B - Performance	I - Impact indicator	SEAI, 2010			2 - Commercial/Corporate	4 - Environmental (NGO)	Y
	Environmental Economy	EU: Final energy consumption by economic sector 2010	A - Descriptive	I - Impact indicator	Eurostat Statistics			2 - Commercial/Corporate	4 - Environmental (NGO)	Y
	Environmental Economy	Ireland: Energy Factsheet	A - Descriptive	D - Driving force indicator	EU Directorate-General for Energy	http://www.energy.eu/country_overview/Ireland_2011.pdf		5 - Community/Citizen Engagement	2 - Commercial/Corporate	?
	GHG's & Climate Change	European Union Emissions Trading System (EU ETS) data from CITL	D - Policy effectiveness	S - State indicator	EEA	http://www.epa.europa.eu/data-and-maps/data/european-union-emissions-trading-scheme-eu-ets-data-from-citl-5		1 - Policy Research	2 - Commercial/Corporate	?
	GHG's & Climate Change	Ireland: Historic Indicators	A - Descriptive	S - State indicator	SEAI	http://www.seai.ie/Publications/Statistics_Publications/Energy_in_Ireland/</				

5. Energy	Environmental Economy	Ireland: Online Forecast Portal- energy supply and demand forecasts to 2020	D - Policy effectiveness	I - Impact indicator	SEAI	http://forecasts.seai.ie/		3 - Environmental (Governmental)	1 - Policy Research	Y	
	Global Indicators	EU: Final energy consumption by fuel type 2010	B - Performance	I - Impact indicator	Eurostat Statistics			2 - Commercial/Corporate	5 - Community/Citizen Engagement	Y	
	Global Indicators	EU: Energy intensity 2010	A - Descriptive	D - Driving force indicator	Eurostat Statistics			3 - Environmental (Governmental)	1 - Policy Research	Y	
	Environmental Economy	Ireland: Primary energy production 1990-2010	A - Descriptive	I - Impact indicator	SEAI, 2010			3 - Environmental (Governmental)	5 - Community/Citizen Engagement	Y	
	GHG's & Climate Change	Ireland: Renewable energy production 1990-2010	B - Performance	I - Impact indicator	SEAI, 2010			3 - Environmental (Governmental)	5 - Community/Citizen Engagement	Y	
	GHG's & Climate Change	Ireland: Electricity consumption from renewable sources 1990-2010	B - Performance	I - Impact indicator	SEAI, 2010			3 - Environmental (Governmental)	5 - Community/Citizen Engagement	Y	
	GHG's & Climate Change	EU: Electricity consumption from renewable sources 2009	B - Performance	I - Impact indicator	Eurostat Statistics			3 - Environmental (Governmental)	4 - Environmental (NGO)	Y	
	Global Indicators	Most frequently considered appliances characteristics	A - Descriptive	R - Response indicator	Gaspar, R. And Antunes, D. 2011	http://www.sciencedirect.com/science/article/pii/S0304412111006549		1 - Policy Research	5 - Community/Citizen Engagement	?	
	Social, Health & Well-being	Factors considered in customer's assessment of energy efficiency	C - Efficiency	R - Response indicator	Promotion3e	http://tinyurl.com/pfrhmf		5 - Community/Citizen Engagement	2 - Commercial/Corporate	?	
	Global Indicators	Promotion of Energy-efficient appliances in Europe	C - Efficiency	R - Response indicator	Promotion3e	http://tinyurl.com/pfrhmf		2 - Commercial/Corporate	1 - Policy Research	?	
	Social, Health & Well-being	National BER Research Tool	A - Descriptive	D - Driving force indicator	SEAI	https://pubs.seai.ie/BERResearchTool/ber/search.aspx		5 - Community/Citizen Engagement	1 - Policy Research	Y	charge before access is granted.
	Social, Health & Well-being	Domestic BER Publication Rates	D - Policy effectiveness	D - Driving force indicator	SEAI, 2013	http://tinyurl.com/s8h4rbp		5 - Community/Citizen Engagement	2 - Commercial/Corporate	?	
	Social, Health & Well-being	Domestic BER Grades	D - Policy effectiveness	D - Driving force indicator	SEAI, 2013	http://tinyurl.com/ajocam3		6 - Community/Citizen Engagement	3 - Commercial/Corporate	?	
	Social, Health & Well-being	Non Domestic BER Publication Rates	D - Policy effectiveness	D - Driving force indicator	SEAI, 2013	http://tinyurl.com/s3b9v9e		7 - Community/Citizen Engagement	4 - Commercial/Corporate	?	
	Social, Health & Well-being	Non Domestic BER Grades	D - Policy effectiveness	D - Driving force indicator	SEAI, 2013	http://tinyurl.com/s27vrbg		8 - Community/Citizen Engagement	5 - Commercial/Corporate	?	
	Environmental Economy	Most recent market share of the energy label classes, by country	A - Descriptive	D - Driving force indicator	Promotion3e	http://tinyurl.com/pfrhmf		2 - Commercial/Corporate	1 - Policy Research	?	
	Environmental Economy	Distribution network and smart metering data structure	A - Descriptive	R - Response indicator	Toshiba Research Europe	http://eeexplorer.ieee.org/1stamp/stamp.jsp?ip=&number=5622050		2 - Commercial/Corporate	1 - Policy Research	?	
	GHG's & Climate Change	Ireland: Heat consumption from renewable sources 1990-2010	B - Performance	I - Impact indicator	SEAI, 2010			3 - Environmental (Governmental)	5 - Community/Citizen Engagement	Y	
	GHG's & Climate Change	Ireland: Transport use from renewable sources 2006-2010	B - Performance	I - Impact indicator	SEAI, 2010			3 - Environmental (Governmental)	2 - Commercial/Corporate	Y	
	Environmental Economy	Ireland: Imported energy dependency 1990-2011	B - Performance	D - Driving force indicator	SEAI, 2011			3 - Environmental (Governmental)	1 - Policy Research	Y	
	Environmental Economy	EU: Imported energy dependency 2009 Eurostat Statistics: Tables by theme(Energy) Energy Statistics -	A - Descriptive	D - Driving force indicator	SEAI, 2010			3 - Environmental (Governmental)	1 - Policy Research	Y	
	Environmental Economy	Ireland: Fuel imports 1990-2010	A - Descriptive	D - Driving force indicator	SEAI, 2010			3 - Environmental (Governmental)	1 - Policy Research	Y	
	Environmental Economy	Total Primary Energy by Fuel Source, 2011	A - Descriptive	S - State indicator	SEAI, 2012; NES, 2012	http://tinyurl.com/pfh4Sou		3 - Environmental (Governmental)	1 - Policy Research	?	
	Environmental Economy	Gross Electricity Consumption by Fuel Source, 2011	A - Descriptive	S - State indicator	SEAI, 2012; NES, 2012	http://tinyurl.com/pfh4Sou		3 - Environmental (Governmental)	5 - Community/Citizen Engagement	?	
	Environmental Economy	Renewable Energy as Percentage of Gross Energy Consumption by Sector, 1990-2011	A - Descriptive	D - Driving force indicator	SEAI, 2012; NES, 2012	http://tinyurl.com/pfh4Sou		3 - Environmental (Governmental)	4 - Environmental (NGO)	?	
	GHG's & Climate Change	Energy-related emissions from production	A - Descriptive	S - State indicator	EPA, 2013; Hyland et al., 2012	http://epa.ie/pubs/reports/research/econ/striverreport103.html		3 - Environmental (Governmental)	2 - Commercial/Corporate	?	
	GHG's & Climate Change	Energy-related emissions from consumption	A - Descriptive	S - State indicator	EPA, 2013; Hyland et al., 2012	http://epa.ie/pubs/reports/research/econ/striverreport103.html		3 - Environmental (Governmental)	5 - Community/Citizen Engagement	?	
	Environmental Economy	Ireland's Offshore Renewable Energy Potential	A - Descriptive	D - Driving force indicator	Department of Communications, Energy and Natural Resources; NES, 2012	http://tinyurl.com/pfh4Sou		3 - Environmental (Governmental)	2 - Commercial/Corporate	?	
	Social, Health & Well-being	Emissions from households by direct and indirect channels	A - Descriptive	S - State indicator	EPA, 2013; Lyons, 2012	http://epa.ie/pubs/reports/research/econ/striverreport103.html		3 - Environmental (Governmental)	5 - Community/Citizen Engagement	?	
	Social, Health & Well-being	Household size intensity of emissions: ratio of household emissions per person	A - Descriptive	S - State indicator	EPA, 2013; Lyons, 2012	http://epa.ie/pubs/reports/research/econ/striverreport103.html		3 - Environmental (Governmental)	5 - Community/Citizen Engagement	?	
	Social, Health & Well-being	Indicative Growth in Renewable Heat Use in Each Sector Required to Meet RES-H 12% by 2020	A - Descriptive	P - Pressure indicator	SEAI, 2012; NES, 2012	http://tinyurl.com/pjltzdw		1 - Policy Research	4 - Environmental (NGO)	Y	
	Environmental Economy	Ireland: Total primary energy requirement 1990-2011	A - Descriptive	S - State indicator	SEAI, 2011			3 - Environmental (Governmental)	1 - Policy Research	Y	
6. Transport	Environmental Economy	Ireland: Vehicles under current licence 1985-2010	A - Descriptive	D - Driving force indicator	Department of Transport, Tourism and Sport			3 - Environmental (Governmental)	1 - Policy Research	Y	
	Global Indicators	EU: Passenger cars 2009	A - Descriptive	D - Driving force indicator	Eurostat Statistics			2 - Commercial/Corporate	3 - Environmental (Governmental)	Y	
	Global Indicators	EU: Road freight transport 2010	A - Descriptive	D - Driving force indicator	Eurostat Statistics			3 - Environmental (Governmental)	2 - Commercial/Corporate	Y	
	Social, Health & Well-being	Ireland: Rail and bus passenger and vehicle traffic 1996-2010	A - Descriptive	D - Driving force indicator	CSO: Transport			1 - Policy Research	5 - Community/Citizen Engagement	Y	
	Global Indicators	EU: Rail passenger traffic 2009	A - Descriptive	D - Driving force indicator	Eurostat Statistics			1 - Policy Research	5 - Community/Citizen Engagement	Y	
	Global Indicators	Ireland: International passengers through Irish ports 1995-2010	A - Descriptive	D - Driving force indicator	CSO: Tourism and Travel			3 - Environmental (Governmental)	1 - Policy Research	Y	
	Global Indicators	EU: International air passengers 2010	A - Descriptive	D - Driving force indicator	Eurostat Statistics			3 - Environmental (Governmental)	1 - Policy Research	Y	
	GHG's & Climate Change	Proposed revised vehicle tax rates by CO2 emissions bands and resulting CO2 emissions reductions	C - Efficiency	R - Response indicator	Comhar, 2007	http://tinyurl.com/qc4da9s		3 - Environmental (Governmental)	2 - Commercial/Corporate	?	
	Social, Health & Well-being	Ireland: Means of travel to work 1986-2006	D - Policy effectiveness	D - Driving force indicator	CSO: Census of Population; EPA, 2013	http://epa.ie/pubs/reports/research/econ/striverreport103.html		5 - Community/Citizen Engagement	4 - Environmental (NGO)	Y	
	Social, Health & Well-being	Ireland: Private cars per 1,000 population 1985-2011	A - Descriptive	D - Driving force indicator	Department of Transport, Tourism and Sport			5 - Community/Citizen Engagement	2 - Commercial/Corporate	Y	
	GHG's & Climate Change	Emissions Associated with Transport: 2005-2020	A - Descriptive	I - Impact indicator	EPA, 2012; NES, 2012	http://tinyurl.com/pjltzdw		4 - Environmental (NGO)	5 - Community/Citizen Engagement	?	
	GHG's & Climate Change	Percentage of Cars in each Emission Band (2009 to first quarter 2012)	A - Descriptive	R - Response indicator	CSO: Transport			3 - Environmental (Governmental)	1 - Policy Research	Y	
	GHG's & Climate Change	Number of Cars, Kilometres Travelled and Emissions Profile: Dublin and Rest of Ireland	A - Descriptive	I - Impact indicator	NESC	http://tinyurl.com/pjltzdw		1 - Policy Research	3 - Environmental (Governmental)	?	
	GHG's & Climate Change	Ireland: New private cars licensed by emission class 2005-2012	D - Policy effectiveness	I - Impact indicator	CSO: Transport			3 - Environmental (Governmental)	5 - Community/Citizen Engagement	Y	
	Social, Health & Well-being	Ireland: Municipal waste generated 2001-2010	A - Descriptive	D - Driving force indicator	EPA, 2010			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y	
	Environmental Economy	Dublin Port Imports and Exports of waste 2006	A - Descriptive	D - Driving force indicator	Dublin City Council; National TSF	http://tinyurl.com/sjvswll		As Required	3 - Environmental (Governmental)	4 - Environmental (NGO)	?
	Global Indicators	Destination of Notified Exports of Waste	A - Descriptive	D - Driving force indicator	EPA, 2005; National TSF	http://tinyurl.com/sjvswll		3 - Environmental (Governmental)	1 - Policy Research	?	
	Social, Health & Well-being	Litter Problem Awareness in Dublin	A - Descriptive	R - Response indicator	Dublin City Council	http://tinyurl.com/okp3e8k		As Required	5 - Community/Citizen Engagement	1 - Policy Research	?
Social, Health & Well-being	Perceptions towards littering	D - Policy effectiveness	R - Response indicator	Dublin City Council	http://tinyurl.com/okp3e8k		As Required	5 - Community/Citizen Engagement	1 - Policy Research	?	
GHG's & Climate Change	Ireland: EPA Waste and Industrial Emissions Licence Search facility	D - Policy effectiveness	R - Response indicator	EPA	http://www.epa.ie/terminal/four/waste/index.jsp#UqRkSe3Dk		2 - Commercial/Corporate	1 - Policy Research	Y		
Social, Health & Well-being	Ireland: National Waste Collection Permit Office: Waste Collection Permits	A - Descriptive	R - Response indicator	NWCPD	http://www.nwcpo.ie/permitssearch.aspx		2 - Commercial/Corporate	1 - Policy Research	Y		
Social, Health & Well-being	Suggested improvements to clean up the city	C - Efficiency	R - Response indicator	Dublin City Council	http://tinyurl.com/okp3e8k		As Required	5 - Community/Citizen Engagement	1 - Policy Research	?	
Social, Health & Well-being	Waste Arisings Managed in the Dublin Region for 2007 - 2010	A - Descriptive	D - Driving force indicator	Waste Management Plan for the Dublin Region, 2012	http://tinyurl.com/pakswm9		3 - Environmental (Governmental)	4 - Environmental (NGO)	?		
Social, Health & Well-being	Growth in Household Waste Arisings 2006 - 2010	B - Performance	D - Driving force indicator	Waste Management Plan for the Dublin Region, 2012	http://tinyurl.com/pakswm9		5 - Community/Citizen Engagement	4 - Environmental (NGO)	?		
Social, Health & Well-being	Recycling and Recovery Rates for Household Waste 2009 & 2010	D - Policy effectiveness	R - Response indicator	Waste Management Plan for the Dublin Region, 2012	http://tinyurl.com/pakswm9		5 - Community/Citizen Engagement	1 - Policy Research	?		
Environmental Economy	Number of Existing Recycling Centres	R - Response indicator	R - Response indicator	Waste Management Plan for the Dublin Region, 2012	http://tinyurl.com/pakswm9		1 - Policy Research	4 - Environmental (NGO)	?		
Environmental Economy	Commercial Waste Collected in the Dublin Region 2010	C - Efficiency	D - Driving force indicator	Waste Management Plan for the Dublin Region, 2012	http://tinyurl.com/pakswm9		2 - Commercial/Corporate	3 - Environmental (Governmental)	?		
Environmental Scenarios	Municipal Waste Projection 2010 - 2020	E - Total welfare	R - Response indicator	Waste Management Plan for the Dublin Region, 2012	http://tinyurl.com/pakswm9		3 - Environmental (Governmental)	1 - Policy Research	?		
Social, Health & Well-being	Packaging Waste Generated in Dublin and Sent for Disposal in 2010	A - Descriptive	D - Driving force indicator	Waste Management Plan for the Dublin Region, 2012	http://tinyurl.com/pakswm9		3 - Environmental (Governmental)	2 - Commercial/Corporate	?		
Land Use	Waste Generated in Dublin and Disposed to landfill 2006 - 2010	A - Descriptive	S - State indicator	Waste Management Plan for the Dublin Region, 2012	http://tinyurl.com/pakswm9		4 - Environmental (NGO)	3 - Environmental (Governmental)	?		
Environmental Economy	National Waste Report 2011	B - Performance	S - State indicator	EPA	http://www.epa.ie/pubs/reports/waste/stats/nationalwastereport2011.html#UqRkSe3Dk	Annually	3 - Environmental (Governmental)	4 - Environmental (NGO)	Y		
Land Use	Energy Recovery from Dublin Landfills, 2006 - 2010	A - Descriptive	I - Impact indicator	Waste Management Plan for the Dublin Region, 2012	http://tinyurl.com/pakswm9		1 - Policy Research	2 - Commercial/Corporate	?		
Global Indicators	Headline Waste Key Performance Indicators for years 2006 - 2010	E - Total welfare	R - Response indicator	Waste Management Plan for the Dublin Region, 2012	http://tinyurl.com/pakswm9		1 - Policy Research	3 - Environmental (Governmental)	?		
Global Indicators	EU: Municipal waste generated 2010	A - Descriptive	D - Driving force indicator	Eurostat Statistics			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y		
Land Use	Ireland: Municipal waste sent to landfill 2001-2010	A - Descriptive	D - Driving force indicator	EPA, 2010			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y		
Global Indicators	EU: Municipal waste sent to landfill 2010	A - Descriptive	D - Driving force indicator	Eurostat Statistics			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y		
Social, Health & Well-being	Ireland: Recovery of packaging waste 2001-2010	C - Efficiency	R - Response indicator	EPA, 2010			5 - Community/Citizen Engagement	2 - Commercial/Corporate	Y		
Global Indicators	EU: Recovery of packaging waste 2009	C - Efficiency	R - Response indicator	Eurostat Statistics			5 - Community/Citizen Engagement	2 - Commercial/Corporate	Y		
Social, Health & Well-being	Ireland: Electrical waste collected 2007-2010	A - Descriptive	R - Response indicator	EPA, 2010			1 - Policy Research	3 - Environmental (Governmental)	Y		
Social, Health & Well-being	Household waste-collection scenarios	A - Descriptive	P - Pressure indicator	EPA, 2013	http://epa.ie/pubs/reports/research/econ/striverreport103.html		5 - Community/Citizen Engagement	1 - Policy Research	Y		
Global Indicators	EU: Electrical waste collected from private households 2008	A - Descriptive	R - Response indicator	Eurostat Statistics			5 - Community/Citizen Engagement	1 - Policy Research	Y		
Social, Health & Well-being	Ireland: Collection of construction and demolition waste 2004-2010	A - Descriptive	S - State indicator	EPA, 2010			1 - Policy Research	3 - Environmental (Governmental)	Y		
7. Waste	Land Use	EU: Common farmland birds 2008	A - Descriptive	S - State indicator	Eurostat Statistics			4 - Environmental (NGO)	5 - Community/Citizen Engagement	Y	
	Land Use	Species data extracted from the National Vegetation Database	A - Descriptive	S - State indicator	National Biodiversity Data Centre	http://maps.biodiversityireland.ie/#/DataSet/186		4 - Environmental (NGO)	1 - Policy Research	?	
	Biodiversity & Heritage	Natura 2000 - the European network of protected sites	D - Policy effectiveness	S - State indicator	EEA	http://www.eea.europa.eu/data-and-maps/data/natura-4		1 - Policy Research	3 - Environmental (Governmental)	Y	
	Heritage trees of Ireland	Heritage trees of Ireland	D - Policy effectiveness	S - State indicator	Tree Council of Ireland	http://maps.biodiversityireland.ie/#/DataSet/27		4 - Environmental (NGO)	1 - Policy Research	?	
	Air	Habitat Mapping Survey of Dublin City's Strategic Greenways	D - Policy effectiveness	R - Response indicator	Dublin City Council	http://dublinlinked.ie/dataset/datasets/dataset-042.php		As Required	1 - Policy Research	4 - Environmental (NGO)	?
	Land Use	Fingal Development Plan 2011 - 2017 Development Plan Heritage Sites	D - Policy effectiveness	S - State indicator	Fingal City Council	http://dublinlinked.ie/dataset/datasets/dataset-022.php		As Required	3 - Environmental (Governmental)	4 - Environmental (NGO)	?
	Land Use	Conservation Areas and Architectural Conservation Areas (ACAs) - 2011-2017 Development Plan - Dublin City Council	D - Policy effectiveness	S - State indicator	Dublin City Council	http://dublinlinked.ie/dataset/datasets/dataset-023.php		As Required	4 - Environmental (NGO)	1 - Policy Research	?
	Heritage Venues	Heritage Venues	D - Policy effectiveness	R - Response indicator	Fingal City Council	http://dublinlinked.ie/dataset/datasets/dataset-172.php		As Required	5 - Community/Citizen Engagement	3 - Environmental (Governmental)	?
	Land Use	Environmental Designations - 2011-2017 Development Plan - Dublin City Council	D - Policy effectiveness	R - Response indicator	Dublin City Council	http://dublinlinked.ie/dataset/datasets/dataset-131.php		As Required	3 - Environmental (Governmental)	4 - Environmental (NGO)	?
	Land Use	Urban Tree Survey of South Central Dublin City 2007-2009	D - Policy effectiveness	S - State indicator	Dublin City Council	http://dublinlinked.ie/dataset/datasets/dataset-151.php		As Required	4 - Environmental (NGO)	1 - Policy Research	?
	Land Use	National Invasive species Database	E - Total welfare	P - Pressure indicator	National Biodiversity Data Centre	http://maps.biodiversityireland.ie/#/DataSet/66		4 - Environmental (NGO)	1 - Policy Research	?	
	Water	Marine species distributions in Irish coastal waters	A - Descriptive	P - Pressure indicator	Sea Search	http://maps.biodiversityireland.ie/#/DataSet/158		1 - Policy Research	4 - Environmental (NGO)	?	
	Global Indicators	Biodiversity records from Ireland - General	A - Descriptive	S - State indicator	National Biodiversity Data Centre	http://maps.biodiversityireland.ie/#/DataSet/7		3 - Environmental (Governmental)	4 - Environmental (NGO)	?	
	Social, Health & Well-being	Atlas of mammals in Ireland 2010-2015	A - Descriptive	S - State indicator	National Biodiversity Data Centre	http://maps.biodiversityireland.ie/#/DataSet/138		1 - Policy Research	4 - Environmental (NGO)	?	
	Water	Seabird 2000	A - Descriptive	S - State indicator	Birdwatch Ireland	http://maps.biodiversityireland.ie/#/DataSet/145		3 - Environmental (Governmental)	1 - Policy Research	?	
	Land Use	Changes in Population of Countryside Birds 1998-2007	A - Descriptive	I - Impact indicator	Birdwatch Ireland	http://www.epa.ie/media/countrysidebirds/populations.pdf		4 - Environmental (NGO)	1 - Policy Research	?	
	Biodiversity & Heritage	Bird Atlas 2007-2011	A - Descriptive	S - State indicator	Birdwatch Ireland	http://www.bto.org/volunteer-surveys/birdatlas</					

9. Environmental Economy	Transport	The impact of carbon tax per income decile, split between electricity, motor fuels and other energy	E - Total welfare	D - Driving force indicator	Energy Policy; Callan et al. 2009	http://tinyurl.com/onb9gq		1 - Policy Research	3 - Environmental (Governmental)	?
	Social, Health & Well-being	The impact of carbon tax per income decile, split between urban and rural households; non-electric energy only	E - Total welfare	D - Driving force indicator	Energy Policy; Callan et al. 2009	http://tinyurl.com/onb9gq		1 - Policy Research	4 - Environmental (Governmental)	?
	Social, Health & Well-being	The effect of a carbon tax, social welfare increase, and tax rate reduction per income decile	E - Total welfare	D - Driving force indicator	Energy Policy; Callan et al. 2009	http://tinyurl.com/onb9gq		1 - Policy Research	5 - Environmental (Governmental)	?
	Social, Health & Well-being	Sustainable Development Indicators for the Dublin Region	D - Policy effectiveness	R - Response indicator	Dublin City Council	http://dublinlinked.ie/dataset/datasets/dataset_299.php	Annually	1 - Policy Research	3 - Environmental (Governmental)	Y
	Global Indicators	EU: Environmental tax revenue 2009	E - Total welfare	D - Driving force indicator	Eurostat Statistics			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y
	Social, Health & Well-being	Ireland: General government environmental expenditure 2000-2010	D - Policy effectiveness	D - Driving force indicator	CSO: National Accounts			3 - Environmental (Governmental)	4 - Environmental (NGO)	Y
	Energy	Ireland: Wholesale price index for energy products 2000-2011	C - Efficiency	D - Driving force indicator	CSO: Wholesale price indices			2 - Commercial/Corporate	3 - Environmental (Governmental)	Y
	Energy	Ireland: Consumer price index for energy products 1980-2011	C - Efficiency	D - Driving force indicator	CSO: Consumer price indices			2 - Commercial/Corporate	5 - Community/Citizen Engagement	Y
	Land Use	Ireland: Resource productivity 1999-2008	C - Efficiency	D - Driving force indicator	CSO: Environmental Accounts			1 - Policy Research	3 - Environmental (Governmental)	Y
	Land Use	EU: Resource productivity 2007	C - Efficiency	D - Driving force indicator	Eurostat Statistics			1 - Policy Research	3 - Environmental (Governmental)	Y
	Land Use	Ireland: Sea fishery landings 1990-2010	D - Policy effectiveness	D - Driving force indicator	Sea Fisheries Protection Authority	www.sfa.ie		4 - Environmental (NGO)	4 - Environmental (NGO)	Y
	Land Use	EU: Sea fishery landings 2009	D - Policy effectiveness	D - Driving force indicator	Eurostat Statistics			4 - Environmental (NGO)	4 - Environmental (NGO)	Y
	Energy	Ireland: Imports and exports of fuels 2000-2011	A - Descriptive	D - Driving force indicator	CSO: Trade statistics and VIMA			3 - Environmental (Governmental)	1 - Policy Research	Y
	Energy	EU: Imports of fuels 2010	A - Descriptive	D - Driving force indicator	Eurostat Statistics			3 - Environmental (Governmental)	1 - Policy Research	Y
	Social, Health & Well-being	Ireland: General government debt and balance 1995-2011	A - Descriptive	D - Driving force indicator	CSO: National Accounts			3 - Environmental (Governmental)	5 - Community/Citizen Engagement	Y
	Global Indicators	EU: Net receipts from EU 2000-2011	A - Descriptive	D - Driving force indicator	European Commission			3 - Environmental (Governmental)	1 - Policy Research	Y
	GHG's & Climate Change	Changes in cost and emission reduction resulting from subsidy changes	D - Policy effectiveness	I - Impact indicator	ESRI	http://tinyurl.com/iv8mrbq		2 - Commercial/Corporate	1 - Policy Research	?
	Social, Health & Well-being	EU: Per capita net receipts from EU 2000-2011	E - Total welfare	D - Driving force indicator	European Commission			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y
	Global Indicators	EU: General government tax revenue 2011	E - Total welfare	D - Driving force indicator	Eurostat Statistics			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y
	Social, Health & Well-being	Ireland: Income tax distribution 2002-2010	E - Total welfare	D - Driving force indicator	Revenue Commissioners Statistical Reports 2002-2010			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y
	Social, Health & Well-being	Ireland: General government expenditure on pay and social welfare 1995-2011	E - Total welfare	D - Driving force indicator	CSO: National Accounts			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y
	Global Indicators	Euro exchange rates 2001-2012	E - Total welfare	D - Driving force indicator	Eurostat Statistics			3 - Environmental (Governmental)	5 - Community/Citizen Engagement	Y
	Social, Health & Well-being	Ireland: Gross domestic expenditure on R&D 1995-2010	C - Efficiency	D - Driving force indicator	Eurostat Statistics			1 - Policy Research	3 - Environmental (Governmental)	Y
	Social, Health & Well-being	New House Registrations, Dublin City	D - Policy effectiveness	D - Driving force indicator	Fingal City Council	http://www.fingalcoco.ie/media/2.4.1.UN20WS_Appendices.pdf	As Required	5 - Community/Citizen Engagement	2 - Commercial/Corporate	?
	Social, Health & Well-being	Average Annual Disposable Income 2009-2017	C - Efficiency	D - Driving force indicator	CSO; ESRI	http://www.fingalcoco.ie/media/2.4.1.UN20WS_Appendices.pdf		5 - Community/Citizen Engagement	3 - Environmental (Governmental)	?
Global Indicators	Ireland: Gross fixed capital formation by sector 2002-2011	A - Descriptive	D - Driving force indicator	CSO: Institutional Sector Accounts			2 - Commercial/Corporate	3 - Environmental (Governmental)	Y	
Energy	EU: Harmonised index of consumer prices for energy products 2011	A - Descriptive	D - Driving force indicator	Eurostat Statistics			2 - Commercial/Corporate	3 - Environmental (Governmental)	Y	
Social, Health & Well-being	Green Economy Sectors and Current Policy	A - Descriptive	R - Response indicator	NESC	http://files.nesc.ie/nesc_secretariat_papers/No_7_FPC_Greening_the_%20Economy.pdf		1 - Policy Research	3 - Environmental (Governmental)	Y	
Social, Health & Well-being	Greening Economy: A Broader View	A - Descriptive	R - Response indicator	NESC, 2012	http://files.nesc.ie/nesc_secretariat_papers/No_7_FPC_Greening_the_%20Economy.pdf		3 - Environmental (Governmental)	4 - Environmental (NGO)	Y	
Land Use	Ireland: House completions 1970-2011 and residential property price index 2005-2012	C - Efficiency	D - Driving force indicator	Department of the Environment, Community and Local Government			5 - Community/Citizen Engagement	2 - Commercial/Corporate	Y	
GHG's & Climate Change	Impact on economy through recycling carbon levy using 3 options	B - Performance	I - Impact indicator	Comhar, 2007	http://tinyurl.com/xc4ada9		3 - Environmental (Governmental)	2 - Commercial/Corporate	?	
Land Use	EU: House completions 2007-2011	A - Descriptive	D - Driving force indicator	Department of the Environment, Community and Local Government; Eurostat			5 - Community/Citizen Engagement	2 - Commercial/Corporate	Y	
10. Global Indicators	Environmental Economy	World population 2012 and 2025	A - Descriptive	D - Driving force indicator	UN Department of Economic and Social Affairs, 2011			3 - Environmental (Governmental)	4 - Environmental (NGO)	Y
	Social, Health & Well-being	Infant mortality and life expectancy 2010	A - Descriptive	D - Driving force indicator	UN Department of Economic and Social Affairs, 2011			4 - Environmental (NGO)	5 - Community/Citizen Engagement	Y
	Social, Health & Well-being	Population in developing regions living below \$1 per day 1990-2008	C - Efficiency	D - Driving force indicator	UN Millennium Development Goals, 2012			4 - Environmental (NGO)	5 - Community/Citizen Engagement	Y
	Social, Health & Well-being	Employment rate 2011	A - Descriptive	D - Driving force indicator	UN Millennium Development Goals, 2012; CSO: Quarterly National Household Survey			3 - Environmental (Governmental)	1 - Policy Research	Y
	Environmental Economy	Official Development Assistance 2011	A - Descriptive	D - Driving force indicator	Irish Aid, 2011			3 - Environmental (Governmental)	4 - Environmental (NGO)	Y
	Social, Health & Well-being	Net enrolment ratio in primary education 1991-2010	C - Efficiency	D - Driving force indicator	UN Millennium Development Goals, 2012; CSO: Quarterly National Household Survey			3 - Environmental (Governmental)	4 - Environmental (NGO)	Y
	Social, Health & Well-being	Estimated emigration by Nationality 2006-2009	A - Descriptive	D - Driving force indicator	Fingal City Council	http://www.fingalcoco.ie/media/2.4.1.UN20WS_Appendices.pdf	As Required	3 - Environmental (Governmental)	1 - Policy Research	?
	Social, Health & Well-being	Main Environmental Challenges	A - Descriptive	R - Response indicator	EPA, 2012			1 - Policy Research	3 - Environmental (Governmental)	Y
	Energy	Commercial Energy Production by Fuel and Region: 2010-2050	A - Descriptive	S - State indicator	OECD, 2012; NESC, 2012	http://files.nesc.ie/nesc_secretariat_papers/ccbg_No2_Green_Growth.pdf		3 - Environmental (Governmental)	1 - Policy Research	?
	Water	Global Demand for Water: 2000-2050	A - Descriptive	S - State indicator	OECD, 2012; NESC, 2012	http://files.nesc.ie/nesc_secretariat_papers/ccbg_No2_Green_Growth.pdf		4 - Environmental (NGO)	5 - Community/Citizen Engagement	?
	Energy	Global Primary Energy Demand: 1980 - 2050	A - Descriptive	P - Pressure indicator	OECD, 2012; NESC, 2012	http://files.nesc.ie/nesc_secretariat_papers/ccbg_No2_Green_Growth.pdf		3 - Environmental (Governmental)	1 - Policy Research	?
	GHG's & Climate Change	Greenhouse gas emissions under Kyoto Protocol 1995-2010	B - Performance	I - Impact indicator	UN Framework Convention on Climate Change			3 - Environmental (Governmental)	4 - Environmental (NGO)	Y
	Environmental Economy	Ireland: Employment rate by age class 2000-2012	A - Descriptive	D - Driving force indicator	CSO: Quarterly National Household Survey			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y
	Environmental Economy	Ireland: Unemployment rate 1985-2012	A - Descriptive	D - Driving force indicator	CSO: Live register			2 - Commercial/Corporate	3 - Environmental (Governmental)	Y
	Environmental Economy	Ireland: Emigration 1987-2012	A - Descriptive	D - Driving force indicator	CSO: Census of Population			3 - Environmental (Governmental)	1 - Policy Research	Y
Environmental Economy	Average Occupancy rates (persons per household)	A - Descriptive	D - Driving force indicator	Fingal City Council	http://www.fingalcoco.ie/media/2.4.1.UN20WS_Appendices.pdf	As Required	5 - Community/Citizen Engagement	3 - Environmental (Governmental)	?	
Environmental Economy	Ireland: Immigration 1987-2012	A - Descriptive	D - Driving force indicator	CSO: Census of Population			3 - Environmental (Governmental)	1 - Policy Research	Y	
Global Indicators	EU: People at risk of poverty 2007-2011	D - Policy effectiveness	D - Driving force indicator	CSO: Survey of Income and Living Conditions; Eurostat			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y	
Environmental Economy	Ireland: Old age dependency ratio 1996-2041	A - Descriptive	D - Driving force indicator	CSO: Census of Population			3 - Environmental (Governmental)	1 - Policy Research	Y	
Environmental Economy	Ireland: Persons aged 80 and over 1926-2011	A - Descriptive	D - Driving force indicator	CSO: Census of Population			3 - Environmental (Governmental)	1 - Policy Research	Y	
Environmental Economy	Ireland: Life expectancy 1901-2006	E - Total welfare	D - Driving force indicator	CSO: Census of Population			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y	
Environmental Economy	Ireland: Recorded criminal offences 2004-2011	A - Descriptive	D - Driving force indicator	CSO: Crime statistics			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y	
Environmental Economy	Ireland: Pupil-teacher ratio 1995-2012	A - Descriptive	D - Driving force indicator	Department of Education and Skills			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y	
Global Indicators	EU: Average class sizes 2010	A - Descriptive	D - Driving force indicator	Eurostat Statistics			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y	
Environmental Economy	Ireland: Second level and third level completion rates 1995-2012	B - Performance	D - Driving force indicator	CSO: Quarterly National Household Survey			2 - Commercial/Corporate	3 - Environmental (Governmental)	Y	
Global Indicators	Population	A - Descriptive	D - Driving force indicator	CSO	http://www.epa.ie/media/population.pdf		3 - Environmental (Governmental)	1 - Policy Research	?	
Environmental Economy	Gross Domestic Product at Current Market Prices Per Capita	A - Descriptive	D - Driving force indicator	CSO	http://www.epa.ie/media/gdp.pdf		3 - Environmental (Governmental)	1 - Policy Research	?	
Transport	Ireland: Usual means of travel to school 1986-2011	A - Descriptive	D - Driving force indicator	CSO: Census of Population			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y	
Transport	Ireland: Usual means of travel to work 1981-2011	A - Descriptive	D - Driving force indicator	CSO: Census of Population			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y	
Global Indicators	EU: Obesity levels 2008	A - Descriptive	D - Driving force indicator	UN World Health Statistics, 2012			3 - Environmental (Governmental)	1 - Policy Research	Y	
Environmental Economy	The average growth rate of per capita income for 2000-2100 for three alternative scenarios of climate change	B - Performance	I - Impact indicator	ESRI	http://tinyurl.com/rv8mrbq		1 - Policy Research	3 - Environmental (Governmental)	Y	
Environmental Economy	Social and Behavioural Barriers and Strategies for Retrofitting Homes	D - Policy effectiveness	R - Response indicator	NESC, 2012	http://tinyurl.com/xbum73		2 - Commercial/Corporate	3 - Environmental (Governmental)	?	
Environmental Economy	EU: Alcohol consumption 2008	A - Descriptive	D - Driving force indicator	Department of Health; UN: World Health Statistics 2012			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y	
Environmental Economy	EU: Tobacco consumption 2009	A - Descriptive	D - Driving force indicator	UN World Health Statistics, 2012			5 - Community/Citizen Engagement	3 - Environmental (Governmental)	Y	
12. National Models & other National Resources	GHG's & Climate Change	GAINS Ireland Model - GHGs and Air Quality Integrated Assessment Model	D - Policy effectiveness	J - Impact indicator	EnvEcon	http://www.emeccon.eu/work/project/gains-ireland-modelling/	Annually	1 - Policy Research	3 - Environmental (Governmental)	Y
	Land Use	FAPRI - Ireland Partnership, Economic Projections for Irish Agriculture - Environmental Modelling	D - Policy effectiveness	J - Impact indicator	Taagasc	http://www.tnri.teagasc.ie/fapri/modelling.htm		2 - Policy Research	4 - Environmental (Governmental)	Y
	Land Use	Geological Survey of Ireland	A - Descriptive	I - Impact indicator	Department of Communications, Energy and Natural Resources	http://www.gsi.ie/		1 - Policy Research	3 - Environmental (Governmental)	Y
	Land Use	All-Island Research Observatory	A - Descriptive	I - Impact indicator	Multiple partners and data providers	http://www.airo.ie/		2 - Policy Research	4 - Environmental (Governmental)	Y
	Energy	Irish Times Model - Energy System Model	B - Performance	I - Impact indicator	UCC	http://www.ucc.ie/en/energypolicy/irishtimes/	Annually	1 - Policy Research	3 - Environmental (Governmental)	Y
	GHG's & Climate Change	Isus Model - Emissions and Resource Use Forecasting Model	B - Performance	P - Pressure indicator	ESRI	http://www.esri.ie/research/research_areas/environment/isus/	Annually	1 - Policy Research	3 - Environmental (Governmental)	Y
	Transport	TREMOVE Ireland Model - National Scale Transport Policy Model	D - Policy effectiveness	I - Impact indicator	EnvEcon	http://www.emeccon.eu/work/project/national-transport-policy-modelling/	Annually	1 - Policy Research	3 - Environmental (Governmental)	Y

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