



Counting What Counts

A Review of Sustainable Development Indicators for Ireland

Draft Report

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1. Introduction.

Achieving the aim of moving any modern European economy onto a sustainable footing will be a process of managed change, comprising of target setting, policy development and implementation and, most relevant to this research, monitoring and evaluation of progress towards targets, through the adoption and application of a comprehensive set of indicators.

1.1 The aim of this Briefing Paper.

The aim of this paper is to provide an overview of current state of play with respect to Sustainable Development (SD) indicators within both Ireland and the EU, to provide recommendations on national indicators for sustainable development including selection criteria and the merits of any hierarchical approach. The briefing is written within the context of ongoing EU-wide harmonisation of SD policy and related monitoring and evaluation measures, and is based on the working assumption that the choice of national indicators for Ireland will be largely determined by the indicator set adopted to underpin the European Union Strategy for Sustainable Development, with recommendations made for additional national indicators, where these can be identified as adding value to sustainable development policy and decision making within Ireland.

1.2 What is an Indicator?

The following definition was used by Eurostat in a recent review of experiences of EU Member States with SD Indicators¹:

'An indicator is a parameter, or a value derived from a set of parameters, that points to, provides information about and/or describes the state of a phenomenon. It has significance beyond that directly associated with the parameter value.'

Therefore, an indicator is a measure of activity, which can be used to compare the performance of this activity against targets, aims and objectives.

1.3 What is an SD Indicator?

A lot of experience has been gained over the years in the development and application of economic indicators such as Gross Domestic Product or Gross National product, with indicators for the social and environmental aspects of sustainability receiving increasing attention in recent years. The key difference with SD indicators is that collectively these indicators are seeking to provide a complete picture of our socio-economic-environmental system in an integrated way, to reflect the fundamentally holistic nature of SD.

1.4 The Role of Indicators in Sustainable Development.

The contribution of indicators to the SD decision making process is represented in Figure 1. This is an iterative process and indicator sets are subject to revision over time to reflect changing policy priorities. The indicator set has two fundamental purposes:

- To improve information for decision makers
- To measure progress against objectives

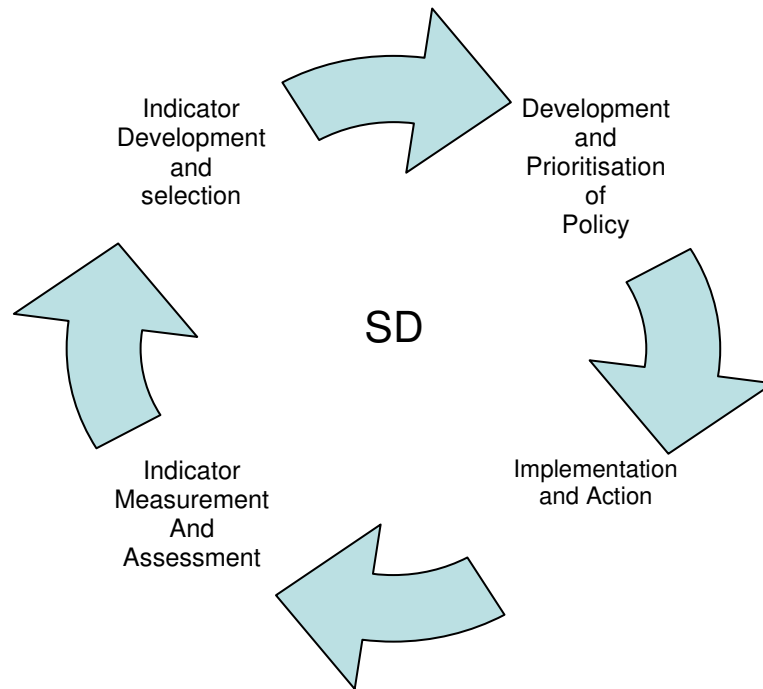


Figure 1. Indicators and the SD Decision Making Process (adapted from Curry, Maguire *et al.* (2007))²

1.5 Selecting Indicators.

In December 2001 at Laeken, the European Council adopted a set of indicators on social inclusion known as the Laeken indicators, and the principles developed for the selection of these indicators have since been applied to the selection of SD indicators by the European Commission Sustainable Development Indicators Task Force (The work of the task force is described in more detail below). The Laeken principles are:

- An indicator should be robust and statistically validated.
- An indicator should be responsive to policy interventions but not subject to manipulation.
- An indicator should be measurable in a sufficiently comparable way across Member States, and comparable as far as practicable with international standards.
- An indicator should be timely and susceptible to revision.
- The measurement of an indicator should not impose on Member States, on enterprises, nor on the Union's citizens a burden disproportionate to its benefits.

The task force also identified that any portfolio of indicators should follow the following principles:

- The portfolio of indicators should, as far as possible, be balanced across different dimensions.
- The indicators should be mutually consistent within a theme.
- The portfolio of indicators should be as transparent and accessible as possible to EU citizens.

1.6 Objectives of the review of Sustainable Development Indicators for Ireland.

The Department of Environment, Heritage and Local Government (DEHLG) has committed to an updated National SDS by mid-2007. This review is intended to inform the input of Comhar to the process. The specific objectives of the research are:

- Provide an overview of the range of social, economic and environmental indicators currently available in Ireland which address trends in sustainable development;
- Provide a brief summary of sustainable development indicators currently in use in EU member states (where available);
- Identification of any significant current data gaps for Ireland in the collection of indicators;
- Provide examples of best practise within the EU and elsewhere in the collection and dissemination of indicators for sustainable development;
- Provide a brief overview of relevant work undertaken by the EU, OECD and UN agencies relevant to the development of sustainable development indicators for Ireland; and
- Provide recommendations on national indicators for sustainable development including selection criteria and the merits of any hierarchical approach.

2. An overview of the range of social, economic and environmental indicators currently available in Ireland which address trends in sustainable development.

2.1 Development of SDS in Ireland

Early experiences with the development of Sustainable Development Indicators (SDI) were based around the testing programme developed by the UN Commission on Sustainable Development (UNCSD) and launched in 1996. Six EU member states (Austria, Belgium, Finland, France, Germany and the UK) participated in this testing programme and since then the focus of activity has shifted to EU level and to the level of individual member states.

Ireland was one of the first EU countries to publish a SD strategy with the publication of '*Sustainable Development- a Strategy for Ireland*' in 1997³. The strategy committed to:

- Preparation of a series of environmental quality indicators by 1998
- Development of sustainability indicators and preparations advanced towards satellite green accounts.
- Development of regional sustainability indicators by regional authorities.

The Strategy recognised that data collection '*is not yet adequate to allow a full evaluation of materials use and energy flows in the Irish economy. Their limitations mean that the definition and measurement of sustainable development indicators will remain tentative in the short-term.*

The priorities for action included development of the ability to measure and monitor sustainable development performance through the use of indicators to measure progress towards sustainability. The Strategy identifies a phased approach with the preparation of environmental quality indicators by the EPA and a longer-term work programme which includes research, data assembly, methodology development and preparation of satellite environmental accounts.

A review of progress '*Making Ireland's Development Sustainable: Review, Assessment and Future Action*'⁴ was carried out in 2002 and identified a number of environmental and sustainable development indicator initiatives which had been undertaken and resulted in the publication of:

- Environment in Focus (EPA, 1999)⁵
- Indicators for Transport and the Environment in Ireland (EPA, 2000)
- Rural Environmental Indicators (EPA, 2001)

- National Progress Indicators for Sustainable Economic, Social and Environmental Development (NESC, 2002)⁶.

Since then there have been further publications in the Environment in Focus series and the Central Statistics Office (CSO) first published an initial set of national progress indicators in 2003 in response to a specific request in '*Sustaining Progress. Social Partnership Agreement 2003-2005*⁷'. With the exception of the CSO indicators, there has been little progress in the development and application of a SDI set for Ireland. An overview of indicators currently available for Ireland is given below.

2.2 Current Social, Economic and Environmental Indicators

2.2.1 Measuring Ireland's Progress

The progress indicators used in these reports are intended to provide a synoptic analysis of the economic, social and environmental situation in Ireland. The first report was published in 2003 and subsequently on an annual basis, there are 106 indicators covering 10 domains namely:

- Economy
- Innovation and technology
- Employment and unemployment
- Social cohesion
- Education
- Health
- Population
- Housing
- Crime
- Environment

2.2.2 Environmental Protection Agency

The EPA has published three indicator reports 'Environment in Focus' in 1999, 2002 and 2004. The structure of these reports and indicators has changed over time. The most recent report contained 60 indicators of which 26 had been reported on in previous publications. The indicators are structured into two categories:

1. State of the environment indicators
 - Air
 - Water
 - Waste
 - Land cover and biodiversity
2. Sectoral environmental indicators
 - Transport
 - Industry
 - Energy
 - Agriculture
 - Forestry
 - Fisheries

2.2.3 National Economic and Social Council

In 2002 NESC published a report '*National Progress Indicators for Sustainable Economic, Social and Environmental Development*'. They recommended a theme based approach to sustainable development indicators with selection criteria and selected 18 headline indicators and 12 background indicators. These are shown in Table 1.

Table 1. NESC Sustainable Development Indicators

Theme	Headline Indicator	Background Indicator
Successful adaptation to change	Labour productivity	Business investment in R&D
	Per capita GNP/Annual GDP growth rates	
Utilisation and development of the information society	Gross domestic expenditure on R&D as a proportion of GDP (GERD)	IT graduates as % of all graduates
	Proportion of households with access to a PC/Internet	Government appropriations and outlays on R&D as a proportion of sustainability GDP (Gbaord)
		Internet Hosts per 1,000 population
Economic inclusion	Employment rate	Number of childcare places per 1,000 children aged under 5 Years (pre-school) and 6 to 15 years (after-school).
	Unemployment rate	
	Labour force participation Rate	
Social Inclusion	Percentage of households living in consistent poverty	Income inequality measure
	Households and persons experiencing relative income poverty	Number and proportion of public in-patients waiting 6 months or more (children) and 12 months or more (adults) for targeted specialities
	Retention rates to the end of upper Secondary school	
	Disability-adjusted life expectancy at birth and 60 years	
	Housing stock and completions: Local Authority and private	
Lifelong learning	Participation in adult and continuing education and training	n/a
Balanced regional development	Employment growth rates by region	% FDI by region
		GVA by region
		Per capita expenditure on infrastructure
Commitment to EU/International organisations	Total ODA as percentage of GDP	n/a
Maintaining and managing the environment	Greenhouse Gas emissions	Vehicle Numbers: Cars per 1,000 Capita
	River water quality	Household and commercial waste arising
	Disposal and recovery of municipal waste	

Since the publication of this indicator set the themes of sustainable consumption and production and management of natural resources have received greater attention due to the recognition of the role of environmental goods and services in supporting human well-being, these are not sufficiently addressed in this set; however the indicator set does propose regional indicators.

The 2006 NESC Strategy '*People, Productivity and Purpose*'⁸ considers the breaking of the link between economic growth and environmental degradation a priority and highlights the need to factor the environment more fully into our understanding of the Irish economy and society. The strategy highlights the lack of indicators that address social inclusion and regional development and using poverty as an example advocate that it is useful to distinguish between systemic indicators, diagnostic indicators and performance indicators respectively.

- A systemic indicator is a high level indicator that gives an overall picture of how a system is performing. Trends in it should communicate unambiguously and clearly that performance is improving or deteriorating. For this reason it is strongly motivational.

- A diagnostic indicator provides information specific to a particular activity or component of the system. It is usual to employ them after the trend in a systemic indicator has indicated a need for more detailed information in order to see more clearly where and how something might be put right.
- A performance indicator measures the effects of a particular intervention, programme or project relative to a desired set of outcomes. It isolates the impact of a specific intervention and allows its efficiency and effectiveness to be assessed.

NESC also state that each indicator should be provisional and revisable in the light of experience and need consistent and timely data to be provided if they are to be useful.

2.3 Material Flow Accounts (MFA) – derived indicators

The 1997 SDS contained a commitment to ‘develop a materials and energy balance for industry to determine the full extent of industry’s environmental/natural resource impacts and advise on targets for greater eco-efficiency’. In 2001 the EPA funded a demonstration MFA for Ireland which carried out two pilot studies namely a national fossil fuel flow account with derived indicators and a regional water flow account; and identified data gaps for a complete national material flow account (Clean Technology Centre, 2004)⁹.

A methodology for carrying out MFA’s has been approved and issued as a methodological guide by the Statistical Office of the European Commission (EuroStat) ‘*Economy-wide material flow accounts (MFA) and derived indicators: A methodological guide*’ (EuroStat, 2001)¹⁰. A time series (1980-2000) of MFAs and derived indicators have been calculated for European countries (EU-15) using this methodology¹¹ and in 2005 the EPA funded ‘*Island Limits: A Material Flow Analysis and Ecological Footprint of Ireland*’ which carried out a full MFA for Ireland and calculated the derived indicators:

Direct Material Input (DMI) measures the direct input of materials (in terms of their mass) for use into the economy i.e. all materials which are of economic value and are used in production and consumption activities. DMI equals domestic extraction plus imports

Domestic Material Consumption (DMC) measures the total amount of material used directly in the economy. DMC equals DMI minus exports.

Domestic Processed Output (DPO) is the total weight of materials extracted from the domestic environment or imported, which have been used in the domestic economy before flowing to the environment. Included in DPO are emissions to air, waste disposed in landfills, material loads in wastewater and materials dispersed into the environment as a result of product use.

Direct Material Output (DMO) represents the total quantity of material leaving the economy after use either towards the environment or outside the national boundary. DMO is the sum of DPO and exports.

Physical Trade Balance (PTB) measures the physical trade surplus or deficit of an economy and PTB equals imports minus exports.

Resource Efficiency Indicators measure the resource productivity and intensity of the economy. Resource productivity is the contribution to GDP at constant prices generated per tonne of domestic extraction (DE), material input and material consumption (GDP/MFA indicator). Resource intensity is the tonnes of domestic extraction, material input and material consumption needed to generate one unit of GDP at constant prices (MFA indicator/GDP).

These indicators provide a picture of the ‘industrial metabolism’ of Ireland and allow comparison in a standardised way with other countries and over time. A time series of DMI, DMC and the resource efficiency indicators is available.

2.4 Integrated or Composite Indices

Composite or integrated indices offer a different way of measuring and communicating SD by bringing together several important issues into a single, easy to understand number. These tend

to be calculated by aggregating indicators produced by national statistical agencies. A number of these have been calculated for Ireland including:

- Environmental Sustainability Index
- Inclusive Wealth Accounting (Genuine Savings)
- Human Development Index
- Environmental Vulnerability Index
- Ecological Footprint
- Happy Planet Index

Environmental Sustainability Index

The 2005 Environmental Sustainability Index (ESI) benchmarks the ability of nations to protect the environment over the next several decades. It does so by integrating 76 data sets –tracking natural resource endowments, past and present pollution levels, environmental management efforts, and a society’s capacity to improve its environmental performance –into 21 indicators of environmental sustainability. These indicators permit comparison across the following five fundamental components of sustainability: Environmental Systems; Environmental Stresses; Human Vulnerability to Environmental Stresses; Societal Capacity to Respond to Environmental Challenges; and Global Stewardship¹².

The ESI is a relatively new indicator and has been calculated for 2002 and 2005 only. Ireland was ranked 21 out of 146 countries in 2005. ESI is calculated by the Yale Centre for Environmental Law and Policy and Columbia University Centre for International Earth Science Information Network in collaboration with the World Economic Forum and EC Joint Research Centre.

Inclusive Wealth Accounting (Genuine Savings)

Adjusted net saving, (also known as genuine saving), is a sustainability indicator building on the concepts of green national accounts. Adjusted net savings measure the true rate of savings in an economy after taking into account investments in human capital, depletion of natural resources and damage caused by pollution.

Adjusted net savings are derived from standard national accounting measures of gross national savings by making four types of adjustments. First, estimates of capital consumption of produced assets are deducted to obtain net national savings. Then current expenditures on education are added to net domestic savings as an appropriate value of investments in human capital (in standard national accounting these expenditures are treated as consumption). Next, estimates of the depletion of a variety of natural resources are deducted to reflect the decline in asset values associated with their extraction and harvest. Estimates of resource depletion are based on the calculation of resource rents. An economic rent represents the excess return to a given factor of production. Rents are derived by taking the difference between world prices and the average unit extraction or harvest costs (including a 'normal' return on capital). Finally, pollution damages are deducted. Many pollution damages are local in their effects, and therefore difficult to estimate without location-specific data. Here we estimate health damages due to urban air pollution. As for global pollution damages, the estimates include damages from carbon dioxide emissions (World Bank, 2006).

A data set of Adjusted Net Saving is available for Ireland from 1971-2004 from the World Bank and calculated annually.

Human Development Index

The HDI is a summary measure of human development. It measures the average achievements in a country in three basic dimensions of human development:

- A long and healthy life, as measured by life expectancy at birth.

- Knowledge, as measured by the adult literacy rate (with two-thirds weight) and the combined primary, secondary and tertiary gross enrolment ratio (with one-third weight).
- A decent standard of living, as measured by GDP per capita in purchasing power parity (PPP) terms in US dollars.

The HDI is compiled by the UN Development Programme and Ireland is ranked 4th in the world. A time series of HDI data is available for 1975, 1980, 1985, 1990, 1995, 2000 and 2004.

Environmental Vulnerability Index

A vulnerability index for the natural environment, the basis of all human welfare, has been developed by the South Pacific Applied Geoscience Commission (SOPAC), the United Nations Environment Programme (UNEP) and their partners, namely Ireland, Italy, New Zealand and Norway. The index was developed through consultation and collaboration with countries, institutions and experts across the globe. This index is designed to be used with economic and social vulnerability indices to provide insights into the processes that can negatively influence the sustainable development of countries. The EVI is based on 50 indicators for estimating the vulnerability of the environment of a country to future shocks. These indicators are combined by simple averaging and reported simultaneously as a single index, a range of policy-relevant thematic sub-indices and as a profile showing the results for each indicator.

The first EVI assessment of Ireland was in 2005 and classified Ireland as highly vulnerable with the issues of ecosystem imbalance, environmental openness and intensive farming as the issues of greatest environmental vulnerability.

Ecological Footprint

The Ecological Footprint is an indicator of human consumption of natural resources and a means of communicating the intensity of resource use. It is calculated by analysing data on a wide range of activities such as how we use energy, transport patterns, waste production, food production and consumption and land use. The amount of biologically productive land and water area that is needed to meet this demand for resources and absorb the wastes that are generated is determined in global hectares (gha) which allow global comparison of national Footprints. The total amount of global hectares is divided fairly among the global population to determine each individual's 'earthshare' which currently is 1.8 gha. The Ecological Footprint of 150 countries is calculated annually by the Global Footprint Network and published in the form of National Footprint Accounts and a time series for Ireland from 1961 to 2003 is available.

Happy Planet Index

The Happy Planet Index (HPI) is an innovative new measure that shows the ecological efficiency with which human well-being is delivered around the world. It is the first ever index to combine environmental impact with well-being to measure the environmental efficiency with which country by country, people live long and happy lives. The Index doesn't reveal the 'happiest' country in the world. It shows the relative efficiency with which nations convert the planet's natural resources into long and happy lives for their citizens. The nations that top the Index aren't the happiest places in the world, but the nations that score well show that achieving, long, happy lives without over-stretching the planet's resources is possible. The HPI shows that around the world, high levels of resource consumption do not reliably produce high levels of well-being (life-satisfaction), and that it is possible to produce high levels of well-being without excessive consumption of the Earth's resources. It also reveals that there are different routes to achieving comparable levels of well-being. The HPI was calculated for the first time in 2006 based on data from 2005 and Ireland was ranked 113 out of 178 countries.

2.5 Regional and Local Indicators

There are few regional indicators published in Ireland relating to SD, those that are mainly address economic performance, employment, waste and water. The New Economics Foundation has been developing community indicators. Community indicators tap into local energy and

expertise as well as engaging a whole spectrum of people in the task of working together to improve their community; to make it 'sustainable'. Research has been undertaken by the University of Limerick as part of the ERTDI programme into the local SDIs and should inform the development of a process by which sub-national indicators can be developed.

3. A summary of sustainable development indicators currently in use in EU member states (where available).

3.1 EU Sustainable Development Strategy

In June 2001, the European Council adopted 'A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development'¹³. The Strategy comprised three parts:

1. A set of cross-cutting proposals and recommendations to improve the effectiveness of policy and make sustainable development happen. This means making sure that different policies reinforce one another rather than pulling in opposite directions.
2. A set of headline objectives and specific measures at EU level to tackle the issues which pose the biggest challenges to sustainable development in Europe.
3. Steps to implement the strategy and review its progress.

Within the Strategy implementation and review process was a commitment to '*regular monitoring and reporting of progress based on indicators*'. The Strategy further identified the need for additional indicators to those already set out in the Lisbon Strategy, the EU Economic Development Strategy, which was launched by the Commission in March 2000. The Lisbon Strategy had set out the open method of coordination, based principally on:

- jointly identifying and defining objectives to be achieved (adopted by the Council);
- jointly established measuring instruments (statistics, indicators, guidelines);
- benchmarking, i.e. comparison of the Member States' performance and exchange of best practices (monitored by the Commission).

The adoption of the EU Strategy, and in particular the commitment to regular measurement and review resulted in a range of actions on the development SD indicators by a range of actors, which are considered in detail below:

3.2 EU Sustainable Development Indicator Task Force

In September 2001, the European Commission Statistical Programme Committee established a Task Force '*to develop a common response from the European Statistical System to the need for indicators on Sustainable Development (SD)*'.

The Task Force published its final report in April 2006¹⁴ and this recommended the following actions:

- Endorse the framework for Sustainable Development Indicators (SDIs) and the list of SDIs,
- Recommend to the national statistical institutions to maintain and expand their work on data needed for SDIs,
- Recommend to other data producers inside the EU institutions and agencies to maintain and expand their work on data production as well as compatibility of administrative and statistical data sources in order to contribute to the compilation of SDIs and,
- Support actively the Working Group on Sustainable Development Indicators, in order to follow-up and update the framework and SDIs, to improve inter-linkages between various indicators as well as to exchange experiences on best practice with SDIs.

The Task Force organised the selected SD indicators using an indicator pyramid, which enabled the prioritisation of the use of the indicators according to their use, as set out in Figure 2.

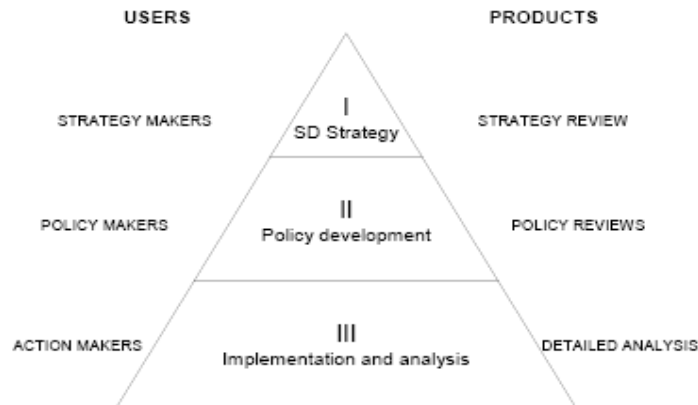


Figure 2. Indicator pyramid

Level 1 (L1): consists of a set of 12 high-level indicators allowing an initial analysis of the theme development. These indicators monitor the top-level policy objectives and are aimed at a high-level policy-making and general public and can therefore be seen as a set of headline indicators.

Level 2 (L2): corresponds to the sub-themes of the framework and, together with Level 1 indicators, monitors progress in achieving the headline policy objectives. These 45 indicators are aimed at evaluation of the core policy areas and communication with general public.

Level 3 (L3): corresponds to the areas to be addressed, i.e. various measures implementing the headline objectives and facilitates a deeper insight into special issues in the theme. These 98 indicators are aimed at further policy analysis and better understanding of the trends and complexity of issues associated with the theme or inter-linkages with other themes in the framework. They are intended for a more specialised audience.

Data development and indicator selection.

The Task Force further divided indicators into 'best-available' and 'best-needed' categories, based on data availability, with best-available indicators being those that can be compiled on the basis of existing data, with best-needed indicators referring to indicators on which:

- concept, definition as well as data do not exist yet;
- concept and definition exist, but there is no data yet;
- data exist, but the quality does not allow publishing or the breakdowns needed are not yet available or
- data exist, but the quality is unknown.

The list of 'best-available' and 'best-needed' indicators is set out in Appendix II. The Task Force made a series of recommendations for data development, including the following 'critical areas for system developments':

- NAMEA and Material Flow Accounting
- Basic statistics on materials
- Public Health Statistics
- Land use statistics

- R&D, Innovation and technology statistics
- socio-economic breakdowns for consumption indicators

Working Group on Sustainable Development Indicators.

The report of the Task Force included a commitment by EuroStat to establish a Working Group on Sustainable Development Indicators, with the following mandate:

- To maintain and further improve the quality of the output of the SDI Task Force (framework, indicators, data, inter-linkages, nowcasting and forecasting);
- Follow and evaluate preparatory work on further development of best needed indicators
- To improve the communication on SDIs, including their presentation and dissemination;
- To exchange best practices among EU Member States and associated countries;
- To support the further development of EU Sustainable Development policies through the provision of relevant SDIs.

3.3 EuroStat Sustainable Development Indicators

The EuroStat SD Indicators are based on the recommendations of the Task Force and set out 10 hierarchal themes, based on the policy priorities of the Sustainable Development Strategy adopted in June 2006, these are:

1. Economic development
2. Poverty and social exclusion.
3. Ageing society.
4. Public Health
5. Climate change and energy.
6. Production and consumption patterns.
7. Management of natural resources
8. Transport.
9. Good governance.
10. Global partnership.

The full indicator set is given in Section 4 as part of the data gaps for Ireland assessment.

3.4 European Environment Agency Indicators.

The EEA has published an Environmental Indicator set by thematic area, with a total of thirty one areas¹⁵. The EEA also published a set of Core Set of Indicators (CSI), which were selected using the following criteria:

- Be policy relevant-support EU policies' priority issues of increasing policy relevance (on the basis of available EU policy documentation, DG environment work programme)
- Monitor progress toward the quantified targets(if there is no targets, then use thresholds)
- Be based on ready available and routinely collected data for EEA countries within specified timescale (to be determined country by country) at reasonable cost-benefit ratio
- Be consistent in space coverage and cover all or most of EEA countries
- Time coverage—sufficient/insufficient time trends (exemptions of general nature to be verified —e.g. situation of candidate countries)
- Primarily be national in scale and representative for countries(countries benchmarking)
- Be understandable and simple
- Be conceptually and methodologically well founded and representative (to be used by at least one community or international organization) and on the bases of well established consultation with countries
- Be of priority in EEA management plan
- Be timely(be produced in reasonable and “useful” time)

- Be well documented and of known quality

The EEA CSIs grouped by topic are set out in Table 2. The EEA publishes the indicators on its web site, and each indicator is supported by a detailed methodology which defines the indicator and sets out the rationale for its choice. The EEA indicators report for the EU-25, however, the methodologies address issues such as differences in data quality and availability between EU-15 and EU-25 Indicators.

Table 2. European Environment Agency Core Set of Indicators

Topic Area	Indicator
Agriculture	<ul style="list-style-type: none"> • Area under organic farming (CSI 026) • Gross nutrient balance (CSI 025)
Air pollution and ozone depletion	<ul style="list-style-type: none"> • Emissions of acidifying substances (CSI 001) • Emissions of ozone precursors (CSI 002) • Emissions of primary particles and secondary particulate precursors (CSI 003) • Exceedance of air quality limit values in urban areas (CSI 004) • Exposure of ecosystems to acidification, eutrophication and ozone (CSI 005) • Production and consumption of ozone depleting substances (CSI 006)
Biodiversity	<ul style="list-style-type: none"> • Designated areas (CSI 008) • Species diversity (CSI 009) • Threatened and protected species (CSI 007)
Climate change	<ul style="list-style-type: none"> • Atmospheric greenhouse gas concentrations (CSI 013) • Global and European temperature (CSI 012) - • Greenhouse gas emissions and removals (CSI 010) • Projections of greenhouse gas emissions and removals (CSI 011)
Energy	<ul style="list-style-type: none"> • Final energy consumption by sector (CSI 027) • Renewable electricity (CSI 031) - Apr 2006 Assessment • Renewable energy consumption (CSI 030) Total energy consumption by fuel (CSI 029) • Total energy intensity (CSI 028)
Fisheries	<ul style="list-style-type: none"> • Aquaculture production (CSI 033) • Fishing fleet capacity (CSI 034) • Status of marine fish stocks (CSI 032)
Terrestrial	<ul style="list-style-type: none"> • Land take (CSI 014) • Progress in management of contaminated sites (CSI 015)
Transport	<ul style="list-style-type: none"> • Freight transport demand (CSI 036) Passenger transport demand (CSI 035) • Use of cleaner and alternative fuels (CSI 037)
Waste	<ul style="list-style-type: none"> • Generation and recycling of packaging waste (CSI 017) • Municipal waste generation (CSI 016)
Water	<ul style="list-style-type: none"> • Bathing water quality (CSI 022) • Chlorophyll in transitional, coastal and marine waters (CSI 023)

	<ul style="list-style-type: none"> • Nutrients in freshwater (CSI 020) • Nutrients in transitional, coastal and marine waters (CSI 021) • Oxygen consuming substances in rivers (CSI 019) • Urban waste water treatment (CSI 024) • Use of freshwater resources (CSI 018)
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4. Identification of any significant current data gaps for Ireland in the collection of indicators.

4.1 Data gaps and needs for national indicators

Section 2 gave an overview of the range of social, economic and environmental indicators for Ireland and while there appears to be a large number of indicators available, the extent to which they address trends in sustainable development is questionable. *'Measuring Ireland's Progress'* is the closest that Ireland has come to publication of an SDI set and available indicators need to be assessed in the context of the outputs of the EU SDI task force and the themes of the renewed EU SDS.

In that context it becomes clear that some significant environmental indicators are outstanding and for those that are available, the extent to which they can be used to assess change over time and for international comparisons is uncertain. The EPA publications on waste in particular acknowledge the uncertainties relating to data quality. The assessment of the availability of data for the EU SDI set in Section 4.3 highlights the need for further development of indicators relating to production and consumption patterns, management of natural resources and transport in particular.

4.2 Data gaps and needs for MFA indicators

Total Material Requirement has been identified as the best-needed headline indicator for production and consumption patterns. In order to calculate this indicator data are required on hidden flows. Hidden flows are flows which do not enter or leave the economy, for example soil erosion from farmland, washed into rivers, ultimately flowing out into the sea. They can be classified as domestic hidden flows or foreign hidden flows and are defined as the total weight of materials which are moved or mobilised in the environment in the course of providing commodities for economic use¹⁶. Little research and data on hidden flows exists for Ireland.

4.3 Availability of data for EU SDI set

Data are available for most of the relevant 'best-available' indicators from the EU SDI set for Ireland. Statistics published by EuroStat¹⁷ were reviewed and data gaps for Ireland were identified.

Theme 1 – Economic Development

Sub theme	Level	Indicator	Ireland data
	1	Growth rate of GDP per capita	Y
Investment	2	Total investment by institutional sector	Y
	3	Real GDP growth rate	Y
	3	GDP per capita in PPS	Y
	3	Regional breakdown of GDP per capita	Y
	3	Total consumption expenditure	Forecast since 2001
	3	Net national income	Y
	3	Inflation rate	Y

	3	Total net saving by institutional sector	N
Competitiveness	2	Labour productivity per hour worked	Y
	2	Real effective exchange rate	Y
	3	Unit labour cost growth, for total and industry	Y
	3	Life long learning:total	Y
	3	Turnover from innovation by economic sector	N
	3	Gross domestic R&D expenditure	Estimated and provisional data
	3	Total public expenditure on education	Y
Employment	2	Total employment rate	Y
	3	Total employment growth	Y
	3	Total employment rate by gender & by highest level of educational attained	Y
	3	Total unemployment rate by gender, age group & by highest level of educational attained	Y
	3	Regional breakdown of employment rate	Y

Theme 2 – Poverty and Social Exclusion

Sub theme	Level	Indicator	Ireland data
	1	Total at-risk-of-poverty rate after social transfers	Y
Monetary poverty	2	Total at-persistent-risk-of-poverty rate	Y
	3	At-risk-of-poverty rate after social transfers by gender, age group, highest level of education attained and by household type	Not by education
	3	Relative at-risk-of-poverty gap	Y
	3	Inequality of income distribution (Income quintile share ratio)	Y
	3	<i>Poverty Mobility</i>	N
Access to labour markets	2	Total long-term unemployment rate	Y
	3	Gender pay gap in unadjusted form	Provisional data since 2003
	3	Total very long-term unemployment rate	Y
	3	People aged 0-59 living in jobless households, by age group	Y
	3	At-risk-of-poverty rate after social transfers by most frequent activity	Y
Other aspects of social exclusion	2	Early school leavers: total	Y
	3	Persons with low educational attainment by age group	Y
	3	<i>Adequacy of housing conditions</i>	N

Theme 3 – Ageing Society

Sub theme	Level	Indicator	Ireland data
	1	Current and projected old age dependency ratio	Y
Pensions Adequacy	2	<i>Projected theoretical replacement rate</i>	N
	2	Relative mean income ratio	For 2001 only

	3	At-risk-of-poverty rate after social transfers for persons aged 65 years and over	Y
Demographic change	2	Life expectancy at age 65 by gender	Y
	3	Total fertility rate	Y
	3	Net inwards migration by age group	Total only
Public finance stability	2	General government debt	Y
	3	Current and <i>projected</i> public pensions expenditure	Current only
	3	Total employment rate by age group	Y
	3	Average exit age from the labour market by gender	Y
	3	Current and <i>projected</i> public expenditure on care for the elderly	Current only

Theme 4 – Public Health

Sub theme	Level	Indicator	Ireland data
	1	Healthy life years at birth by gender	Estimated from 2002
Human health protection and lifestyles	2	Percentage of overweight people	Y
	2	Resistance to antibiotics	Y
	3	Healthy life years at age 65 by gender	Estimated from 2002
	3	Health care expenditure	Y
	3	Cancer incidence rate by gender and type	Y
	3	Suicide death rate by gender and age group	Y
	3	Percentage of present smokers by gender and age group	Y
	3	<i>Work with high levels of job stress</i>	N
	3	Total serious accidents at work	Data not compatible from 1998-2002
Food safety and quality	2	<i>Deaths due to infectious food-borne diseases</i>	N
	2	Salmonellosis incidence rate	Y
	3	<i>Dioxins and PCBs in food and feed</i>	N
	3	<i>Heavy metals in fish and shellfish</i>	N
	3	<i>Pesticides residues in food</i>	N
Chemicals management	2	<i>Index of apparent consumption of chemicals by toxicity class</i>	N
	2	Index of production of chemicals by toxicity class	N – could calculate from ProdCom
	3	<i>Population exposure to air pollution by particulate matters</i>	Y
	3	<i>Population exposure to air pollution by ozone</i>	N
	3	Proportion of population living in households considering that they suffer from noise and from pollution	Up to 2000
	3	<i>Monetary damage of air pollution</i>	N

Theme 5 –Climate change and energy

Sub theme	Level	Indicator	Ireland data
	1	Total Greenhouse Gas Emissions	Y
	2	GHG emissions by sector	Y
	3	CO ₂ intensity of energy consumption	Y
	3	CO ₂ removed by sinks	Y
	1	Gross inland energy consumption by fuel	Y (SEI)
	2	Energy intensity of the economy	Y
	2	Final energy consumption by sector	Y
	2	Gross electricity generation by fuel used in power stations	N
	3	Share of electricity from renewable energy to gross electricity generation by source	Y
	3	Combined heat and power generation	Y
	3	Energy intensity of manufacturing industry	N
	3	Consumption of biofuels	N
	3	<i>External costs of energy use</i>	N
	3	Energy tax revenue	N
	3	High-level radioactive waste and spent nuclear fuel awaiting permanent disposal	Y

Theme 6 – Production and Consumption Patterns

Sub theme	Level	Indicator	Ireland data
	1	<i>Total Material Consumption</i>	N
	1	Domestic material consumption	To 2001
Eco-efficiency	2	Emissions of aggregated acidifying substances and ozone precursors by sector	N
	2	<i>Generation of waste by all economic activities and by households</i>	N
	2	Municipal waste collected	Y
	3	Components of DMC	N
	3	DMC by material	N
	3	Municipal waste treatment by type of treatment method	Y
	3	<i>Generation of hazardous waste by economic activity</i>	Y
Consumption patterns	2	Electricity consumption per dwelling	Y
	2	<i>Green public procurement</i>	N
	3	Household number and size	Y
	3	Meat consumption per capita	Y
	3	<i>Share of consumption of products with an EU or national eco-label</i>	N
Agriculture	2	Share of area under agri-environmental support	Y
	2	Livestock density index	Y
	3	Nitrogen surplus	Y
	3	Share of area occupied by organic farming	Y
	3	<i>Use of selected pesticides</i>	N
Corporate responsibility	3	<i>Share of production from enterprises with a sustainable management system</i>	N
	3	Enterprises with an environmental management	Y

		system	
	3	<i>Ethical financing</i>	N
	3	Eco-label awards by country and product group	Y

Theme 7 – Management of Natural Resources

Sub theme	Level	Indicator	Ireland data
	1	<i>Biodiversity Index</i>	N
	1	Population trends of farmland birds	Y
	1	Fish catches from stocks outside safe biological limits	N
	2	<i>Sufficiency of member states proposals for protected sites under the Habitats Directive</i>	N
	3	<i>Change in status of threatened and/or protected species</i>	N
	2	<i>Trends of spawning biomass of protected fish stocks</i>	N
	3	<i>Effective fishing capacity and quotas by specific fisheries</i>	N
	3	Size of fishing fleet	Y
	3	<i>Share of structural support to fisheries allocated to promote environmentally-friendly practises</i>	N
	2	Groundwater abstraction	N
	3	Population connected to waste water treatment services	Patchy data
	3	<i>Emissions of organic matters as biochemical oxygen demand to rivers</i>	N
	3	<i>Index of toxic chemical risk to the aquatic environment</i>	N
	2	<i>Land use changes by category</i>	N
	2	Built up areas	Y
	2	<i>Exceedance of critical loads of acidifying substances and nitrogen in environmentally sensitive areas</i>	N
	3	<i>Share of total land area at risk of soil erosion</i>	N
	3	<i>Share of total land area at risk of soil contamination</i>	N
	3	Forest trees damaged by defoliation	Y
	3	<i>Fragmentation of habitats due to transportation</i>	N

Theme 8 – Transport

Sub theme	Level	Indicator	Ireland data
	1	<i>Vehicle-km index</i>	N
	1	Total energy consumption of transport	Y
Transport growth	2	Car share of inland passenger transport	Estimated only
	2	Road share of inland freight transport	Y
	3	Modal split of passenger transport	Y
	3	Modal split of freight transport	Y
	3	Volume of freight transport	Y
	3	Energy consumption by transport mode	Y
	3	<i>Access to public transport</i>	N
	2	<i>External costs of transport activities</i>	N
	3	<i>Freight transport prices by mode</i>	N
	3	<i>Investment of transport infrastructure by mode</i>	N
Social & environmental impact of transport	2	Emissions of air pollutants from transport activities	Ozone only

	2	GHG emissions from transport activities	Y
	3	People killed in road accidents <i>by road group</i>	To 2002
	3	Emissions of NOx from road vehicles	Y

Theme 9 – Good Governance

Sub theme	Level	Indicator	Ireland data
	1	Level of citizens confidence in EU institutions	n/a
Policy coherence	2	<i>Proportion of environmentally harmful subsidies</i>	N
	2	Number of infringement cases by policy area	By country
	2	<i>Administrative costs imposed by legislation</i>	N
	3	<i>Share of major proposals with impact assessment</i>	N
	3	Transposition of community law by policy area	n/a
Public participation	2	Voter turnout in national Parliamentary elections	Y
	2	<i>Responses to EU internet public consultations</i>	n/a
	3	Voter turnout in EU Parliamentary elections	Y
	3	E-government on-line availability	Y
	3	Total E-government usage by individuals	Y

Theme 10 – Global Partnership

Sub theme	Level	Indicator	Ireland data
	1	Official development assistance	Y
Globalisation of trade	2	EU imports from developing countries, total and agricultural products	n/a
	2	Sales of selected fair-trade labelled products	n/a
	3	Total EU imports from developing countries by income group	n/a
	3	Total EU imports from developing countries by product group	n/a
Financing for SD	2	Bilateral ODA by category	n/a
	3	Total EU financing for development by type	n/a
	3	ODA and FDI to developing countries by income group and geographical area	n/a
	3	Share of untied ODA in total bilateral ODA commitments	Y
	3	ODA per capita in EU-15 donors and recipient countries	Y
Resource management	2	EU imports of materials from developing countries by group of products	n/a
	3	<i>Contribution to the Clean Development Mechanism</i>	N
	3	CO ₂ emissions per capita in the EU and developing countries	n/a

Many of the indicators unavailable for Ireland relate to the 'best-needed' indicators, however, there are significant data gaps relating to the themes of 'production and consumption patterns',

'management of natural resources', 'transport' and 'public health' where it relates to environmental factors.

5. Examples of best practise within the EU and elsewhere in the collection and dissemination of indicators for sustainable development.

Two key publications by Eurostat provide a thorough overview of this element of the research namely:

- EU Member State Experiences with Sustainable Development Indicators. Eurostat. 2004:
- Measuring progress towards a more sustainable Europe. Sustainable Development Indicators for the European Union. Data 1990 – 2005. Eurostat. 2006.

The objective of the 2004 Eurostat report was *'to advance the methodological understanding of the way in which sustainable development indicators (SDIs) are being developed and used across the fifteen Member States and the extent to which they complement sustainable development (SD) actions at the EU level'*. The research comprised an analysis of SD indicator developments at member states level, and a review of the Member State SDI methodologies and an assessment of inter-dimensional aspects of SD Indicators.

The 2006 Eurostat report describes the set of SD Indicators adopted by the European Commission in 2005 to underpin implementation of the European Union strategy for sustainable development, *'A sustainable Europe for a better world'*, adopted in 2001. The aim of the research was to provide a first progress report on the current state of play in the implementation of the strategy. The report describes trends derived from the analysis of indicators assessed against policy objectives to inform the general public and decision- makers about achievements, trade-offs and failures in attaining the commonly agreed objectives of sustainable development.

5.1 Case Studies.

5.1.1 The United Kingdom.

In March 2005, the UK Government published *'Securing the future'*¹⁸, UK sustainable development strategy, in conjunction with the Government and Devolved Administrations new Strategic Framework, *'One future - different paths'*¹⁹.

This framework included the following:

- a shared understanding of sustainable development
- a vision of what we are trying to achieve and the guiding principles we all need to follow to achieve it
- sustainable development priorities for UK action at home and internationally, and indicators to monitor the key issues on a UK basis.

There are 68 national indicators supporting the Strategy including measures of everyday concern such as health, housing, jobs, crime, education and environment. The indicators also support one or more of the four priority areas outlined in the Strategy.

The Strategic Framework included a set of high-level Framework Indicators combined with a mix of indicators, targets and performance measures in the individual strategies for the UK Government, Scotland, Wales and Northern Ireland. These will underpin the shared framework priorities while reflecting the respective priorities of each administration. This approach allows the indicators to be used in a number of ways:

- as an overall set of 68 sustainable development indicators
- as the high-level set of UK Framework Indicators
- indicators for the priority areas of
 - Sustainable consumption and production

- Climate change and energy
- Protecting our natural resources and enhancing the environment
- Creating sustainable communities and a fairer world

The Strategy sets out the following criteria for the set of indicators:

- are linked to the purpose and priorities within the UK Framework
- are agreed as high priorities by the UK Government and Devolved Administrations
- have UK coverage (though there are some data constraints)
- have trends available
- highlight challenges, and
- are statistically robust and meaningful.

A baseline assessment of all the indicators, for which data were available, was published in June 2005. The UK has adopted an approach based on based on a cascade of SD Indicators at national, regional and local levels, with some additional International indicators. The UK also produces a free pocket-sized (A6) booklet, *Sustainable development indicators in your pocket*, published annually. In 2005, the UK Audit Commission published '*Local quality of life indicators – supporting local communities to become sustainable. A guide to local monitoring to complement the indicators in the UK Government Sustainable Development Strategy*', and stakeholders can access the commission web site to build 'area profiles' based on ten Quality of Life themes.

The UK Sustainable Development Commission.

The equivalent body to Comhar in the UK is Sustainable Development Commission, although its role differs in a number of ways. The Commission acts as an independent sustainable development watchdog, and publishes regular reports on Government progress on SD. The Commission also publishes evidence-based research reports on environment and sustainability issues.

5.1.2 Finland.

The Finnish Government was one of the first European Countries to develop sustainable development policies, with the Council of State presenting a report titled 'Sustainable Development and Finland'²⁰ to the Finnish Parliament in 1990. Finland established its National Commission for SD in 1993. The 'Finnish Model' is based on broad-based, multi-stakeholder participation, combined with high level political leadership – the Finnish Prime Minister is the Chairman of the Finnish National Commission on Sustainable Development. The Finnish Government started work on the countries SD Indicator set in 1998, and published a set of 83 indicators in 2000. Finland published its latest National Strategy for Sustainable Development in 2006, and this contains a strong commitment to assessment and follow-up, stating:

'The success of sustainable development policy will be monitored by methods that include national indicator work. The sustainable development indicators will be developed and updated in the national indicator network between the different administrative sectors.'

The Strategy lists a range of follow-up indicators, including the Environmental Sustainability Index and Human Development Index.

6. An overview of relevant work undertaken by the EU, OECD and UN agencies relevant to the development of sustainable development indicators for Ireland.

The work of Eurostat and the European Commission and the SD Indicators Task Force has been described in detail in Section 3.2. A range of relevant developments are taking place within the Organisation for Economic Cooperation and Development (OECD) and the United Nations and these are described briefly below.

6.1 The work of the OECD.

The OECD has traditionally been best known for its research and publication on best practice on social and economic performance measurement, evaluation and benchmarking. More recently, OECD has been promoting the use of environmental indicators and standardised methodologies for indicators and accounting systems. The OECD has also been one of the lead organisations contributing to the development of the integrated system for environmental and economic accounting, which is described in detail on Section 6.2. The OECD Statistics Department develops statistical methodologies and statistical standards, guidelines, and best practices, including development indicators.

DPSIR framework – driver, pressure, state, impact, response.

There are a range of frameworks which can be used to facilitate the development and selection of indicators, the OECD has employed the DPSIR framework in the development of its environmental indicator set. The DPSIR model is a general framework for organising information about the state of the environment. The idea of the framework was originally derived from social studies and only later applied internationally, for organising systems of indicators in the context of environment and, later, sustainable development.

The framework assumes cause-effect relationships between interacting components of social, economic, and environmental systems, which are:

- Driving forces of environmental change (e.g. industrial production)
- Pressures on the environment (e.g. discharges of waste water)
- State of the environment (e.g. water quality in rivers and lakes)
- Impacts on population, economy, ecosystems (e.g. water unsuitable for drinking)
- Response of the society (e.g. pollution controls)

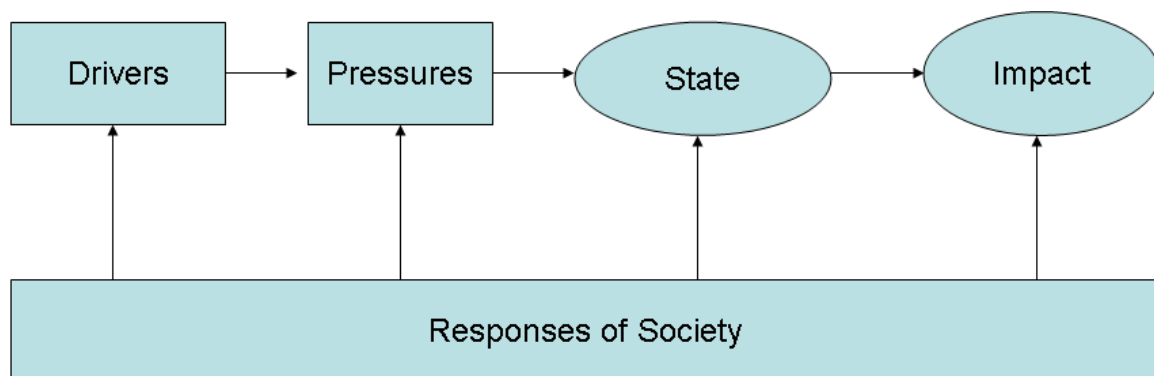


Figure 3. The DPSIR framework.

The Environment and Development Co-operation Department is the main international forum where environment experts from development co-operation agencies meet to define common approaches in support of sustainable development. The OECD has adopted Core Environment and Socio-Economic and Sectoral Indicators, and publishes these in *'Environment at a Glance: OECD Environmental Indicators'*²¹.

6.2 United Nations.

The UN has set out eight Millennium Development Goals, one of which is to *'ensure environmental sustainability'*. Chapter 40 of Agenda 21 calls on countries and the international community to develop indicators of sustainable development. The UN Commission on Sustainable Development publishes an indicator set to serve as reference for countries to develop national indicators of sustainable development²². The previous two editions of the CSD indicators were published in 1996 and 2001, and the third, revised set of indicators has just been released.

The Division of Sustainable Development decided to review the CSD indicators with three main purposes:

- To incorporate new thinking on the role of indicators in sustainable development;
- To reflect country experiences over the past decade;
- To exploit synergies with the Millennium Development Goal indicators and other major sectoral indicator initiatives.

A new set of 50 core indicators has been created, chosen via the following criteria:

- They cover issues that are relevant for sustainable development in most countries.
- They provide critical information not available from other core indicators.
- They can be calculated by most countries with data that is readily available or could be made available within reasonable time and costs.

The full UN SD indicator set will be published in 'Blue book' form in 2007, and this report will include guidance on how to use and adapt the CSD indicators to national conditions and a commitment to the publication of detailed methodology sheets and ongoing updates. The full revised CSD indicator set is provided in Appendix I.

The United Nations Handbook of National Accounting - Integrated Environmental and Economic Accounting (2003)²³.

Undertaken under the joint responsibility of the United Nations, the European Commission, the International Monetary Fund, the Organisation for Economic Co-operation and Development and the World Bank, the SEEA

'provides a common framework for economic and environmental information, permitting a consistent analysis of the contribution of the environment to the economy and of the impact of the economy on the environment. It is intended to meet the needs of policy makers by providing indicators and descriptive statistics to monitor the interaction between the economy and the environment as well as serving as a tool for strategic planning and policy analysis to identify more sustainable development paths.'

With the need for globally standardised systems to integrate reporting key sustainable development and environmental indicators such as greenhouse gas emissions and resource consumption, within the same framework as traditional economic indicators, the SEEA represents a major development in process of developing SD indicators which provide a truly multi-dimensional view.

The European Union and Eurostat played a major role in the development of the SEEA through the London Group on Environmental and Natural Resources Accounting, and the framework set

out by the SEEA is likely to be a major influence in ongoing research and development in indicators within the EU and Internationally. The SEEA framework will play an increasingly important role in integrating and harmonising SD indicator sets and their underpinning data sets in forthcoming years, some examples of the relationship between the SEEA framework and SD indicators are provided in Appendix II.

7. Recommendations on national indicators for sustainable development including selection criteria and the merits of any hierarchical approach.

7.1 Policy driven or statistics driven indicator development?

In most countries, the development of SDI sets is linked to the development of National Sustainable Development Strategies (SDS). SDI sets are often intended to measure the implementation of the strategies aims and objectives. Therefore the objectives and targets of the SDS are the major influence on the selection of SDIs selected. In the case of Ireland as the SDS is currently being revised there is an opportunity to draw on the experiences of other countries in developing an indicator set. The 1997 SDS recognised that work towards a SDI set for Ireland would be refined as data collection systems, methodologies and consensus grows internationally about the choice of themes for international comparisons. The renewed EU SDS and the work of the SDI Task Force and ongoing work programme of EuroStat can inform Ireland's review of the SDS and development of an indicator set in the coming year. It is vital to progress the development of the strategy and selection of the SDI set in parallel. The renewal of the EU SDS has resulted in the re-evaluation of the indicator set proposed by the Task Force and review of indicator sets by some member states (CSO, pers.comm.).

7.1 Size of indicator set

A review of EU member states experiences with SDI highlighted the tendency to initially produce a very large SDI set, in some cases as many as several hundred indicators, and then reduce the number on the grounds of both relevance to the national situation and data availability. There has also been a move away from the three pillar approach to a more integrated and holistic approach with the identification of SD themes and selection of SDIs that reflect these. This is reflected in the EU SDI set which has ten themes.

SD is also a dynamic concept and SD policy needs to reflect the changing economic and social climate and environment. However to measure progress towards SD a consistent set of SDIs need to be benchmarked and measured over time. Denmark, Sweden, Germany and the UK have all produced 'headline' datasets of 15-20 SDIs which are usually widely disseminated.

The indicator set contained in the final report of the EU SDI Task Force would be a useful starting point and the assessment undertaken in Objective 3 shows that data exists for many of these indicators. Not all the SDI's identified in the list will be relevant in the context of the revised Ireland SDS as the themes have not yet been identified. However, the list can be used as a basis from which to prioritise indicators in relation to national goals using criteria such as robustness, practicality, usefulness to policy makers, integration and data availability and quality.

7.3 Selection criteria

Selection criteria for indicators are outlined in the EEA, NESC and EU publications reviewed for this research. We have extended the EU RACER framework and provided definitions of the criteria. These criteria have been used in assessments undertaken by Defra and are currently being used in an assessment of indicators for the European Commission. They collectively capture RACER:

- Relevance – usefulness to policy makers and complementarity/integration criteria
- Accepted – robustness and practicality criteria
- Credible – robustness and usefulness to policy makers criteria

- Easy – practicality criteria
- Robust – robustness criteria

Criteria	Definition
Robustness	
1. Defensible theory	The indicator is based on sound theory that ensures conservation of mass and energy; avoids double counting or omissions of resources used; is consistent in its units of measure; relies on assumptions that are clearly stated and reasonable and does not require the use of ill-defined or poorly quantified parameters.
2. Reliability	The indicator is reliable in terms of its accuracy, repeatability and the protocol and formulas used in the calculations are clearly specified.
3. Sensitivity	The methodology used changes rapidly enough with respect to input parameters to pick up policy-significant changes and is without non-linearities, discontinuities and thresholds that might lead to misleading interpretations of changes in the results.
Practicality	
4. Technical feasibility	The methodology is simple enough to allow calculations using readily available software without the requirement for extensive expert staff input and calculation methodology are clearly defined to avoid ambiguity and consequent error in implementation.
5. Data availability	The indicator does not require inputs of data that are excessive, expensive or onerous to collect and cannot be properly measured. Ideally the indicator should be based on data that are already collected and readily available in electronic form.
6. Ease of communication	The underlying rationale and meaning of indicator should be easily understood by stakeholder groups. This will be facilitated by conceptual simplicity and simplicity of calculation. For effectiveness in public communication the indicator must resonate with widely held values and concerns to motivate stakeholders to calculate or provide data and accept interpretations of the meaning of indicator.
Usefulness to policy makers	
7. Identification of targets and gaps	Can the methodology frame targets that are meaningful in terms of monitoring and which can be achieved through policy initiatives? It should also be able to quantify gaps between the current situation and specified targets.
8. Identification of trends	Can the indicator be used to track changes though time? This implies that at least one input variable will require time series data (e.g. a series of annual measurements).
9. Forecasting and modelling	Can the indicator be used in a predictive sense to forecast future impacts or for more sophisticated modelling where the impact of different potential policies can be simulated?
10. Spatial disaggregation	Can the indicator be applied at different scales e.g. regional and city scales? This would facilitate development and monitoring of policies by local government and other sub-national authorities.
11. Sectoral disaggregation	Can the indicator be calculated and applied to individual sectors of the economy? This would facilitate the development and monitoring of policies tailored to the specific requirements of different sectors. This might be expected to make them more relevant to, and therefore more engaging for, that sectors stakeholders.
Complementarity/Integration	
12. Complementarity	Are there potential complementarities between the indicator and others in particular the System of National Accounts?

13. Enhancement of synergies	Is there the potential for further integration of the indicator with others?
14. Policy support	Can the complementarity/synergies between the indicator and others being assessed be enhanced in a manner that supports policy information?

7.4 Specific Recommendations

The review has focused mainly on the availability of indicators and data for the development of a SDI set for Ireland. However, it is equally important that the correct structures are set in place to enable progress to be made.

Given that the national SDS is currently under revision, we would recommend that the following approach be taken to the identification and selection of SDIs:

1. The SDS should take an integrated and holistic approach to policy development with the identification of SD themes and the indicators set should reflect this.
2. The SDI set should be developed in parallel with the SDS enabling integration of the strategy and indicators and a public consultation period to be undertaken for both at the same time. Consideration should be given to the development of a web-discussion portal which in Germany has been effective in getting input from the public and academia to the debate.
3. A hierarchical approach to SDIs should be used enabling the SDI set to inform decision making, benchmark and measure progress over time and measure the implementation of the strategy. The SDI set should contain three levels of indicators:
 - A core set of 'headline indicators' which monitor top level objectives and are accessible to decision makers and the general public (level 1 indicators).
 - A set of indicators that address the themes of the SDS and evaluate and monitor progress towards the headline policy objectives (level 2 indicators).
 - A set of indicators that correspond to the implementation of specific policy objectives identified in the SDS (level 3 indicators) and can be used for more detailed analysis.
4. The SDI set should incorporate relevant SDIs which are already used by the EU to minimise duplication of effort by statistical agencies in collecting and analysing data and to enable methodological and data improvements being carried out by EuroStat and others to be incorporated into improving Ireland's SDIs.
5. The criteria used to select SDIs should apply the same principles as the Laeken indicators and the EU RACER framework (Relevance, Accepted, Credible, Easy and Robust) as defined above.

It is equally important that the development of an indicator set is resourced properly and the appropriate structures put in place to support this. We recommend that:

6. The Central Statistics Office, ESRI and NESC should be resourced to carry out the development of SDIs, including development of regional indicators (where appropriate).
7. The high level Departmental steering group on the SDS should quickly identify and resource one agency or Department to take on a co-ordination role between data providers. The model currently being taken forward for Kyoto reporting may be considered.

8. Environmental Accounting should be given a high priority and the appropriate organisation resourced sufficiently to enable further development of integrated economic and environmental accounting and the institutionalisation of material flow accounting.
9. The recommendations of the SPAR (Statistical Potential of Administrative Data) project should be reviewed in the context of development of SDIs and lessons learnt in the review be applied to the appropriate systems and structures established at the outset of the process of SDI development.

8. Integrating Sustainability Indicators – Summarising Sustainability.

A range of tools and techniques have been developed which attempt to summarise the sustainability of a society, region or organisation, by capturing all of the economic, environmental and social indicators, and presenting these to policy makers in an integrated format. This provides a multi dimensional analysis of SD which facilitates policy development and decision making. There are a range of approaches; one which has been applied recently at a national level in Australia is Triple Bottom Line Accounting.

In 2005, the University of Sydney and the Australian Commonwealth Scientific and Research Organization (CSIRO) published '*Balancing Act. A Triple Bottom Line Analysis of the Australian Economy*'²⁴, which attempted to provide an overview of the Australian economy using a set of ten environmental, social, and financial indicators. The report presented the results of the analysis of the sectors of the Australian economy using TBL Spider Diagrams, an example of which is provided in Figure 4.

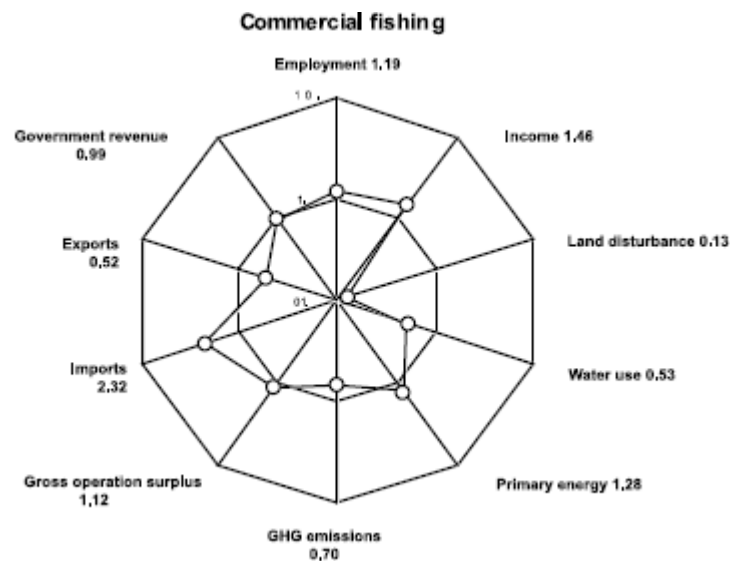


Figure 4. TBL Spider Diagram for the Australian commercial fishing sector

It is further recommended that the review of Ireland's SDS and indicator set includes assessment of the usefulness to policy makers of a TBL assessment for Ireland.

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Appendix I

United Nations Commission on Sustainable Development (CSD) SD Indicators (2007)

Theme	Sub-theme	Indicator	Core indicator
Poverty	Income poverty	Percent of Population Living Below National Poverty Line	Yes
		Proportion of population below International Poverty Line (\$1 and/or \$2)	
	Income inequality	Ratio of share in national income of highest to lowest quintile	Yes
	Sanitation	<i>Proportion of population with access to improved sanitation, urban and rural</i>	Yes
	Drinking water	<i>Proportion of population with sustainable access to an improved water source, urban and rural</i>	Yes
	Access to energy	Share of households with access to electricity or commercial energy	Yes
		Percentage of population using solid fuels for cooking	
Living Conditions	Proportion of urban population living in deprived housing conditions	Yes	
Governance	Good governance	Percentage of population having paid bribes	Yes
	Crime	Number of recorded violent crimes and homicides per 100,000 population	Yes
Health	Mortality	Mortality rate under 5 years old	Yes
		Life expectancy at birth	Yes
		Healthy life years expectancy	
	Health Care Delivery	Percent of population with access to primary health care facilities	Yes
		Immunization against infectious childhood diseases	Yes
		Contraceptive prevalence rate	
	Nutritional Status	Nutritional status of children	Yes
	Health status and risks	Prevalence of tobacco use	
		Suicide rate	
<i>Morbidity of major diseases such as HIV/AIDS, malaria, tuberculosis</i>		Yes	
<i>Morbidity of major childhood diseases such as diarrhea, pneumonia, malaria</i>			
Education	Education level	Gross intake into last year of primary education, by sex	Yes
		Net enrolment rate in primary education	Yes
		Adult secondary (tertiary) schooling attainment level, by sex	Yes
		Life long learning	
	Literacy	Adult literacy rate, by sex	Yes
Demographics	Population	Population growth rate	Yes
		Total fertility rate	
		Dependency ratio	Yes
	Tourism	Ratio of local residents to tourists in major tourist regions and destinations	

Theme	Sub-theme	Indicator	Core indicator
Natural hazards	Vulnerability to natural hazards	Percentage of population living in hazard prone areas, by type of natural hazard	Yes
	Disaster preparedness and response	Economic and Human Loss Due to Natural Disasters, as percentage of population and of GDP	
Atmosphere	Climate change	Emissions of greenhouse gases	
		CO2 emissions, total and by sector	Yes
	Ozone layer depletion	Consumption of ozone depleting substances	Yes
	Air quality	Ambient concentration of air pollutants in urban areas	Yes
Land	Land use and status	Land use change	
		Land degradation	
	Desertification	Land affected by desertification	
	Agriculture	Arable and permanent cropland area	Yes
		Efficiency of Fertilizer Use	
		Use of Agricultural Pesticides	
		Organic farming as percentage of total farming	
	Forests	Forest Area as a Percent of Land Area	Yes
		Percent of forests damaged by defoliation	
Area under sustainable forest management			
Oceans, seas and coasts	Coastal Zone	Algae Concentration in Coastal Waters	
		Percentage of total population living in coastal areas	Yes
		Coastal pollution	
	Fisheries	Proportion of fish stocks within safe biological limits	Yes
	Marine environment	Coverage of protected areas as percentage of marine area, total and by ecological region	Yes
		Marine trophic index	
Area of coral reefs			
Freshwater	Water Quantity	Water use as a percentage of renewable water resources	Yes
		Water use intensity by industry	Yes
	Water Quality	BOD in Water Bodies	
		Concentration of faecal coliform in freshwater	Yes
	Waste water treatment		
Biodiversity	Ecosystem	Coverage of protected areas as percentage of terrestrial area, total and by ecological region	Yes
		Management effectiveness of protected areas	
		Area of Selected Key Ecosystems	
		Fragmentation of habitat	
	Species	Abundance of Selected Key Species	
		Assessment of threatened species	Yes
Invasive species			

Theme	Sub-theme	Indicator	Core indicator
Economic development	Macroeconomic performance	GDP per Capita	Yes
		Investment Share in GDP	Yes
		Savings Rate	
		Adjusted net savings rate	
		Inflation	
	Sustainable public finance	Debt to GNI ratio	Yes
	Employment	Labor productivity and unit labor costs	Yes
		Employment-population ratio, by sex	Yes
		Employment Status, by sex	
	Information and communication technologies	Share of women in wage employment in the non-agricultural sector	Yes
		Internet users per 100 population	Yes
		Fixed telephone lines per 100 population	
	Research and development	Mobile cellular telephone subscribers per 100 population	
R&D Expenditure as percentage of GDP			
Tourism	Tourism contribution to GDP	Yes	
Global economic partnership	Trade	Current account deficit as percentage of GDP	Yes
		Share of imports from developing countries and from LDCs	
		<i>Average tariff barriers against imports from developing countries and LDCs</i>	
	External financing	Total Official Development Assistance (ODA) given or received as a percentage of GNI	Yes
		FDI inflows and outflows as percentage of GNI	
		Remittances as percentage of GNI	
Consumption and production patterns	Material consumption	Material intensity of the economy	Yes
		Domestic material consumption	
	Energy use	Annual energy consumption per capita, total and by main user category	Yes
		Share of renewable energy sources in total energy supply	
		Intensity of energy use, total and by sector	Yes
	Waste generation and management	Generation of waste	
		Generation of hazardous waste	Yes
		Management of radioactive waste	
		Waste treatment and disposal	Yes
	Transportation	Car share of inland passenger transportation	Yes
Road share of inland freight transport			
<i>Energy intensity of transport</i>			

Note: indicators in italics are subject to final confirmation.

Appendix II

List of 'best-available' and 'best-needed' indicators.

Level/ Theme	'Best-needed' indicators	Proxy for the 'best-needed' indicators	Situation of the 'best-needed' indicators
L1-PCP	Total Material Consumption	Domestic Material Consumption	Methodology exists; lack of data for most countries
L1-MNR	Biodiversity index	Population trends of farmland birds	Some work done by EEA. No agreement on methodology
L1-TR	Vehicle-km	Energy consumption by transport	Methodology exists; lack of data for some modes of transport
L2-AS	Projected theoretical replacement ratio	Relative median income ratio	Data collection under progress (SILC)
L2-PH	Deaths due to infectious food-borne diseases	Salmonellosis incidence rate in human beings	Lack of data and methodology
L2-PH	Index of apparent consumption of chemicals	Index of production of chemicals	No agreement on methodology. Work on progress at Eurostat
L2-PH	Population exposure to air pollution by particulate matter	-	Lack of data and methodology. Ongoing work between DG ENV, Eurostat and EEA
L2-PCP	Generation of waste	Municipal waste collected	Data will be available with upcoming Waste Statistics Regulation
L2-PCP	Green public procurement	-	Administrative data to be checked
L2-PCP	Share of industrial production from enterprises with a formal sustainable management system	Enterprises with an environmental management system (EMS)	No data. The concept of sustainable management system is extremely difficult to conceive. Additional parameter would need to be added in Structural Business surveys
L2-MNR	Sufficiency of Member States proposals for protected sites (EU Habitats directive)	-	Indicator under development by DG ENV and the EEA
L2-MNR	Trends of spawning biomass of selected fish stocks	-	Indicator selected by DG FISH for Sustainable Fisheries indicators. No data available
L2-MNR	Land use changes	Built-up areas	No dynamic data available yet. Possibility to use LUCAS data at EU level
L2-MNR	Exceedance of critical loads of acidifying substances and nitrogen	-	Lack of data and methodology
L2-TR	External costs of transport activities	-	Lack of data and methodology
L2-GG	Proportion of environmentally harmful subsidies	-	Some work done by OECD. Lack of data and methodology
L2-GG	Administrative cost imposed by legislation	-	Lack of data and methodology
L2-GG	Responses to EC Internet public consultations	-	Administrative data to be checked

Appendix III

Examples of the relationship between the SEEA framework and SD indicators for Consumption and Production.

<i>Consumption and production patterns</i>		
Material Consumption	Intensity of Material Use	SEEA flow accounts report total material inputs; indicator can be derived by dividing GDP by total material inputs
Energy Use	Annual Energy Consumption Per Capita	SEEA flow accounts report total energy use; indicator derived by dividing total energy use by population
	Share of Consumption of Renewable Energy Resources	Calculated from composition of energy flow accounts
	Intensity of Energy Use	SEEA flow accounts report total energy inputs; indicator can be derived by dividing GDP by total energy inputs
Waste Generation and Management	Generation of Industrial and Municipal Solid Waste	SEEA flow accounts for solid waste.
	Generation of Hazardous Waste	SEEA flow accounts for specific types of waste
	Generation of Radioactive Waste	SEEA flow accounts for specific types of waste
	Waste Recycling and Reuse	SEEA flow accounts for waste, recycling and reuse