In-Stream

Integration of Mainstream Economic Indicators with Sustainable Development Objectives

Institute for European Environmental Policy

D7.4 Consolidated report: Qualitative analysis key results and policy implications

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Table of Contents

1 Introduction 4
1.1 The aim of this report 4
1.2 Structure 4

2 IN-STREAM key results 5
2.1 The IN-STREAM approach: three storylines to contextualise the role of sustainability indicators 5
2.1.1 Biodiversity 5
2.1.2 Green Growth and Green Innovation 7
2.1.3 Resource Efficiency 8
2.2 Key Messages from the IN-STREAM quantitative and qualitative analysis 9

3 Policy implications of the use of sustainability indicators 13
3.1 The current use of sustainability indicators 14
3.2 Biodiversity related policies 16
3.2.1 Sustainability indicators for biodiversity policy 16
3.2.2 Sustainability indicators for agriculture policy 20
3.2.3 Sustainability indicators for fishery policy 22
3.3 Resource efficiency related policies 24
3.3.1 Sustainability indicators for resource efficiency policy 25
3.4 Green growth related policies 27
3.4.1 Sustainability indicators for Climate Change policy 27
3.4.2 Sustainability indicators for Cohesion policy 30
3.5 Communicating the importance of sustainability indicators 33

4 Conclusions and recommendations 35

1 Introduction

1.1 The aim of this report

This report provides a summary overview of the policy needs and opportunities of an increased use of sustainability indicators for selected policy areas, and offers guidance on how these could be adopted at different phases of policy development, building on the key outcomes of deliverables 7.1, 7.2 and 7.3. Its objectives are to:

- Provide a clear overview of the key findings of the IN-STREAM project, especially in the areas of green growth, resource efficiency and biodiversity;
- Show to which extent selected key indicators are currently used in policy-making;
- Investigate the scope for further use of sustainability indicators across the policy-cycle of a number of selected policy areas, chosen in the light of current policy priorities;
- Illustrate how sustainability indicators have been taken up by the media so far, and highlight the potential for improving their communicability;
- Identify needs for additional indicators, barriers to further uptake and suggestions as to how the current gap in the use of indicators in policy making can be bridged;
- Provide some useful policy recommendations to further stimulate the use of sustainability indicators in policy making.

1.2 Structure

This research note is a summary of the work carried out under deliverables 7.1 ('Summary / comparative review of findings'), 7.2 ('Opportunities for a better use of indicators in policy-making: emerging needs and policy recommendations') and 7.3 ('Outcomes of the workshops on policy processes and decision making – identifying needs for sustainability indicators'). The report is structured as follow:

Chapter 2 summarises the key findings from the IN-STREAM project, building on the analysis carried out in deliverable 7.1;

Chapter 3 provides an overview of the implications of the use of sustainability indicators for policy making, building on deliverables 7.2 and 7.3;

Chapter 4 presents the key findings and conclusions of the analysis.

2 IN-STREAM key results

'The welfare of a nation can scarcely be inferred from a measurement of national income'. (Simon Kuznets - GDP's creator, 1934)

The IN-STREAM (Integration of Mainstream Economic Indicators with Sustainable Development Objectives) project covers a wide set of methodologies and approaches, aiming to advance on different issues in the wider 'Beyond GDP' agenda. To show the similarities and complementarities of these diverse approaches, the research results have been structured around three broad policy areas (storylines), to show how the methodologies used in the project and the key results can be applied in policy making and policy analysis. These storylines are:

- Green Growth: encouraging green growth, green innovation, moving to a low carbon economy and making use of the EU Cohesion Policy as a motor of change.
- Resource efficiency: Encouraging resource efficiency via sustainable consumption and production, including eco-efficiency, water and waste policies.
- Biodiversity: halting biodiversity loss and realising opportunities for investment in natural capital via biodiversity, agriculture and fisheries policies and forestry.

These three storylines were also considered particularly relevant in the context of the current EU policy agenda. In particular, the 'green growth' storylines takes into account inter alia the recent Europe 2020 and OECD's Green Growth policies, the 'resource efficiency' storyline is inspired by Europe 2020 and its resource efficiency Flagship initiative, the 'biodiversity' storyline by the European Biodiversity Strategy.

2.1 The IN-STREAM approach: three storylines to contextualise the role of sustainability indicators

2.1.1 Biodiversity

Biodiversity – the variety of ecosystems, species and genes – is the world's natural capital, and its conservation and restoration is a key environmental priority for the EU.

Biodiversity and ecosystem services that benefit people, society and the economy, have been lost or degraded across Europe and the globe, and risk being further lost if there is not a major change in policies and their implementation (MA, 2005, TEEB 2011). Progress will be facilitated by having an improved evidence base. Indicators and accounts play a key role in building this evidence base and inform policy decisions.

While it is a very complex task to measure all aspects of biodiversity, an increasing number of indicators have emerged throughout the past few years to communicate trends in biodiversity and ecosystem health to policy-makers. Drawing upon a number of biodiversity related indicators, the latest assessments[1] by the European Commission revealed that, despite some progress, the state of Europe's biodiversity is still a serious cause for concern. A number of ecosystems have been damaged in recent years, and continue to deteriorate. It is also evident that a major failure of existing biodiversity policy instruments is related to the lack of appropriate indicators, milestones and baselines to measure progress[2].

Having failed to meet its target to halt biodiversity loss by 2010, the EU adopted this year, as part of its **post-2010 Biodiversity Strategy**, a new target to halt biodiversity and ecosystem services loss by 2020. The increasing importance given to the value of biodiversity and the conservation ecosystem services further fuelled the demand for reliable biodiversity and ecosystem service related indicators. As part of this process, in 2010 the EU has established a *biodiversity baseline* noting the state of biodiversity on that year (EEA, 2010c). This will act as a reference point for measuring future changes in biodiversity, for instance as a result of EU policy.

As part of this EU Biodiversity Strategy, a sub-**strategy on Green Infrastructure** is planned for 2011. In this regard, the Commission seeks to develop ways to assess its future implementation efficiency. It will therefore be important to identify the best indicators for demonstrating and assessing the contribution of different elements of Green Infrastructure to ecosystem resilience and to determine what specific requirements for indicators are lacking.

The recently released 'The Economic of Ecosystems and Biodiversity' (**TEEB) study**[3] highlights the link between ecosystem health and the (often overlooked) value of the important services that these provide. The TEEB for National Policy-Makers[4], among other things, calls for suitable indicators and/or accounting frameworks to measure our natural

[1] Monitoring the impact of EU biodiversity policy (2010): http://ec.europa.eu/environment/nature/info/pubs/docs/biodiversityindicators_factsheet.pdf

[2] Herkenrath P., Fournier N., Gantioler S., Good S. and Mees C. (2010) Assessment of the EU Biodiversity Action Plan as a tool for implementing biodiversity policy. June 2010. European Commission Biodiversity Knowledge Base. Service contract nr 09/543261/B2

[3] TEEB Synthesis Report: http://www.teebweb.org/LinkClick.aspx?fileticket=bYhDohL_TuM%3d&tabid=1278&mid=2357

[4] Chapter 3: Strengthening indicators and accounting systems for natural capital:

http://www.teebweb.org/LinkClick.aspx?fileticket=J3_lcRRutGw%3d&tabid=1019&language=en-US

capital and highlights the urgency of measures that would allow for the formation of a solid evidence base for informed policy decisions.

The importance of biodiversity and health ecosystems for human well-being and long term prosperity is increasingly recognised. The recent developments in EU biodiversity policy, the latest Convention on Biological Diversity (CBD)'s Conference of the Parties (COP) meeting in Nagoya (November 2011) and the strong attention received by TEEB make ecosystem valuation a very crucial and timely topic. IN-STREAM reflects the emerging consensus in this area and highlights the different indicator approaches that have been suggested.

Key research undertaken by the IN-STREAM project which is relevant to biodiversity policy include the qualitative analysis identifying the key strengths and weaknesses of biodiversity indicators, as well as a detailed policy cycle analysis on the current and potential use of biodiversity indicators was conducted. Additionally, quantitative estimates of the effect of emission reductions on the value of ecosystem services were carried out.

2.1.2 Green Growth and Green Innovation

The notions of 'green innovation' and 'green growth' have captured policy makers' attention, and are endorsed in different strategies at the EU and OECD[5] level. These concepts promise to reconcile several seemingly contradictoy policy objectives: to achieve sustainable economic growth, create high-quality jobs, and secure the competitive edge of EU businesses over competitors from other regions, while at the same time achieving a drastic cut of CO_2 emissions a move towards increasing resource efficiency. Additionally, green growth holds the promise of emerging stronger and greener from the economic crisis. Green innovation is seen as an essential ingredient to achieving such green growth: through innovations in environmental industries, such as renewable power and energy efficiency, it is expected that European businesses can secure technological leadership and a competitive edge in markets for green technologies and products, which are considered as future growth markets.The notion of green innovation and its contribution to green growth is also very much enshrined in the OECD Green Growth Strategy.

As with other comparably broad concepts – such as 'green investments' or 'clean technologies' - it is nearly impossible to provide a clear and unequivocal definition of green growth or green innovation. Green innovation is generally understood to include technological innovations in areas such as renewable energies, energy efficiency, electric cars or fuel cells, as well as non-technological innovations. In an effort to measure whether countries are moving toward green growth, the OECD (2010a) has suggested to consider five broader groups of indicators: (i) indicators reflecting the environmental efficiency of

[5] See OECD website – OECD Work on green Growth http://www.oecd.org/document/10/0,3746,en_2649_37465_44076170_1_1_1_37465,00.html

production as well as the absolute pressures associated with production, (ii) indicators reflecting the environmental efficiency of consumption as well as the absolute environmental pressures associated with consumption (iii) indicators describing the natural asset base of the economy, (iv) indicators monitoring environmental quality of life, and (v) indicators describing policy responses and instruments.

The green growth agenda therefore established an important connection between different approaches to measuring economic, social and environmental progress, as well as between different types of alternative well-being indicators. Green growth strategies aim to not only protect the environment, but also contribute to social and economic objectives by creating employment and strengthening the competitiveness of the European economy. In this sense, the notion of green growth is therefore quite closely linked to some interpretations of sustainable development.

Most of the IN-STREAM work relevant to green growth provides strategies and information to cope with the trade offs of policies aiming at a diverse set of objectives. Important research carried pout under the project includes, inter alia, the work on the FEEM's Sustainability Indicator, the modelling linking environmental objectives with employment and competitveness, and the statistical analysis work assessing trade offs and synergies between indicators.

2.1.3 Resource Efficiency

Resource efficiency is about the management of raw materials, energy and water resources, to, inter alia, avoid resource overuse, minimise waste generation, and reduce costs and price volatility. In January 2011 the European Commission published a communication[6] on 'A resource efficient Europe – Flagship initiative under the Europe 2020 Strategy', and recently released the related 'Roadmap to a resource efficient Europe'.

The Communication lays out the benefits of an EU policy for more resource efficiency, which again highlights the diverse set of objectives that such a policy must consider. The communication states that a push for more resource efficiency will help Europe to boost economic performance while reducing resource use, identify and create new opportunities for economic growth and greater innovation and boost the EU's competitiveness, ensure security of supply of essential resources, and fight against climate change and limit the environmental impacts of resource use.

The Communication also identifies synergies and trade offs between the range of objectives. For example it refers to the savings that more resource efficient approaches can bring to businesses working in resource intensive sectors, as well as the social and economic benefits that can be achieved by reinvesting potentially higher tax revenues from resource

[6] http://ec.europa.eu/resource-efficient-europe/pdf/resource_efficient_europe_en.pdf

usage. Additionally, the Communication details the activities of the Commission in a diverse set of policy fields that aim to achieve these objectives.

Indicators will be of utmost importance in monitoring the achievements towards these objectives. Currently, Eurostat lists resource productivity among its eleven Sustainable Development headline Indicators (SDI). In August 2010, the European Commission's Joint Research Centre (JRC)[7] published a new type of life-cycle-based indicators for quantifying and monitoring progress towards sustainable development. The JRC developed three sets of indicators on resources (including resource efficiency, eco-efficiency, resource productivity, and resource-specific impacts), products (focussing on products' environmental impacts) and waste (covering the entire waste management chain).

Indicators will also be relevant for defining resource efficiency targets. At this stage it is planned that a resource efficiency target will be adopted in 2012. However, details about how binding this target would be, and whether it will be broken down into national targets for each Member State, are not yet set.

Some EU policies target resource efficiency specifically. Others, although aiming towards different objectives (e.g. economic policies, climate change policies and others), nonetheless have a substantial impact on resource efficiency. Policy makers need to balance different types of objectives and manage their inherent trade-offs.

It should be noted that there is some overlap between the IN-STREAM work relevant to resource efficiency and the work on green growth, as resource efficiency is an important part of the green growth agenda. Again, the IN-STREAM work can be used to address the trade-offs of policies aiming at a diverse set of policy objectives. In this context, important research topics in the project include the work on the income distribution effect of emission reduction policy and the analysis of the land use effects of biofuel targets.

2.2 The IN-STREAM overall quantitative and qualitative analysis – key approaches and messages

The IN-STREAM project included the development of a diverse set of tools that could be of use to policy makers aiming at sustainability, especially but not exclusively in the three policy fields of biodiversity, green growth and resource efficiency.

The focus of the work was on the links between mainstream indicators and sustainability measures and on the links between the different pillars of sustainability (economic, social

[7] Decoupling indicators, Basket-of-products indicators, Waste management indicators: Framework, methodology, data basis and updating procedures. Draft for public consultation.

and environmental pillars). The qualitative work of IN-STREAM showed that indicators should be used to support the integration of environmental considerations across a wide range of policy areas. For instance, biodiversity and climate change related indicators can be useful to inform a wide range of policies, from budget allocations (e.g. cohesion policy funds) to thematic environmental policies (e.g. air, water policies, etc.).

The project stressed that there is no 'one size fits all' indicator(s) that can be used across different policies. Rather than recommending a single composite index, IN-STREAM's findings support a balanced use of a range of economic, environmental and social indicators across a wide range of policy areas. This means that the choice of the right indicators and indicator sets can be crucial for the appropriate inclusion of sustainability concerns into policy making. For that purpose, the project showed how to use qualitative and statistical analytical approaches to build a robust and effective indicator set.

The quantitative work conducted within IN-STREAM covers a wide set of analysis that can be divided into three categories: composite indicators and modelling, climate change and competitiveness and valuation of the benefits of environmental action. These are briefly summarised below.

Composite Indicators and modelling

There has been a long debate if sustainability should be measured by specific indicators for specific policies, or by aggregate or composite indicators. On one hand, composite indicators can be very effective tools in communicating overarching sustainability messages to non-experts, but on the other hand the necessary subjectivity in any step in the construction of these indices, like the choice of indicators to include, the choice of the 'weights' to assign to each, or the choice of the aggregation procedure, have led to significant criticism. IN-STREAM used Computable General Equilibrium (CGE) models to gain further insights into this question.

In reality, it is neither possible to summarise sustainability in just one figure, nor to rule subjectivity out; and this no matter how comprehensive, complex and innovative the generation process of a composite index is. Nonetheless, the project shows that composite indicators can be invaluable communication devices to make the preference structure and value judgments underpinning any given sustainability assessment explicit. They can also offer the opportunity to investigate in depth if and how this assessment can change when those preferences and values change. This information can be very useful for policy decision makers and, in our view, can be more important than the synthesis provided.

In order to analyse sustainability with a consistent quantitative modelling framework, it is particularly useful to get insights on the possible relations between its different components and highlight regional specificities. The large database of CGE models makes it possible to calculate the indicators for several regions and sectors, Furthermore, the modelling of market

interactions and international trade effects is ideal to capture and identify the potential trade-offs in an economic system.

To support the adoption of sustainability indicators by policy makers, forward-looking models can be used to help better understand the correlations between economic, social and environmental indicators and illustrate the trade-offs associated with the pursuit of certain policy objectives. Moreover, forward looking modelling exercises can provide important informative support to anticipate possible trends in sustainability and its components in given (business as usual or policy) scenarios.

Climate change action and competitiveness

The effect of sustainability policies on economic competitiveness is a key concern in many countries. The European Union committed itself to achieve unilaterally at least a 20% reduction in its greenhouse gas emissions by 2020 compared to the 1990 level. IN-STREAM investigated the implications of alternative EU emissions pricing strategies on economy-wide adjustment costs and competitiveness. In terms of conventional trade theory, the EU has a comparative advantage in the energy-intensive industries which is decreased, but not abolished, even if relatively stringent emissions reduction targets and a uniform tax implementation apply. The IN-STREAM results also suggest that differential emissions pricing schemes can reduce overall economic efficiency and lead to a pending trade-off between sector-specific competitiveness concerns and broader considerations. We conclude that a general-equilibrium perspective is essential to assess competitiveness implications resulting from any policy interference.

There are many studies which focus on the assessment of climate policies on a national and international level. Using an input-output approach, IN-STREAM examined the regional impact of a program by the government of the German state of Baden-Wuerttemberg to increase the share of renewable energy carriers in electricity generation and the share of renewables in heat supply. These impacts are of particular interest, as in Baden-Wuerttemberg the manufacturing industries are particularly important relative to the rest of Germany. Thus, the project analysed the effects of the policy actions on the production as well as the employment of several sectors.

The results of the project suggest that policy actions promoting renewable energy types do not necessarily create new jobs and additional turnover for the whole economy, since other investments might be crowded out by investments in installations of renewable energy and the demand in other sectors might decrease. However, if the producers of the installations become internationally competitive and are able to export parts of their products to the rest of Germany and the world, these crowding out effects can be attenuated and turnover and employment effects might be positive in total.

Valuation of the benefits of environmental action

Policy makers have to make explicit or implicit trade-offs as the reduction in the emission of one pollutant might be at the cost of an increase in another. Transforming pressure indicators into impact indicators can support policy makers in making these trade-offs explicit. This can be done using the impact pathway approach (IPA). The estimated impacts include damage and risk to human health, ecosystems, crops and materials. The IPA takes into account the non-linear relationships between pressures and effects as well as the dependency of the effects on time and site of the activities.

For many environmental impacts well established indicators exist for example DALYs (disability adjusted life years for health effects) or PDFs (potentially disappeared fraction of species for ecosystem damage). These indicators can be further aggregated and compared across categories by transforming health and ecosystem damage into monetary values. These monetary values can then be integrated as a building block into more aggregated welfare indicators and be used in impact assessments of policy proposals.

For climate change, the impact pathway approach can also be used, i.e. damages and damage costs can be calculated either by agreeing on whether to use equity weighting or not or by using a distance to target approach. Having identified a sustainable emission scenario, the difference between the actual greenhouse gas emissions and the emissions of the sustainable path is calculated. For aggregation the avoidance costs to reach this pathway are estimated.

Overall, the work of IN-STREAM aimed to link mainstream indicators with sustainability measures, with the wider objective of linking the sustainability measures more firmly into the policy making process. The project showed how the results and methodologies of IN-STREAM can support and improve the sustainability of policy making, especially in the three key policy fields of green growth, resource efficiency and biodiversity.

More details about the IN-STREAM results are available on the IN-STREAM website http://www.in-stream.eu/download/Deliverable7.1_final.pdf .

3 Policy implications of the use of sustainability indicators

> *'If the present growth trends continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years'. (Meadows, 1972)*
>
> *'In 1972 the model showed a time of crises 50-70 years into the future; now the crises appear 10-30 years in the future'. (Meadows, 2005)*

There is a growing concern that, at our current level of consumption and production patterns, we are engaged on a fundamentally unsustainable path. We are already consuming more than the planet can produce, with a global footprint equal to 1.5 planets (GFN, 2011), and the pressures on resources are further increasing. If current trends continue, by 2050 the global population is expected to have grown by 30 per cent to around 9 billion (EC, 2010), with dramatic implications for consumption levels. It is estimated that, by then, we will need the equivalent of more than two planets to sustain us (EC, 2011).

Some non renewable resources will likely become highly scarce or exhausted, with demand potentially out-stripping supply (e.g. for certain minerals and fossil fuels) leading to major price volatility as well as lack of access to resources. Many renewable resources will be used beyond their natural generation capacity, leading to inefficient resource management (e.g. fisheries) and running down of the capital stock itself (e.g. fisheries, forest, soil). Furthermore, ecosystems can be pushed to a point beyond which they can no longer withstand external pressures (e.g. due to pollution, climate change, over-exploitation). In some cases this has already occurred (e.g. fisheries collapse in some areas, eutrophication of coastal areas leading to loss of marine life) and more risks occurring if consumption and production patterns, inefficiencies and impacts don't change. Whether such threshold points, which mark the boundaries of system integrity, are trespassed, there may be critical results, often irreversible (ten Brink et al., 2008).

There is therefore an increasing recognition of the need for policy to be driven not only by economic and financial motives, but also by sustainability concerns. For instance, at Eu nik stressed the need to develop indicators to monitor progress on green growth, green public procurement and eco-innovation. Data on natural capital and its eco-system services needs also to be bette nik, 2011).

The work carried out under IN-STREAM aims to explore the policy needs and opportunities of an increased use of sustainability indicators for selected policy areas, and provides guidance on how these could be adopted at different phases of policy development.

3.1 The current use of sustainability indicators

Several initiatives have been carried out level to foster the adoption of sustainability indicators into national, European and International policies.

Among the most recent, the 2007 *international conference 'Beyond GDP'* marked a milestone in the commitment of the European Commission to integrate economic indicators with sustainability principles. As a result, in June 2009 the Commission published its *communication 'GDP and beyond – Measuring progress in a changing world'* (CEC, 2009) pushing forward the idea 'to take stock of natural resources and human and social capital, rather than just the use of these resources,' as well as focusing on 'the role of eco-systems in providing welfare'. The Commission has also being developing a *composite index on environmental pressures* to be used in policy making alongside GDP and social indicators, to indicate whether progress is being made on environmental goals.

In terms of data gathering, for several years Eurostat, the EU statistical office, has collected and organised data into so called '*environmental accounts'*. These build on the United Nation's system of integrated environmental and economic accounting (SEEA) and aim to outline the potential impact of economic and social activity on the environment.

So far, data on environmental accounts has been reported by Member States to Eurostat on a voluntary basis. The recent *Regulation on European environmental economic accounts* (No 691/2011) by the European Commission formalised this process and, since August 2011, the submission of national environmental accounts to the European Commission has become a mandatory requirement. From 2012, Member States will have to regularly report data on air emissions, environmentally related taxes by economic activity and economy-wide material flow. In 2013 the European Commission could propose to introduce a range of additional data modules, including accounts on energy, resource use, water, waste, forest and ecosystem services.

In addition, in March 2010 the European Commission unveiled its Strategy **'***Europe 2020: A strategy for smart, sustainable and inclusive growth'* (EC, 2010), the much anticipated successor of the Lisbon Strategy. In the long term, the Strategy aims to turn the EU into a smart (based on knowledge and innovation), sustainable (promoting resource efficient, greener and more competitive growth); and inclusive (high employment, delivering economic, social and territorial cohesion) economy.

The Strategy proposes a series of headline targets relating to the three priorities, which will need to be translated into national targets. These targets, to be met by 2020, are: 75 per cent of the population aged between 20-64 to be employed; 3 per cent of the EU's GDP to be spent on R&D; 20-20-20 climate and energy targets to be met (including an increase to 30 per cent emission reduction 'if conditions are right'); Share of early school leavers to be under 10 per cent and for at least 40 per cent of the younger generation to have a tertiary degree; and a reduction of the number of Europeans living below the poverty line by 25 per cent. The Strategy's five headline targets are currently measured by eight headline

indicators, which include employment rate, GDP expenditure on R&D, GHG emissions (base year 19990), share of renewable energy sources in gross final energy consumption and energy intensity.

The strategy includes seven *flagship initiatives*, of which three may be considered particularly relevant with regard to moving towards the objective of environmental sustainability:

- *Resource efficient Europe* – aiming to support the shift towards a resource efficient and low-carbon economy that is 'efficient in the way it uses all resources'.
- *Innovation Union* - which include the development of a strategic approach to the EU's research agenda focused on, *inter alia,* energy security, transport, climate change, resource efficiency, environmentally-friendly production methods and land management;
- *Industrial policy for the globalization era* - which include the development of a framework for an industrial policy to, *inter alia,* support the transition to greater energy and resource efficiency and promote technology and production methods that reduce natural resource use and increase investment in existing natural assets.

Other international activities, beside the European Commission's, include the research carried out by the Commission on the Measurement of Economic Performance and Social Progress (CMEPSP), also known as the *Stiglitz-Sen-Fitoussi Commission*. Its work is motivated by the recognition of an 'increasing gap between the information contained in aggregate GDP data and what counts for common people's well-being'. In its landmark report, published in September 2009, the Commission recognised that international effort must be directed to the identification of the limits of GDP as an indicator of economic performance and social progress, including the problems with its measurement. Moreover, the feasibility and relevance of additional, more relevant tools to complement GDP must be addressed, including how to present the statistical information in an appropriate way.

The Commission's report stresses that time is ripe for our measurement system to shift emphasis from measuring economic production to measuring people's well-being. It argues that more attention needs to be paid to other existing aggregates such as National Income and Households Consumption needs. Among its recommendations, it proposes the compilation of a Net Disposable National Income, mostly targeted at improving households' well-being.

The *Organisation for Economic Cooperation and Development's (OECD)* is also very active in promoting the use of indicators alternative to GDP. In 2011 it presented its Green Growth Strategy as well as three reports on green growth, the tools for achieving it and the indicators for reporting on progress (OECD, 2011a; 2011b; 2011c), as a contribution to the Rio+20 process.

The OECD acknowledges that pursuing a Green Growth Agenda will require economies to rely increasingly on an extended set of indicators to allow measuring progress towards an effective implementation of the green growth 'toolkit'. It is therefore working on the

development of indicators to capture major aspects of green growth in line with the Green Growth Strategy, and pay particular attention to efficiency and productivity issues. In addition, it recognises the importance of measuring whether green growth actually delivers reduced pressure on the environment and whether environmental quality is improving as a result. Interactions of environmental quality with people's well-being need also to be captured.

In particular, the report *Monitoring Progress: OECD Indicators* (OECD, 2011c) explores four inter-related groups of indicators namely: Environmental and resource productivity, Economic and environmental assets, Environmental quality of life and Economic opportunities and policy responses. All aim to support a transition to a green economy that takes into account the wider wealth of nations and wellbeing of societies.

It is recognised that new or improved indicators and data will be needed to measure progress towards green growth, most notably in the areas of environmental quality, natural resource scarcity and quality-of-life beyond material wellbeing.

3.2 Biodiversity related policies

Biodiversity – the variety of ecosystems, species and genes – is the world's 'natural capital' and its conservation and restoration is a key environmental priority for the EU.

Overall, it is apparent that the importance of biodiversity and healthy ecosystems for human well-being and long term prosperity is increasingly being recognised. The latest developments in EU biodiversity policy, the recent Convention for Biological Diversity (CBD) Conference of the Parties (COP) meeting in Nagoya and the strong attention received by The Economics of Ecosystems and Biodiversity (TEEB) initiative in the EU and globally make ecosystem valuation a very crucial and timely topic. In this regard, TEEB (2011) highlights the value of the services that healthy ecosystems provide, and calls for suitable indicators and accounting frameworks to measure our natural capital.

Furthermore, the relevance of the Common Agriculture Policy (CAP) in the EU budget and the influence it can have on the improvement of agriculture practices, as well as the importance of the Common Fisheries Policy (CFP) for the sustainability of EU fisheries, imply that the use of sustainability indicators can have a significant impact on the allocation of future funding and on the effectiveness of key EU policies.

3.2.1 Sustainability indicators for biodiversity policy

Given the multitude of pressures affecting biodiversity (like land-use change, pollution, natural resources over-exploitation and climate change), the complexity of underlying drivers, and the potential negative impacts from different sectors, the successful implementation of

biodiversity policy depends critically on the integration of biodiversity considerations into other policy areas. Indicators therefore have a role to play not only in the biodiversity policy cycle as such, but also to ensure that policy makers in other fields take possible impacts of biodiversity into account.

Several challenges beset, however, the development and application of biodiversity indicators. Since biodiversity is an umbrella concept whose measurement traditionally involves the simultaneous consideration of species diversity, genetic variability within populations, and the functional diversity of ecosystems (Levrel, 2007, Reid et al, 1993), it is difficult to construct a single indicator that reliably covers all facets of biodiversity simultaneously (EASAC, 2004). The issue of scale, in terms of both space and time, poses an additional challenge. Different indicators are needed to inform decision-making at various levels, from local to global, and some measurements may change too slowly with time to provide the immediate information needed for policy and management decisions (Reid et al, 1993). Recent efforts have been concentrated on developing and agreeing on a basket of indicators that, by complementing each other, jointly capture biodiversity's multiple dimensions and potential interactions.

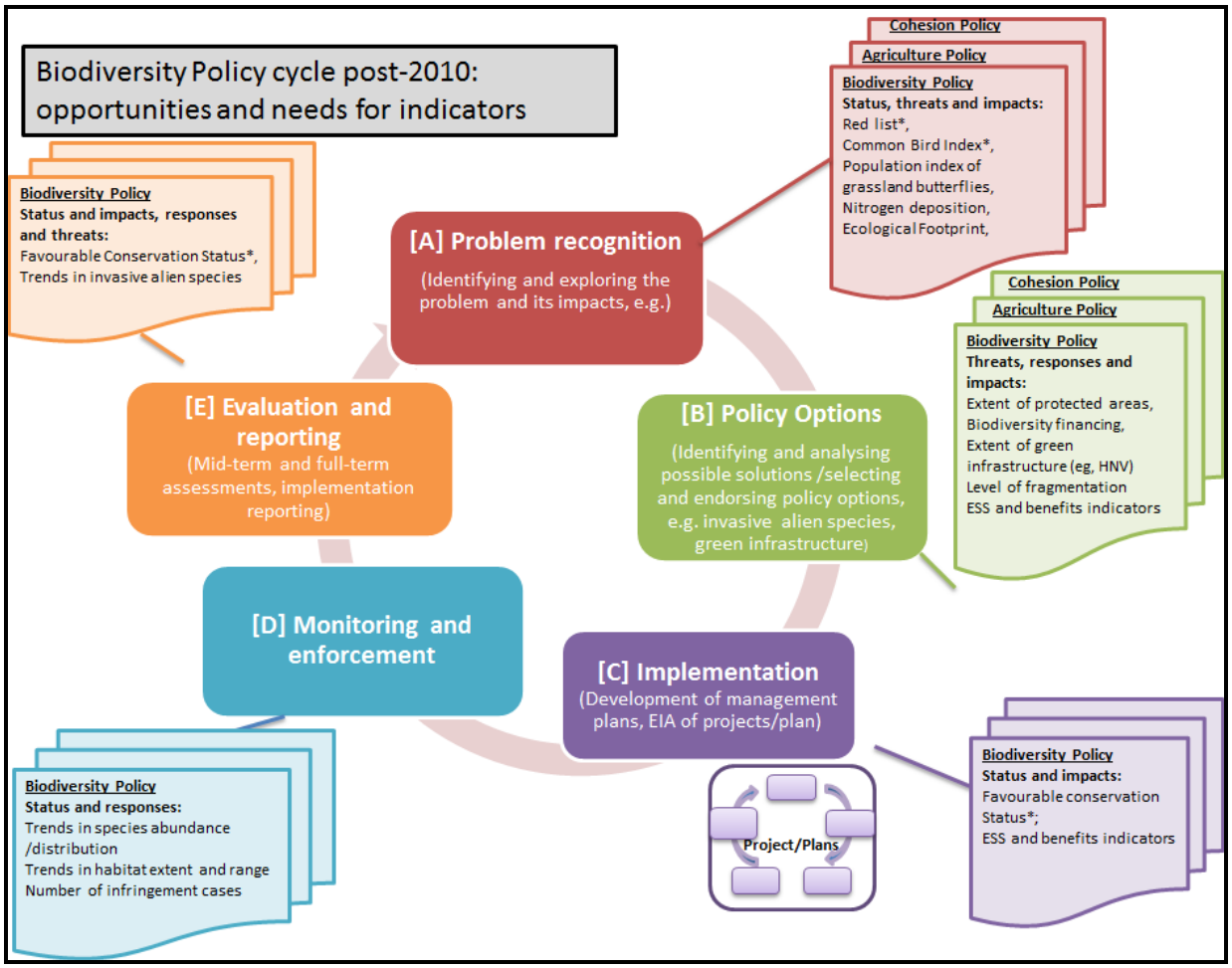
At EU level, the process of developing and adopting indicators in the field of biodiversity policy has mainly been driven by the reporting requirements of the Nature Directives and to the Convention on Biological Diversity (CBD), and the need to assess progress towards the headline target of halting biodiversity loss. The Habitats Directive (92/43/EC) requires Member States to monitor the conservation status of habitats and species of Community interest found within their territory and to report every six years on the implementation of measures foreseen in the Directive. The indicator Favourable Conservation Status (FCS) is used to assess the ecological condition of such habitats and species. Similarly, the Birds Directive (2009/147/EC) foresees reporting by Member States every three years, but no related indicator assessing the status of species targeted by the directive has been developed. Indicators also have a role to play with regard to the implementation of Article 6 of the Habitats Directive, which requires Member States to avoid damaging activities within Natura 2000 sites that could significantly disturb species or deteriorate habitats for which the sites have been designated.

In 2001, the EU committed to halting the loss of biodiversity in the EU by 2010 and restoring habitats and natural systems. To this end, an EU Biodiversity Action Plan (BAP) was adopted in 2006. A similar global target – to significantly reduce the rate of biodiversity loss by 2010 – was set by Parties to the CBD in 2002. The adoption of the 2010 biodiversity target stimulated efforts in developing indicators to monitor progress towards this objective. A first set of CBD indicators was adopted in 2004. The EU followed suit, setting in motion a process for streamlining European biodiversity indicators (SEBI) in 2005. A basket of 26 SEBI indicators was selected in 2007. The new CBD Strategic Plan and EU biodiversity strategy for the post-2010 period, adopted in October 2010 and May 2011, respectively, call for a revision of the current indicator frameworks.

A major failure of the 2006 BAP was related to the lack of appropriate indicators and baselines to measure progress. It was often necessary to introduce indicators at a later stage, and not always was it possible to identify appropriate ones for several targets and actions, as many of the BAP's objectives were not sufficiently measurable and time-bound. The new EU biodiversity strategy aims to overcome these shortcomings by setting out quantifiable targets that lend themselves to the use of indicators.

As revealed by questionnaires sent to biodiversity policy experts and discussions during one of the project workshops, indicators in this field have in particular been applied at four stages of the policy cycle: problem recognition, problem exploration, monitoring and reporting, and evaluation. The design of the SEBI indicators may be a reason for this bias, as the focus of SEBI is on state and pressure indicators, while response indicators are under-represented. There is, however, scope for further applying indicators in the intermediary stages of the policy cycle, to identify possible solutions and support impact assessment or cost-benefit analyses of different policy options. The figure below shows the potential role of selected sustainability indicators in the context of the biodiversity policy cycle.

Figure 1 Current and future opportunities for using sustainability indicators in the biodiversity policy cycle



Amongst the IN-STREAM indicators, the Common Bird Index, Red List Index and Marine Trophic Index are included in the SEBI set. The Favourable Conservation Status indicator is the main performance measure of the Habitats Directive, but has not fully entered the core sets of indicators applied in policy areas impacting and/or relying on biodiversity, such as agriculture, fisheries or cohesion policy. The Common Bird index is applied as a baseline indicator for agricultural policy. The Red List Index and Marine Trophic Index are also used in the context of annual assessments of EU fisheries by ICES. The Potentially Disappeared Fraction indicator is not currently used in EU biodiversity policy, or beyond. Among the composite environmental indicators analysed in the framework of IN-STREAM, only the Ecological Footprint was identified as used by the practitioners we interviewed. It is included in the SEBI set, but also applied in the context of resource use.

A number of limitations have been identified in relation to existing indicator frameworks. With regard to the SEBI basket, these include, inter alia, the poor representativeness of state indicators, the scarcity of ecosystem service indicators included in the set (currently limited to a few provisioning services), and the limited information captured in the indicators of sustainable use (which do not fully reflect the extent to which fisheries, forests and agricultural ecosystems are sustainably managed). Furthermore, the SEBI indicators provide only a limited picture of policy responses to address biodiversity loss, and of the impact of such responses.

With regard to the CBD framework, many of the indicators were found to have patchy coverage, either geographically or in terms of content. The set has been deemed particularly incomplete in relation to sustainable use, the quality of ecosystems, ecosystem services, and the links to human well-being (UNEP-WCMC, 2009). Moreover, the CBD indicator framework is primarily structured around the Convention's priorities, which might hinder its uptake and use within other policy sectors or environmental governance processes (CBD, 2010).

Indicators traditionally applied to EU biodiversity policy have primarily addressed the environmental pillar of sustainable development, focusing on ecological status and trends, and impacts on ecosystems. However, the post-2010 biodiversity policy marks a shift in emphasis towards ecosystem services and the importance of biodiversity for human well-being. The increased focus on ecosystem services demands suitable indicators to estimate trends in their provision and to provide a more complete picture of ecosystem resilience. However, such indicators are a relatively new tool, currently available for only a fraction of the wide array of services derived from ecosystems (Layke, 2009; Anton et al, 2010). There is a need, on one hand, to address current gaps through further development of ecosystem services indicators and, on the other, to better integrate the indicators developed by the scientific community into biodiversity policy-making.

To inform the selection and design of new policies, indicators should reflect not only where we stand with regard to the targets set, but also *why* we have missed or successfully reached certain targets. Response indicators are essential in this regard. While it is not always feasible to capture policy responses into a quantifiable indicator, the development of

standardised reporting and analysis could support the application of qualitative indicators of response.

Given the close linkages between biodiversity and other sectors, it is also necessary to develop a streamlined set of biodiversity indicators to be integrated into several policy areas, including agriculture, cohesion policy, fisheries policy, and others.

3.2.2 Sustainability indicators for agriculture policy

In the field of agriculture, there is a wide range of public goods that may be delivered through agricultural management, many of which are in high demand by society, but are not always provided by the market. On the market supply side, farmers have little incentive to provide public goods because they are not being paid to do so. To improve provision, public policy measures should intervene to incentivize farmers and land managers to take up or maintain beneficial management practices. In particular, the provision of environmental public goods - such as farmland biodiversity, water quality, water availability, soil functionality, climate stability (including greenhouse gas emissions and carbon storage), air quality, resilience to flooding and fire, and maintenance of agricultural landscapes - needs incentives through policy measures, as does a diverse suite of social public goods, including food security, rural vitality and farm animal welfare and health. There is evidence of undersupply in most of the key environmental public goods provided by agriculture, and it is crucial that the environmental performance of relevant measures is appropriately monitored and evaluated in the EU and national policies, in particular in the Common Agriculture Policy (CAP).

In the context of the CAP, sustainability indicators are currently used for tracking outcomes, results and impacts of the rural development policy under Pillar 2, as part of a programmed policy approach. They do not play a role under Pillar 1, which encompasses a non-programmed approach focusing primarily on income support, although there the bulk of CAP expenditure lies, and this gap needs to be interrogated. In the end, both policy streams will have an impact on whether or not agriculture uses the resource base in a sustainable way.

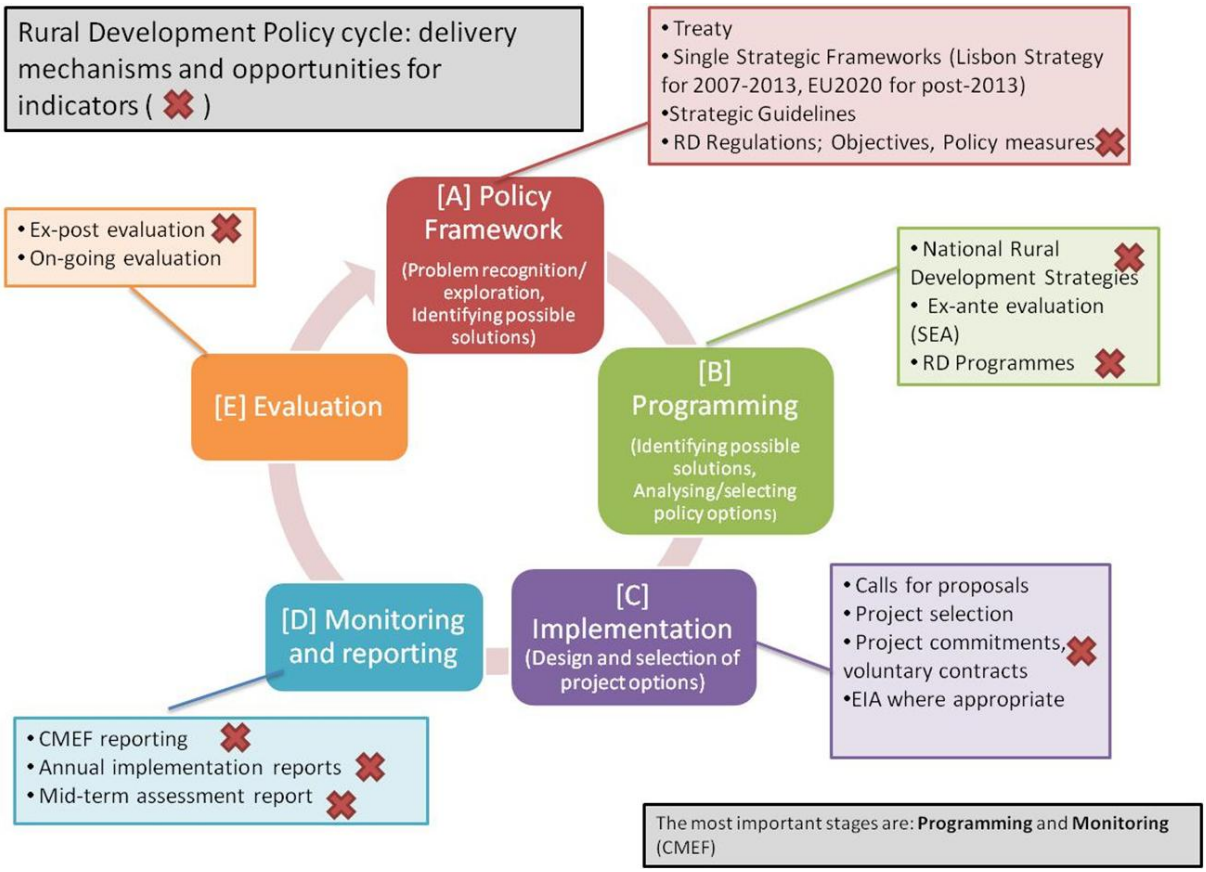
The use of specific indicators for agriculture will continue to help keep track of important trends in the environmental performance of agriculture. In a broad sense, the so-called agri-environment indicators (under development since 2006, building on the IRENA (Indicator Reporting on the Integration of Environmental Concerns into Agriculture Policy) EU-15 indicator exercise finalised in 2005 by EEA) have had a certain use in monitoring the environmental trends underlying agricultural land use in Europe. The more specifically targeted suite of indicators under the Common Monitoring and Evaluation Framework (CMEF) have been designed and used for the evaluation of environmental performance of measures under the CAP Pillar 2 (i.e. the rural development policy) during the 2007-13 programming period.

While the IRENA-derived agri-environment indicators will be useful in describing the broader context of achievements and problems of environmental sustainability within EU agriculture, many of them are not suitable for integration into the CAP as tools to measure the extent to

which policy targets have been achieved. Their scope is designed to be much wider, aiming to track impacts of agriculture and agricultural land use, i.e. farm management practices, agricultural production systems, pressures and risks to the environment, and the state of natural resources. Furthermore, many of them do not seek to differentiate impacts that are driven mainly by exogenous factors (e.g. markets, commodity prices, trade issues, bioenergy policies, climate change, national and regional policies) from impacts that are driven by agricultural policy itself.

The CMEF indicators, on the other hand, have been designed at EU level to feed directly into the rural development policy cycle for the 2007-13 programming period. They build on experience with similar indicators used for the Member States' programmes in the previous programming period, as well as utilising some of the IRENA indicators suited to measuring the performance of rural development measures. The CMEF indicators are integrated with the reporting, monitoring and evaluation mechanisms for the rural development policy, relating to economic, environmental, and social strategic priorities of Pillar 2 (Terres et al., 2010). An overview of how these sustainability indicators have been used in the policy cycle for the rural development is shown in the figure below.

Figure 2 Current and future opportunities for using sustainability indicators in the agriculture policy cycle



The key indicators for measuring environmental impacts within the CMEF are 'Reversing biodiversity decline' (which uses the Common Bird Index), 'Maintenance of high nature value farmland and forestry' and 'Improvement in water quality'. The high nature value (HNV) indicator has proved a particularly important contribution as it makes it mandatory for Member States to track the trends in HNV farming, which is of high importance both for the EU biodiversity targets and for the vitality of the rural areas concerned. However, the robustness of the methods of data aggregation for the HNV indicators needs further improvement. In addition, biodiversity indicators for taxa other than birds are much needed. Indicators for ecosystem services, which so far cover only limited measurements for soil erosion and water quality, also need more development.

As the current programming period has been the first experience with the fully formalised Common Monitoring and Evaluation Framework (CMEF) for Pillar 2 of the CAP, further efforts are needed to refine and extend the indicators.

Furthermore, additional sustainability indicators would be helpful in understanding the impacts of agricultural land use in Europe, and might also help to identify which measurable sustainability objectives could be set up for the CAP Pillar 1 instruments – e.g. to have a better understanding of the scope and benefits of organic farming and organic products labelling, information on carbon content of soil etc. Such agricultural indicators might include, for example, Adjusted Net Savings, the System of Integrated Environmental and Economic Accounting (SEEA-2003), climate change indicators like GHG intensity, or GDP Energy intensity. In particular, it will be useful to explore the feasibility of using resource indicators, such as the Human Appropriation of Net Primary Productivity (HANPP), to develop aggregate information on the utilisation of the natural resource-base by agriculture.

3.2.3 Sustainability indicators for fishery policy

The recognition of the over-exploitation of EU fisheries underlines the importance of having good indicators to measure stock, determine sustainable yields, set targets and monitor progress, as well as improve the management of EU fisheries.

Growing emphasis is being placed on monitoring and reporting the effects of the Common Fishery Policy (CFP) on fish stocks and the wider marine environment. The central role to be played by monitoring and indicators was also emphasised by the European Commission in its Green Paper on the Future of the CFP (CEC, 2008). The development of fisheries/environment indicators has long received political support including from the Fisheries Council in its Conclusions submitted to the Gothenburg Summit in June 2001. These commitments were further developed in the Community action plan to integrate environmental protection requirements into the CFP (COM(2002)186), endorsed by the Council in 2003.

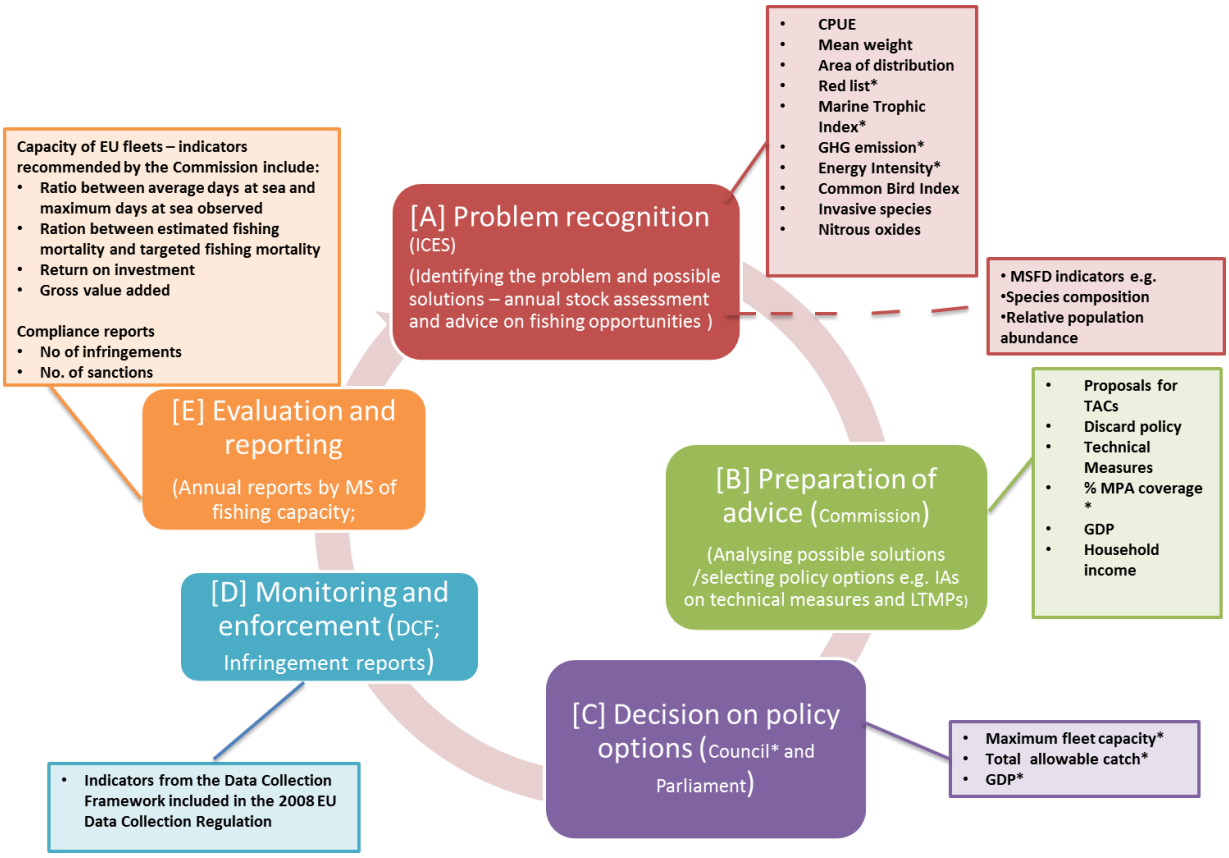
Since that time, significant progress on the development and use of the indicators in support of the implementation of the CFP has been made and indicators are used at various points in the fisheries policy cycle. Indicators have been developed to support the CFP Ecosystem

Approach to Fisheries Management (EAFM). In addition, indicators are currently used in the assessment of overcapacity in EU fleets. Indicators were also included in the 2008 'Guidelines for an improved analysis of the balance between fishing capacity and fishing opportunities'. Finally, the Commission routinely uses a suite of ecological, economic, social and governance indicators in evaluating the options for various fisheries conservation measures, including the impacts of long term management plan proposals and technical measures such as the EU discard policy

Indicators are also being developed for the use in broader marine management. The Integrated Maritime Policy (IMP) adopted in 2008 includes an environmental pillar, the Marine Strategy Framework Directive (MSFD) (2008/56/EC), whose objective is to achieve good environmental status (GES) for the marine waters by 2020. By 2012 Member States will need to, inter alia, determining the characteristics of GES, identifying targets and indicators to be achieved. A 2010 Decision on criteria and methodological standards on 'good environmental status' of marine waters (Decision 2010/477/EU) provides indicators for the measurement of GES.

Some of the key indicators relevant at the different stages of the fishery policy cycle, and used in relation to some of its implementing instruments, are identified in the figure below.

Figure 3 Current and future opportunities for using sustainability indicators in the fishery policy cycle



At the moment, while indicators are being developed and used in the fisheries policy cycle, , they are heavily skewed towards ecological indicators describing the state of the ecosystem (pressure and state indicators) and in support of fisheries management. These include, for instance, the level of fish catches taken from stocks outside 'Safe Biological Limits', which is linked to the indicator of 'Maximum Sustainable Yield' (MSY), and the Marine Trophic Index (MTI). The World Bank's adjusted net savings (Genuine Savings) could become relevant in the future should it take the depreciation of fish stocks into account.

Overall, more research is needed to understand the links between pressure and state indicators, pressure and response indicators and the links between the three of them.

Furthermore, the development of indicators for monitoring the performance of the CFP and the Marine Strategy Framework Directive (MSFD) over time is needed. In order to enhance their use, the CFP objectives need to be clearly defined, allowing for more flexibility at the regional scale to allow for development of indicators relevant to regions.

As the current list of indicators used in the fisheries and marine policy cycles are refined, a broader and more detailed set of data should be requested to be reported under the regulation on environmental economic accounts in its next revision of the Data Collection Framework. In particular, data to support the assessment of cost of over-exploitation and the benefits from efficient management of the aquatic resources exploited by commercial fisheries should be collected.

Finally, the exchange of information between policy areas e.g. biodiversity and fisheries should be facilitated in order to make the best use of information beneficial to both areas.

3.3 Resource efficiency related policies

'Resource efficiency' has become the new buzzword in European environmental policy, with great ambitions for innovation-led resource efficiency to allow a decoupling of resource use from economic growth. The anticipation is that a new drive on resource efficiency would address resource limits, facilitate competitiveness, safeguard and create jobs, address environmental impacts and allow a continuation of the current consumption led economic model. There is clearly a vast potential agenda for resource efficiency actions across many policy areas with major opportunities for progress.

Despite this increased emphasis on resource efficiency, there remains a need to translate commitments into clear objectives and indicators to guide policy-makers and other stakeholders. Recent developments suggest that, given enough political support, the large amount of data increasingly collected on resource use by statistical offices and the work of researchers on resource limits, ecosystem limits and impacts associated with resource use across the EU, should ultimately allow indicators to support the development and monitor the implementation of policies, steering innovation towards increased resource efficiency.

Improving indicators on resource efficiency offers to help 'measure to manage' better and contribute to progress towards a sustainable, resource efficiency, green and potentially equitable socio-economy. In this regard, the resource efficiency flagship initiative mentions that indicators are needed 'to cover issues such as the availability of natural resources, where they are located, how efficiently they are used, waste generation and recycling rates, impacts on the environment and biodiversity'.

3.3.1 Sustainability indicators for resource efficiency policy

The importance of resource efficiency has been recognised in several EU policies. The EU's Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan, published in 2008, identifies a need to move towards more sustainable patterns of consumption and production. Adding to this, the most recent EU economic strategy, Europe 2020, is based on a series of 'flagship initiatives', including one on resource efficiency, which will be monitored by indicators. Furthermore, a Resource Efficient Europe Roadmap 2050 is expected later in 2011. The 2011 Regulation on national environmental economic accounts also requires mandatory regular reporting by Member States on economy-wide material flow accounts.

Eurostat already lists resource productivity among its eleven SDI headline indicators, and in August 2010, the European Commission's Joint Research Centre (JRC) published a new type of life cycle-based indicators for quantifying and monitoring progress towards sustainable development, including three sets of indicators on resources, products and waste. These could also potentially be used to measure progress in the recent EU Raw Materials Initiative (RMI), focusing particularly on materials used in electronics, which can contribute to a low-carbon economy.

The further development of a range of sustainability indicators for resource use should be made a priority. The use of sustainability indicators will be useful in particular on those sectors with the largest environmental impacts and where significant amounts of resources are used. In this regard, three consumption areas are responsible for 75-80 per cent of our environmental impacts: housing, food and drink, and mobility. These sectors are clear priorities for achieving greater resource efficiency. Furthermore, as resource scarcity is a global issue, it will not be enough to consider domestic activities only. EU policies and indicators should take into account environmental impacts occurring abroad that are driven by national or European demand for imported goods

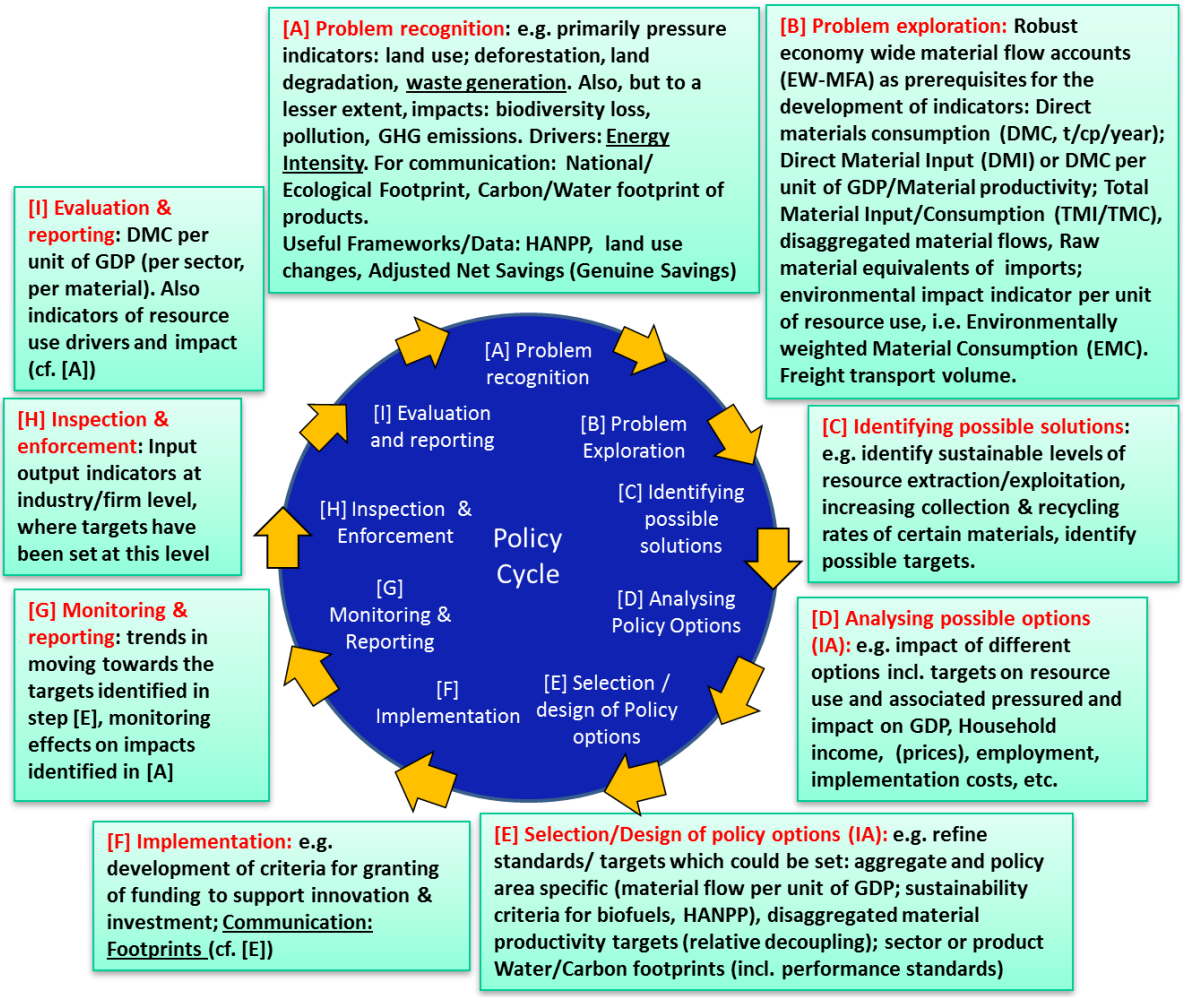
Useful examples of indicators that can be useful for resource efficiency policy are the Environmentally Weighted Material Consumption (EMC), the Total Material Requirement (TMR) and the Total Material Consumption (TMC), Raw Material Consumption (RMC). The Water Footprint and the Carbon Footprint can also be very informative, given their focus on specific environmental issues and their suitability to be applied at the country, sector, company, household and product level.

The potential relevance of the Index of Environmental Pressures and the World Bank's Adjusted Net Savings (ANS, also known as Genuine Savings) for energy efficiency policy could be further investigated. ANS can be relevant in the resource efficiency discussion as far as it includes a component recording trends in stocks of certain natural assets and provides the opportunity to investigate the links between different capital stocks and monitor resource efficiency relevant information. One can expect that the index will be sensitive to improvements in resource efficiency as these should reflect in changes in a whole range of the component indicators (variables) on which the index rests.

Overall, attention will be needed to develop data sets on stocks of materials and sustainability thresholds, as flows on their own do not address over-consumption of either renewable or finite resources.

An overview of how sustainability indicators can be used in the policy cycle of resource efficiency related policies is shown in the figure below.

Figure 4 Current and future opportunities for using sustainability indicators in the resource efficiency policy cycle



3.4 Green growth related policies

The notions of 'green innovation', 'green growth' and 'green economy' have captured policy makers' attention, and are endorsed in different strategies at EU and OECD level.

Green innovation is generally understood to include technological innovations in the areas such as renewable energies, energy efficiency, electric cars or fuel cells, as well as non-technological innovations. *Green growth* promise to reconcile several policy objectives: to achieve sustainable economic growth, create high-quality jobs, to secure the competitive edge of EU businesses over competitors from other regions, and at the same time to achieve a drastic cut of CO2 emissions. The expression '*green economy'* has also been adopted by the European Commission in the context of the Rio+20 process (EC, 2011a): an economy that generates growth, creates jobs and eradicates poverty by investing in and preserving the natural capital upon which the long-term survival of the planet depends. These terms are closely interlinked and sometimes overlapping, therefore are often used interchangeably.

The link between green innovations and the transformation to a low-carbon economy is explicit in the Europe 2020 strategy, in particular in its flagship initiatives 'Innovation union'. 'resource efficient Europe' and 'an industrial policy for the globalisation era' (see also chapter 3.3.1 on resource efficiency). The notion of green innovation and its contribution to green growth is also very much enshrined in the forthcoming OECD Green Growth Strategy, which establishes an important connection between different approaches to measuring economic, social and environmental progress, and between different types of alternative well-being indicators.

With regards to policy applications, the concept of green growth seems particularly relevant in the context of climate change policies (especially mitigation) - as they are key contributors to the transformation to a low carbon economy - and for Cohesion policies – given the great opportunity offered by EU funding to stimulate an environmentally and socially sustainable growth. The use of indicators will arguably be crucial to measure the effect of these policies in terms of environmental performance, economic growth and employment, and to help choosing the best policy mixes.

It should be noted that other policies are also clearly important to achieve green growth. Some have been analysed under the other storylines (biodiversity and resources efficiency), while others could not be analysed within the scope and resources of this study (e.g. air pollution policy, water quality and quantity, adaptation policy etc.). Some of the lessons and recommendations drawn in this paper, however, can be useful also for the policies that could not be analysed.

3.4.1 Sustainability indicators for Climate Change policy

In the context of climate change, energy use and energy efficiency appear particularly crucial policies to achieve green growth. Several initiatives have been taken at EU level, particularly

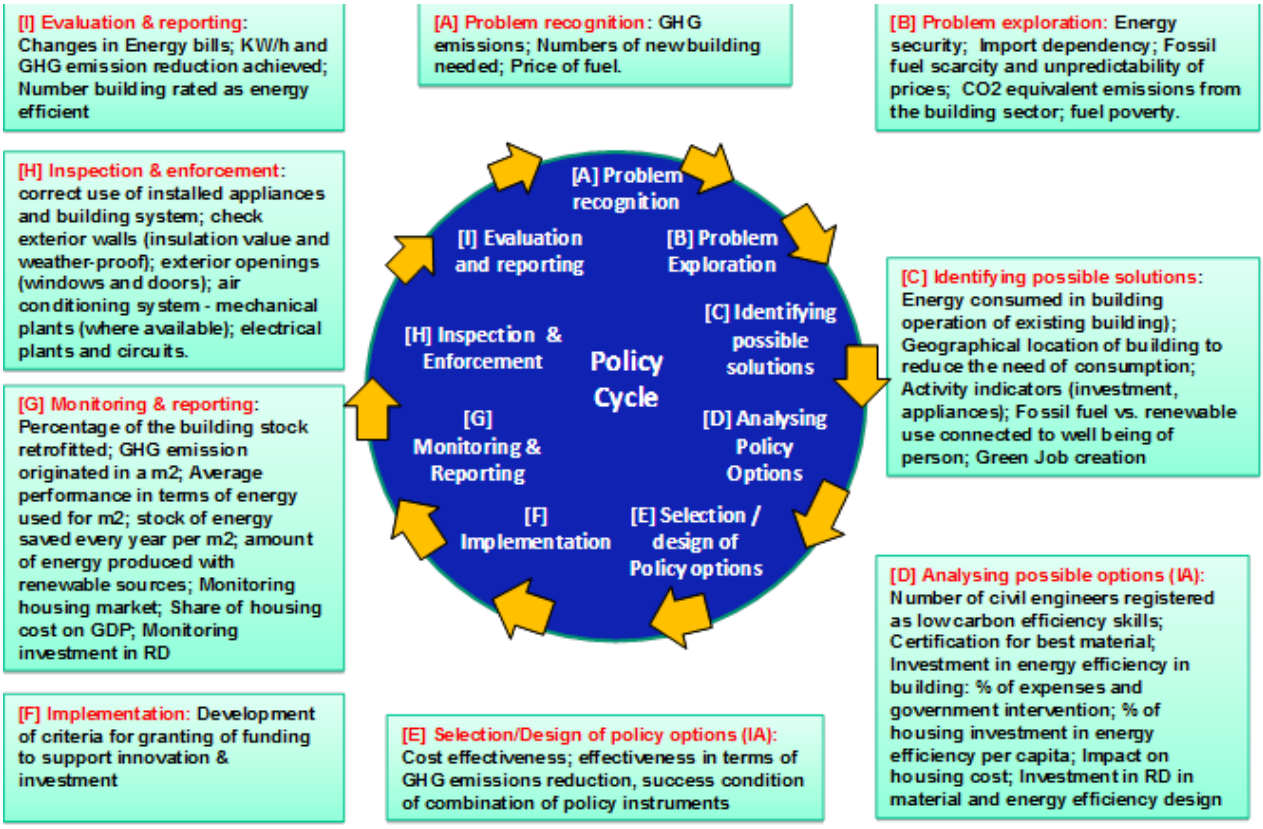
in the last decade, to combat climate change and transform Europe into a highly energy-efficient, low carbon economy. Most notably, in 2007 the EU endorsed the so –called '20-20-20 climate and energy package' (COM(2008)16, 17 and 19), consisting of a number of targets to reduce GHG emissions, increase the share of renewable sources of energy and improve energy efficiency by 2020. In this regards, indicators (e.g. of GHG emissions, RES share etc.) are of fundamental importance to monitor progress towards these targets.

Climate change mitigation as a policy area is characterised by the use of indicators from its early beginnings. The 2001 Sustainable Development Strategy (SDS) and its 2009 Review included objectives in the area of climate change and set up structural environmental indicators of relevance to climate change (e.g. GHG emissions and Energy intensity). Indicators were also crucial to monitor the progress towards meeting the Kyoto Protocol targets and, more recently, the '20-20-20' objectives.

Key indicators for EU climate policy analysis and formulation, among those analysed in the course of the IN-STREAM project, are GHG emissions (per capita/in levels), energy intensity and renewable energy share. Energy efficiency in buildings is also an important indicator, given the high potential of the building sector to deliver cost effective GHG mitigation. These indicators are being closely monitored at European level and are used across a wide range of climate change policies and national programmes. These include policies and measures pursuing the following objectives: improvements in energy efficiency in e.g. buildings, industry, household appliances (sustainable consumption and production); reduction of carbon dioxide emissions from new passenger cars (transport sector); abatement measures in manufacturing industry (industrial emissions); measures to reduce emissions from landfills (waste); and increasing the use of renewable energy (wind, solar, biomass) and combined heat and power installations.

An example of when these (and others) indicators are/should be used in the policy cycle of a specific climate change, like energy efficiency in building related policies, is exemplified in the figure below. This policy was chosen to better exemplify the scope for using indicators with a concrete example. Clearly there is scope and opportunities for using sustainability indicators in several other areas of climate change and energy policy (e.g. RES uptake, GHG reduction from industrial processes, transport policies, etc.)

Figure 5 Current and future opportunities for using sustainability indicators in the energy efficiency in buildings policy cycle



Successful examples of the use of climate change related indicators for policy making include the *Common carbon metric* – an international initiative for Measuring Energy Use and Reporting Greenhouse Gas Emissions from Building Operations launched at COP15 in Copenhagen in 2011; the French *Grenelle 2* – which set out a number of targets for, inter alia, energy performance of buildings; the quantification of emissions from freight transport by European railway companies in the context of the *EcoTransIT-Tool8* initiative; and the *Global City Indicators Program* – which provides a set of indicators with a globally standardized methodology that allows for global comparability of city performance towards sustainability across a wider range of themes, including climate change.

Opportunities for further increasing the accuracy of climate change related indicators and for developing common EU methodology for their measurement would be beneficial to better assess policy effectiveness. For instance, consumption of renewable energy is not always easily measurable. A more systematic breakdown by renewable energy source (RES) would allow a better assessment of overall sustainability of the energy mix. Furthermore, due to frequent export and import of renewable energy, there might be significant differences between production of renewable energy and the actual consumption by a country. Therefore

[8] http://www.ecotransit.org/

in some cases an adjustment to account for these flows might be necessary. Adopting a more detailed sectoral approach for the GHG emissions and energy intensity indicators would also be beneficial for a more thorough assessment of climate change policies, their drivers and possible opportunities for improvements.

It is also important to note that climate change indicators are often linked to trends of other indicators (socio-economic, environmental, energy related indicators). This calls for a more explicit identification of these linkage and consideration of cross-policy impacts at the most relevant stages in the policy cycle. This appears particularly crucial during the analysis of different policy options, where the use of multiple indicators can allow for the identification of relevant trade-offs and appropriate mitigating measures.

3.4.2 Sustainability indicators for Cohesion policy

The aim of EU Cohesion Policy historically has been to address regional disparities and bring structural change to the economies of less developed European regions. Throughout the years, however, the tendency has been to align Cohesion Policy to political high-level projects of the EU. For instance, the 2007-2013 Cohesion Policy strongly supports the Lisbon Strategy for growth and jobs.
In terms of indicators use, the focus of Cohesion Policy on economic development, and particularly growth and jobs, has arguably led to granting more importance to the use of economic and employment indicators (e.g. GDP, competitiveness and jobs), at the expense of other sustainability indicators. Notably, GDP per capita is the only indicator used to determine the eligibility of the different regions for EU Structural and Cohesion Funds and also to measure the effectiveness of the Policy in terms of achieving economic and social cohesion. .

The appropriateness of GDP to reflect new emerging social and environmental challenges and their impacts on regional economies, however, has increasingly been questioned. As argued by the European Environment Agency (EEA, 2008), while structural and cohesion funds have led to short-term improvements in economic growth, they have not resolved overall regional disparities. For instance, it has been stressed that, if progress is measured based not only on GDP per capita growth but on social indicators such as the share of the population at risk of poverty, one would come to different results (Dheret, 2011).

The Community Strategic Guidelines on Cohesion call for the use of appropriate indicators on the state of the environment. However, social indicators are limited only to job creation and social inclusion while environmental ones tend to focus on basic environmental infrastructure, GHG emissions/energy and risk prevention. There are no indicators concerning important environmental themes such as biodiversity and resource efficiency nor are there appropriate indicators to monitor environmental pressures stemming from non-environmental interventions such as transport and industrial development. Also, simple ‘output’ indicators (e.g. a number of projects, etc.) tend to be favoured, which are not very meaningful. The proposed ‘core’ indicators are only of an indicative nature and Member

States/regions are not legally bound to deploy them in the context of their programmes. While a number of environmental and social indicators are being developed by different Member States, the emphasis is still often on economic indicators (EPRC, 2009). The development of 'impact' indicators, which are linked to longer term targets which an intervention is meant to contribute to, has been difficult, as these are often perceived as less tangible (Nordregio et al, 2009).

Some of the environmental indicators most commonly used include greenhouse gas (GHG) emissions, number of passengers per transport mode, municipal waste generation per capita, particulate matter (PM) emissions and emission of other main air pollutants, and the share of the different energy sources in overall energy consumption/production. A great majority of environmental indicators currently adopted by Member States are used at project level and primarily in the context of environmental interventions – especially for reporting on the project's activity and output. EU funds programmes in which environmental indicators play a steering role are rather limited

Among the main obstacles to the effective use of sustainability indicators, it is noted that ex ante evaluations failed to set robust objectives and/or failed to use quantifiable indicators thereby limiting the usefulness of subsequent mid-term and ex post evaluations. Secondly, it was found that the lack of good quality consultation processes deterred the establishment of relevant environmental indicators (EEA, 2008).

It is apparent, therefore, that there is a strong need for integrating additional sustainability indicators in Cohesion Policy, to better account for the social and environmental impacts of the interventions funded, and meet the new challenges of the post-2013 Policy. In this regard, the 2009 Lisbon Treaty's new objective for territorial cohesion for the future Cohesion Policy can offer a new opportunity to reinforce a holistic vision for territorial development that integrates economic, social and environmental objectives and indicators across European regions (EEA, 2010).

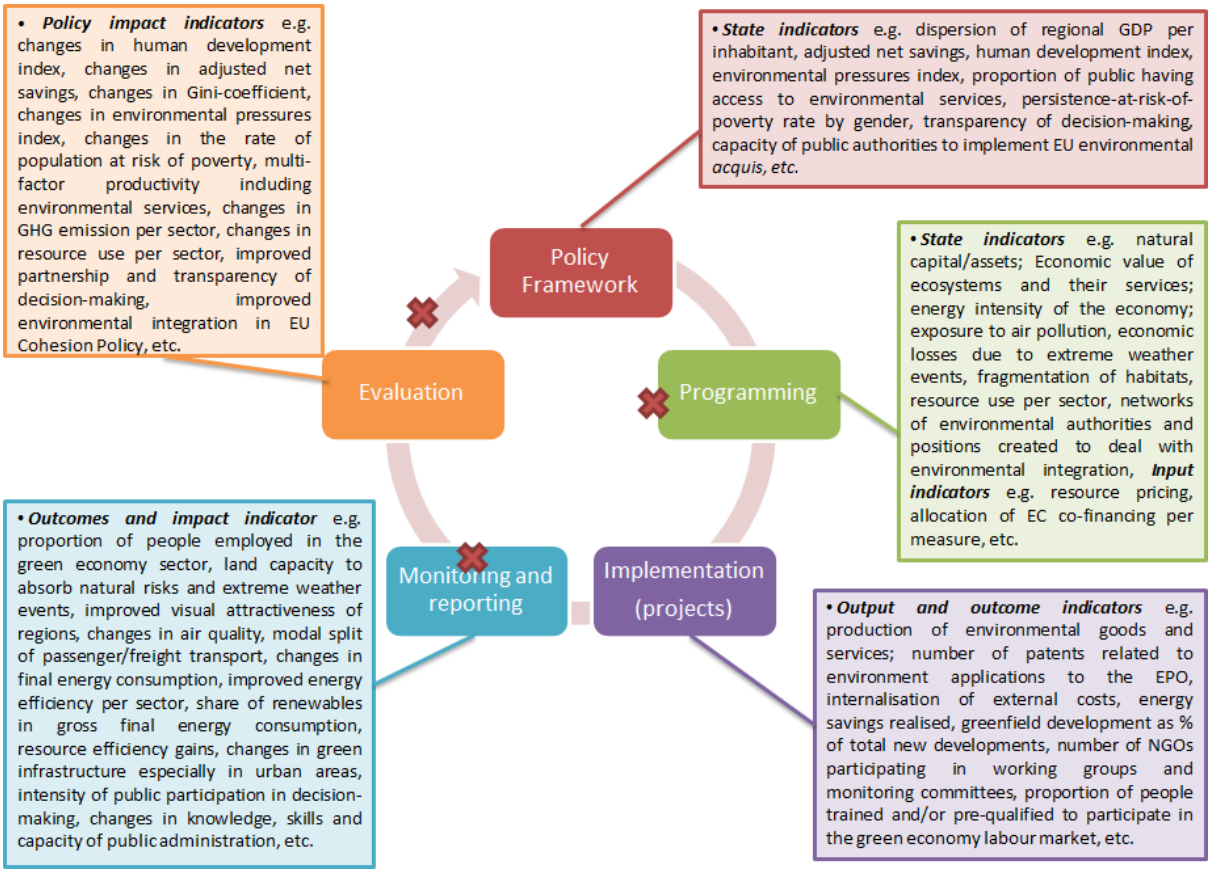
Furthermore, Cohesion Policy itself is currently under revision with the legislative proposals on the post-2013 Cohesion Policy expected to be presented in 2011 and adopted by the end of 2013. The post-2013 Cohesion Policy is to be brought in line with the objectives for 'smart, sustainable and inclusive growth', as enshrined in the new economic Europe 2020 Strategy. The issue of improving result-orientation and quality of spending, underlined in the conclusions of the Fifth Cohesion Report (EC, 2010a,b) is also one of the central items on the reform agenda of the future Policy. EU Presidency conclusions of May 2011 also stressed the need to improve the effectiveness of Cohesion policy through, inter alia, a more result-focused programming and increased emphasis on evaluation and indicators (EU Presidency, 2011). Therefore, the topic of indicators is essential for the currently unfolding political debates and provides an entry point for progressive ideas and proposals concerning the development and use of sustainability indicators.

In order to provide a more multi-faceted picture of regional development dynamics and trends, indicators such as the Human Development Index (HDI), At risk-of-poverty rate after social transfers, Adjusted Net Savings (or Genuine Savings) should be used alongside GDP.

There might also be some scope for using a composite Index for environmental pressures, the ecological footprint, ecosystem indicators (e.g. related to natural hazards regulation) and the total economic value of services provided by ecosystems, and using wider natural capital accounts and/or economic and environmental accounts and associated indicators.

An example of how a set of sustainability indicators can be used at different stages of the Cohesion Policy cycle is shown in the figure below.

Figure 6 Current and future opportunities for using sustainability indicators in the EU Cohesion policy cycle



The development of a coherent and robust system of sustainability indicators, suited to account both for outcomes and results, will be critical, and should be embedded at the level of policy, programme and project. This will require additional administrative capacities and technical support systems to guarantee the availability, collection, analysis and presentation of adequate data.

3.5 Communicating the importance of sustainability indicators

Gross Domestic Product, or GDP, is a very well known concept in our society. The concept of economic growth embedded in the GDP figures has become a universal symbol of a country's wealth, and it is common to look for evidence about it on the media. On the contrary, despite an increasing awareness on the importance of sustainable development, the issue of sustainability is arguably less reflected in the news. In particular, there is clearly not an indicator of sustainability as widespread as GDP. The uptake of such indicators by the media is still low, and several remain completely unknown to the general public.

Any successful move towards a new or reformed set of indicators for policy making depends on, inter alia, whether such metrics are perceived as useful and pertinent by the general public. Indicators that the press and the public can easily identify with and understand (e.g. GDP, unemployment rates, inflation etc.) are arguably more readily picked up by policy makers.

Building on some examples from selected media, this analysis aims to provide a better understanding of which and how sustainability indicators have been most reported on, and what it is needed to improve their communicability.

The methodology adopted for this analysis covered a focused set of sources (14 newspapers) and indicators (19), and therefore aimed to provide illustrative examples rather than an exhaustive statistical analysis. Nevertheless, even from this relatively limited analysis it was possible to identify some interesting lessons.

Overall, there appear to be still a wide disproportion between the coverage of sustainability indicators and of traditional mainstream indicators, like GDP. Often, the alternative indicators mostly taken up by the media are not necessarily the most important at policy level. The media tend to prefer indicators that are easy to understand and that the people can more easily relate to, or indicators that are already strongly publicised by their creators.

Among the sustainability indicators analysed, the most popular appear those measuring a combination of economic and social factors (e.g. Human Development Index - HDI, Gross National Happiness - GNH). In the selected media analysed, such indicators received far more attention over time than pressure or status indicators linked to specific environmental matters, like biodiversity. In some cases this appears to be related to the reputation of the source (e.g. the United Nations for the HDI), as well as the 'popularity' of the issue measured (e.g. 'happiness' is a topic that people can easily relate too). Other indicators, like the water and ecological Footprints, are generally very popular thanks to their immediate way to convey a complex metric (e.g. ecological impacts measured in terms of 'planets' used) and the intensive marketing and/or awareness campaigns conducted by NGOs.

In general, there seem to be a more prominent focus on indicators measuring social and economic factors at the expense of those measuring the pressures on and status of biodiversity. This lack of attention from the media can be in stark contrast, in some cases,

with decision-making actors. For example, the Common Bird Index is a headline indicator in the Sustainable Development Strategy and is widely known and discussed in the wider policy community but, across more than 20 years, has never been mentioned in the selected media sources.

Sustainability indicators as a whole are, seemingly, rarely referred to as alternatives to GDP when measuring or discussing progress by the media. Our research suggests a vast difference in popularity between the two sets of indicators. Nonetheless, the limitations of GDP in measuring true progress have been extensively covered by the print media.

Discussions on such topic and on sustainability indicators in general, have tended to cluster around specific events, such as domestic or international political developments, the regular publication of statistical or qualitative reports on sustainable development, and the creation of a new indicator.

There is clearly a gap between the sustainability indicators that are most used or needed by policy makers and the information passed on to the general public. There is therefore a need to improve the communicability of some key indicators, for instance by translating their result into more understandable messages and increasing public interest though more frequent awareness rising campaigns.

On the other hand, some indicators may be simply too complex to be easily communicated. For instance, an indicator like the Human appropriation of net primary production (HANPP) can be extremely informative for policy making, but too technical to be communicated to the general public. Others indicators, like the Ecological Footprint, can be considered less robust by the scientific community, but widely taken up by the media for their clear message. Similarly, an accurate indicator like the Marine Trophic Index (MTI) can be difficult to be appreciated by the public, while a more simple measure of 'fish catch' would be easy to communicate. This does not mean that some indicators are better than others, but rather that indicators can have different functions. While some may be more suitable for policy and research, others would be more appropriate to communicate a message to the outside world.

It is therefore important that the right indicators are used for the right purpose. There is sometime a trade-off between meaningfulness and clarity that should be taken into account in policy making. While in general the communicability of sustainability indicators and the awareness around their importance should be improved, it may also be necessary to choose different indicators for analysis and for communication. This can ensure that the most robust indicators are used to inform policy choice, and at the same time that the importance of sustainability criteria is fully appreciated by the public.

4 Conclusions and recommendations

The policy analysis undertaken highlighted a number of important considerations and recommendations.

It is apparent that there is currently a fair number of **indicators that focus on state and pressures, while fewer are measuring impacts and responses**. As a result, indicators seems to be used especially in the early phases of the policy cycle, e.g. for problem recognition and decisions on policy options. There is scope to use indicators further, especially in the later stages of policy development.

The use of *'environmental accounts'* is important for integrating environmental considerations into policy decision. Frameworks like the **Natural capital accounts** (measuring stocks of assets: forests, fish, land as well as soil, water, carbon in soils) and the **System of Economic and Environmental Accounts (SEEA)** have a lot of potential and should be further supported by European, national and local institutions and statistical offices within the wider global context (SEEA is a United Nation led process, complementing the UN System of National Accounts - SNA)

The objectives of halting biodiversity loss, coupled with the new aim of halting ecosystem service losses, improve restoration of natural areas and the new interest in green infrastructure, each require additional inputs in biodiversity indicators. In particular, the importance of **ecosystem service indicators** is increasingly recognised. These should be taken into account in several policy areas, not only biodiversity and nature related policies.

The issue of **ecological thresholds and tipping points** is of particular concern, as are issues of resource limits and planetary boundaries. Sustainability indicators have a key role to play, as they can inform about the proximity of such ecological and resource thresholds and the speed at which we are reaching them, and therefore help developing adequate policies to prevent breaching them.

The recognition of the **over-exploitation of EU fisheries** (with it being an 'underperforming natural asset') as well as of damage to the marine environment, underlines the importance of having good indicators to measures stock, assess the state of marine ecosystems, determine sustainable yields, set targets and monitor progress, as well as to measure the performance of the Common Fisheries Policy and the impact of the flow of services to communities.

In **agriculture policy**, the importance of **public goods** aspects (encouraging public goods such as carbon storage in soils, water retention, purification and flood control and avoiding public bads of pollution, impacts on water quality and availability, erosion) merits additional efforts at developing both biodiversity and ecosystem service indicators, to ensure that the wider public goods can duly be taken into account in decisions, funding, investments and instrument design, implementation, monitoring and evaluation.

It is of foremost importance to reduce the environmental impacts related to **resource consumption** (materials, water, energy, land and associated biodiversity). To do so, resource efficiency indicators and targets should be set. Introducing adequate indicators in sectoral policies will be crucial for target setting and monitoring of resource use by specific sectors of the economy and/or products, especially those with the largest environmental impacts (e.g. housing, food and drink, and mobility). It will be critical to assess the level of decoupling of resource impacts from economic growth and implications for future resource availability, prices, impacts and, ultimately, the sustainability of our socio-economic model and practices.

In order to monitor the achievement of the ambitious EU **climate change** targets, sustainability indicators have a crucial role to play, especially GHG emissions, energy intensity and the share of renewable energy consumption in total final energy consumption. This applies at global, national, local, business and citizen levels. Cross-policy impacts, especially with regard to biodiversity policy, should also be taken into account.

The development of a coherent and robust system of sustainability indicators, suited to account both for outcomes and results, is critical in the context of **Cohesion Policy (CP)**. Indicators should be embedded at the level of policy, programme and project. This will be important for understanding the impacts of the operational programmes (OPs) under CP, the development path encouraged by investments, instruments and governance, for creating a valuable evidence base to support decisions by regional policy makers (e.g. informing investment in infrastructures, encouraging job creation all the while committing to environmental principles and objectives such as carbon neutrality or no net loss of biodiversity) as well as for appreciating the inter-linkages between economic, social and eco-systems. This will require additional administrative capacities and technical support systems to guarantee the availability, collection, analysis and presentation of adequate data.

In all the policy areas, there is clearly a gap between the importance of sustainability indicators that are most used or needed by policy makers and the information passed on to the general public by the media. While in general the **communicability** of sustainability indicators and the awareness around their importance should be improved, it may also be necessary to choose different indicators for analysis, policy setting, instrument design, performance checking, consumer information and wider public communication., including easily recognised indicators that motivate action (e.g. footprints, product labels and ratings including energy labels for products and buildings) There is also a need for timely, local and regular data to make the relevant issues ‘live’ for the public – which will require commitments for monitoring, reporting as well as ‘now-casting’. This can ensure that the most robust indicators are used to inform policy choice, and at the same time that the importance of sustainability criteria is fully appreciated by the public.

The challenges facing policy makers in the next 5 to 10 years are different than those of a decade or two ago. At one level a lot of the legislation is in place and the changes needed are rather related to implementation, review and renewal (e.g. progress from 20/20/20 climate and energy target towards low a progressively more ambitious milestones and

targets en route to a low carbon economy by 2050). The policy challenges are also increasingly complex. In the early days of legislation it was about single issue solutions such as emissions standards for effluent. Currently, policies are required on interconnected issues like climate change, biodiversity and resource efficiency, which also have major interconnection with actors and activities in other sectors. Furthermore, in this time of economic and financial crisis, there is an ever stronger need for a clear evidence-base to promote policy, design instruments and check performance. Finally with the growing economy and world population and associated growth in consumption and production, there is increase stress on the world's resources and ecosystems, with both resource limits and ecological thresholds either being breached or in danger of being so. This could induce changes that could be potentially dramatic, non-linear and irreversible. In light of these considerations, there is a critical role for sustainability indicators to play and also a fundamental need to move towards fuller integration of different environmental issues in national policies as well as economics and environmental accounts. Finally, there is a value in having an increasing informed public so that citizens can also participate in debates, make informed choices and be a core driver to the transition to a resource efficient, low carbon, economy that respects ecological values and resource limits and supports wellbeing and progress.

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