



Institute for European
Environmental Policy

Indicators for resource efficiency in policy-making

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I. General overview of the qualitative analysis: Aims, Approach & In-Stream indicators.

- Special insights into the qualitative analysis of **three resource policy relevant indicators**: energy intensity, GHG emissions & waste disposal

II. Policy-cycle analysis and implications for resource efficiency policy.

- **Approach to collecting information** on indicators used across relevant policy areas: **using the policy cycle**
- **Specific objectives of current phase** and especially the **policy-maker consultation on use of indicators**
- **“Resource efficiency policy cycle”** and **opportunities for using indicators to achieve Resource Efficiency/ Sustainable resource use**



I. Overview of the qualitative analysis

Aims of the qualitative analysis



- ❖ Analyse **sustainability indicators** of relevance for policy making
- ❖ Identify **policy implications** of different indicator approaches
- ❖ Collect and incorporate **stakeholders' feedback**
- ❖ Identify **best examples/potential future use** of indicators in policy making

How is the analysis conducted



Analysis of a set sustainability indicators

Identification of policy implications: when to use indicators, connections, need for better info, recommendations – desk based + questionnaire to stakeholders

Case studies on policy implications: focus on 2-3 countries (in progress)

Public communication and the press: where/how indicators are taken up by media

Present/discuss results with stakeholders: the workshops

Summarising finding and identifying way forward for policy processes: the deliverables

Role of indicators in policy making



How can indicators help decision making improve sustainability?

- **identifying conditions and trends**
filling related gaps in knowledge
- **measuring progress and efficiency of measures taken**
consequences of action or inaction
- **benchmarking and monitoring performance in relation to targets set**
whether - how - when
- **enabling policymakers to set new or change policy priorities**

How many indicators are out there?

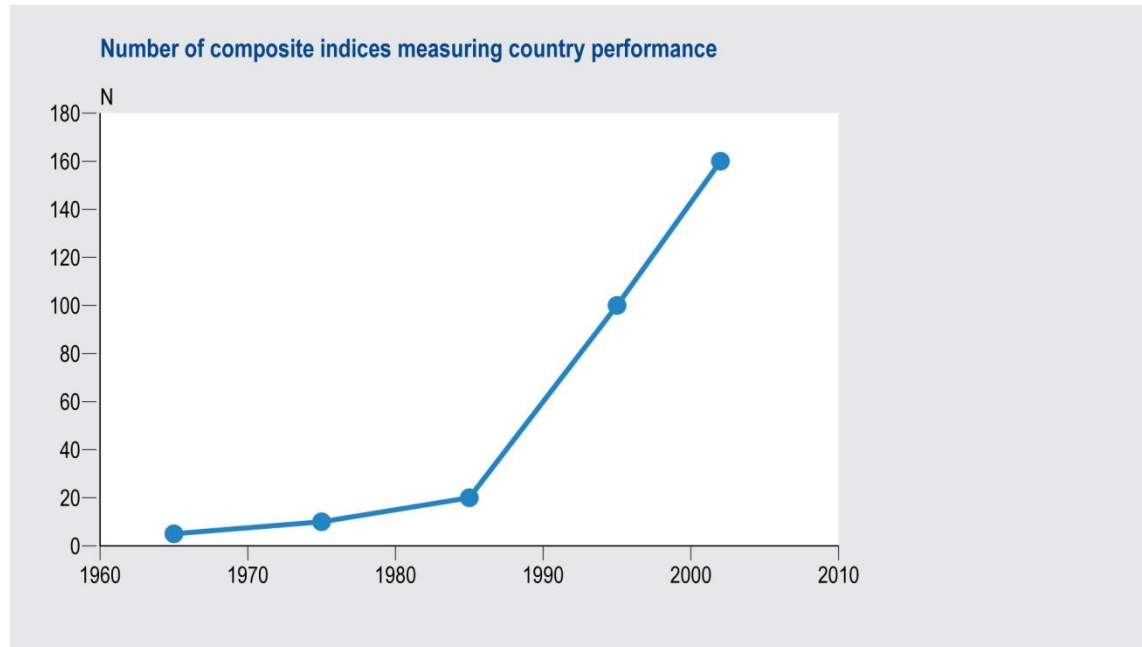


Figure 1: Growth in number of composite indices (UNDP Office of Development Studies, 2006). The indices cover a diverse set of issues including competitiveness, governance, social aspects, human rights, the environment, security and globalization.

More and more people are searching for better indicators

Indicators covered in IN-STREAM (I)



Environmental indicators

Composite environmental indicators

E.g. Ecological footprint, Adjusted net savings, Environmentally weighted Material Consumption (EMC) etc.

State of nature & biodiversity

E.g. Common Bird Index, Red list, Potentially Disappeared Fraction, etc.

Loss of natural areas

Annual increase in built-up areas, Forest fires, etc.

Over-use of nature

Eg. Fish catches outside safe biological limits, loss of soil quality reserves, etc.

Ecosystem Service (ESS) indicators

Eg. Removal of nutrients by wetlands, atmospheric cleansing capacity

Climate change & Energy

Eg. UNFCCC GHG emissions including land use change, Energy consumption, share of renewable energy, etc.

Air pollution

Eg. nitrogen oxides emissions, Emissions of PM 2.5, etc.

Waste

Eg. Amount of waste generated per capita

Resources

Eg. Domestic material extraction/consumption, etc.

Transport

Eg. Freight transport volume, total passenger transport

Indicators covered in IN-STREAM (I)



Socio-economic indicators

Composite indices

Eg. Human Development Index (HDI), Happy Planet Index, Wellbeing accounts, Inequality Index

GDP; Net national Income; etc.

Labour productivity

Net investment in fixed capital; value of built capital

Household income; Household saving rate; Comparative price levels

Total investment

e.g. In infrastructure, gross fixed capital formation (GFCF)

Gross domestic expenditure on R&D; Innovation

e.g. Patents

Employment/Unemployment (economic)

Employment (social)

e.g. Employment rate of older workers, gender, religion etc.

At-risk-of-poverty rate after social transfer (by gender/ total)

Healthy life years, Female/Male; Loss of life years

Life expectancy at birth, Female/Male



Examples: indicators relevant for energy/resource efficiency policy

(by Elisa Portale & Francesco Bosello – FEEM)



❖ **3 Environmental indicators – of relevance in particular for resource/energy efficiency policy**

1) Energy intensity

2) Greenhouse gas emissions

3) Waste disposal

Energy Intensity



What it measures: **Total final energy consumption divided by gross domestic product (GDP).**

Unit of measurement: **tonnes of oil equivalent (toe) or Megajoules (mJ) per US\$ or Euro.**

Data: **Data are produced on an annual basis following the change in GDP data.**

Energy Intensity- RACER



Relevant	<ul style="list-style-type: none">+ The indicator identifies to what extent there is a decoupling between energy consumption and economic growth.+ important insights into how energy efficiency and other factors affect energy use.- No specific international targets regarding energy intensities
Accepted	<ul style="list-style-type: none">- Low acceptance because do not reflect country disparities in energy efficiency and variation in energy mix.
Credible	<ul style="list-style-type: none">+ Can contribute to assess environmental sustainability
Easy	<ul style="list-style-type: none">+ Data often collected systematically by national statistical agencies: energy commodity data for production and use, and GDP data are regularly available for most countries at national level and for some countries at sub-national level.
Robust	<ul style="list-style-type: none">+ Based on a sound accounting methodology backed by most national and international institutions.-Energy intensity should not be used as a proxy of energy efficiency or environmental sustainability for policy-making purposes.

Energy Intensity - SWOT



STRENGTHS

- Annual assessment
- Relatively easy to understand
- Provide information on the economic and technological development

- It is a tool to assess eco-efficiency performance and targets of processes, products, services and complex systems
- It may be used together with GHG emissions to provide a more comprehensive picture of energy production and consumption.

OPPORTUNITIES

WEAKNESSES

- Difficult to compare energy intensity among products and among countries
- It should not be used as an indicator of energy efficiency or sustainability for policy-making purposes>> needs to be complemented by other indicators

- Not sufficient for comprehensive environmental analysis.
- Focused on a narrow, though relevant, part of sustainability.

THREATS

GHG Emissions



What it measures: emissions of the main GHGs which have a direct impact on climate change

carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF₆), chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs), together with the indirect greenhouse gases nitrogen oxides (NO_x), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOCs)

Unit of measurement: Annual GHG emissions in tonnes of CO₂ eq.

Data: Annual review process under the UNFCCC & Kyoto Protocol guarantees continuous improvement of GHG estimates

GHG Emissions - RACER



Relevant	<ul style="list-style-type: none">+ track progress in countries' efforts to lower emissions and reach environmental performance objectives.+ Measuring in conjunction with economic indicators (GDP), and waste indicators will help to support decision making on SD+ GHG emissions forecast are fundamental in shaping environmental policies (e.g. Cap and Trade regulation)
Accepted	<ul style="list-style-type: none">+ accepted as the most important structural indicator of climate change and environmental pressure- common agreement about linkage between GHG emissions and climate change, but magnitude of effects not completely foreseeable.
Credible	<ul style="list-style-type: none">- some ambiguity in GHG considered according to different sources, but all institutions consider main pollutant as CO₂, CH₄, CFC...+ Shortcomings with regard to comparability across countries are well documented
Easy	<ul style="list-style-type: none">+ reliable sources applying clearly defined and consistent standards+Data comparable across countries and over time
Robust	<ul style="list-style-type: none">- It gives information on trend of pollutant in the atmosphere, but does not specifies the reasons behind this pattern (a breakdown by sector and gas can be useful)

GHG Emissions - SWOT



STRENGTHS

- Annual assessment
- Relatively easy to understand
- It assesses progress in decoupling economic growth and environmental damage, and in conciliating economic and environmental sustainability

- It may be used together with energy intensity and waste production indicators to provide a more comprehensive picture of the environmental impact
- It could inform on the effectiveness of R&D policies foremissions abatement & complement with useful information health indicators and policies

WEAKNESSES

- does not include emissions from international aviation/maritime transport
- It does not show how much the climate will be affected by the increased accumulation of GHGs >> needs to be complemented by other indicators

- The acceptance may be hampered by the fact that they do not measure directly the environmental impact of GHG emissions and do not provide a built-in sustainability measure.

OPPORTUNITIES

THREATS

Waste Generation



What it measures: The generation of industrial and municipal solid waste is derived from the production of waste on a weight basis. The precise definition of solid waste is variable.

Unit of measurement: municipal waste generation >>kg per person.
Hazardous waste >> metric tonnes/GDP.
Radioactive waste >>index related to progress towards safe storage or disposal

Data: difficult to obtain, and consist of only rough estimates.
Municipal wastes >>from studies of representative cross-section of the population.
Industrial sources >> monitored by waste collection contractors.
MS are free to decide on the data collection methods.

Waste Generation - RACER



Relevant	<ul style="list-style-type: none">+ important component of SD and environmental pressure.+substantial impact on everyday life of consumers and producers.+If complemented with indicators on waste management, it enables to judge the effectiveness of the process.
Accepted	<ul style="list-style-type: none">+ International waste measurements are sanctioned by EU legislation
Credible	<ul style="list-style-type: none">-some ambiguities regarding the measurement target and quantities involved-There are many differences depending on the composition of waste: time necessary to transform them, space taken up for the same weight and future disposition (recycle, re-use or landfill).-different definitions of hazardous waste.
Easy	<ul style="list-style-type: none">+ Data are self-reported by local authorities.-The coverage of these data is not always exhaustive (illegal dumping)-Compliance to measurement standards may be difficult to verify-Many developed countries collect data, but few developing countries do.
Robust	<ul style="list-style-type: none">+based on an accounting methodology developed by international institutions+ widespread recognition of the need for indicators as tools for monitoring waste in the environmental policy field.- It must be complemented with indicators on waste management which are the main objective of the current policy targets.

Waste Generation - SWOT



STRENGTHS

- Annual assessment
- Waste production is an essential component of SD
- Sanctioned by EU legislation. Formal and informal targets of national and regional waste policies.

• must be complemented with details on typology of waste, amount of recycled, incinerated and landfilled waste, waste to energy and emissions from landfill.

• The composition and treatment of waste is fundamental in assessing possible harmful effects, space necessary to the storage and effectiveness of all process.

OPPORTUNITIES

WEAKNESSES

- does not distinguish between toxic and hazardous waste
- Solid waste production is expensive to measure at source; statistics are difficult to obtain
- data coverage not always exhaustive

• The lack of decoupling, in developing countries, can be a disincentive to use waste indicators for sustainable development.

THREATS



II. Policy-cycle analysis & implications for resource efficiency policy

II.2. Collecting information in a structured way



- ❖ **Step 1: Identify policy areas** in which policy-makers would be invited to indicate which indicators they use/ could consider using/ don't use/ where they feel there is a gap to be filled
- ❖ **Step 2: Develop and adapt the common framework – the policy cycle** to link the different indicators to different steps in the policy-cycle in the different policy areas
- ❖ **Step 3: produce a mapping of opportunities** for the use of indicators and potential indicators (ONGOING)
=> Carrying out structure interviews and brainstorming sessions/discussions as part of the workshops



II.2. Key relevant policy areas identified

❖ **Selected policy areas which were meant to :**

- form the backbone of the three storylines
- allow us to target our policy-maker consultation specific areas

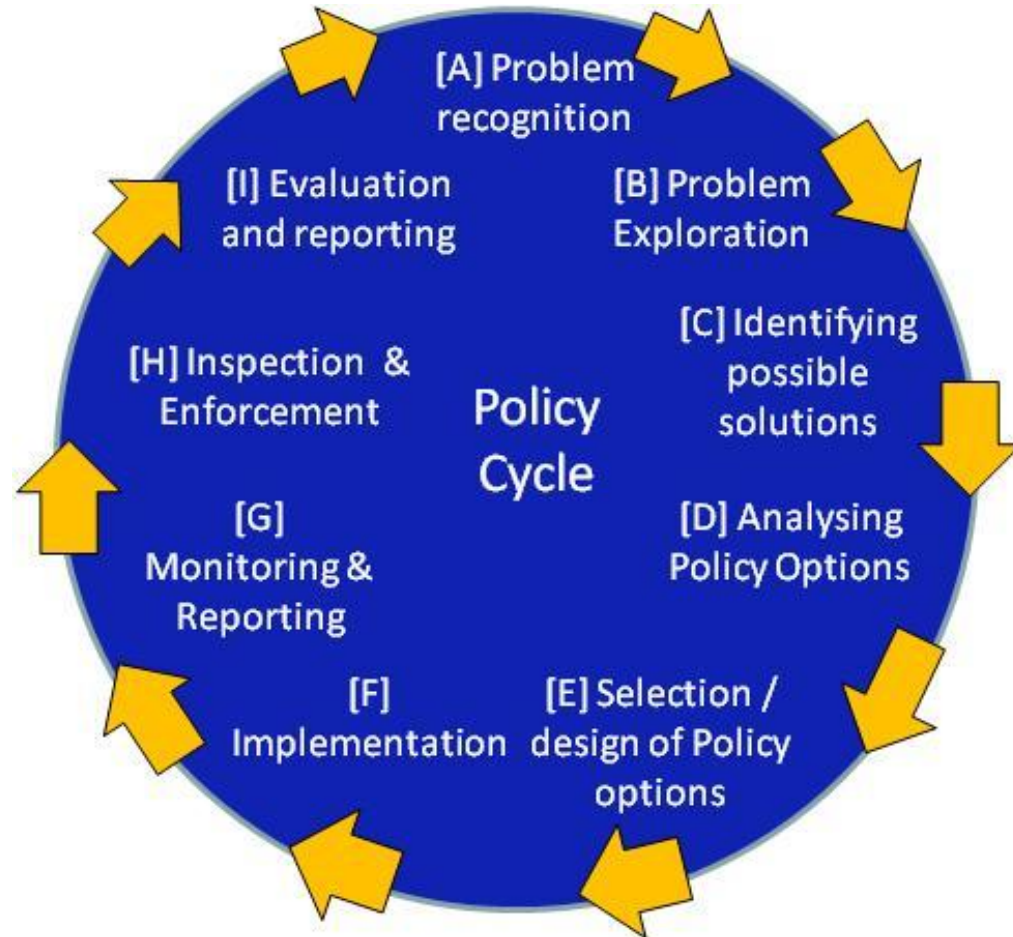
Policy areas	Specific policies
Biodiversity	<ul style="list-style-type: none"> • Biodiversity Action Plan • Habitats Directive • Birds Directive
Agriculture	<ul style="list-style-type: none"> • Rural Development programme 2007-2013 • 2007 Council Regulation on organic production and labelling of org. products
Fisheries	<ul style="list-style-type: none"> • Green Paper on the reform of the CFP
Resource efficiency	<ul style="list-style-type: none"> • Resource Thematic Strategy • EU Flagship Initiative – A resource efficient Europe
Waste	<ul style="list-style-type: none"> • Thematic Strategy on the prevention and recycling of waste • 2008 Directive on Waste • Intergrated Pollution Prevention and Control Directive (IPPC)
Climate Change	<ul style="list-style-type: none"> • EC Communication 20/20 by 2020 • Renewable Energy Directive
Cohesion Policy	<ul style="list-style-type: none"> • Community Strategic Guidelines on Cohesion 2007-2013
Energy efficiency	<ul style="list-style-type: none"> • Energy performance of buildings Directive • Future Energy Efficiency Action Plan

II.2. Framework: generic policy cycle adapted to policy areas

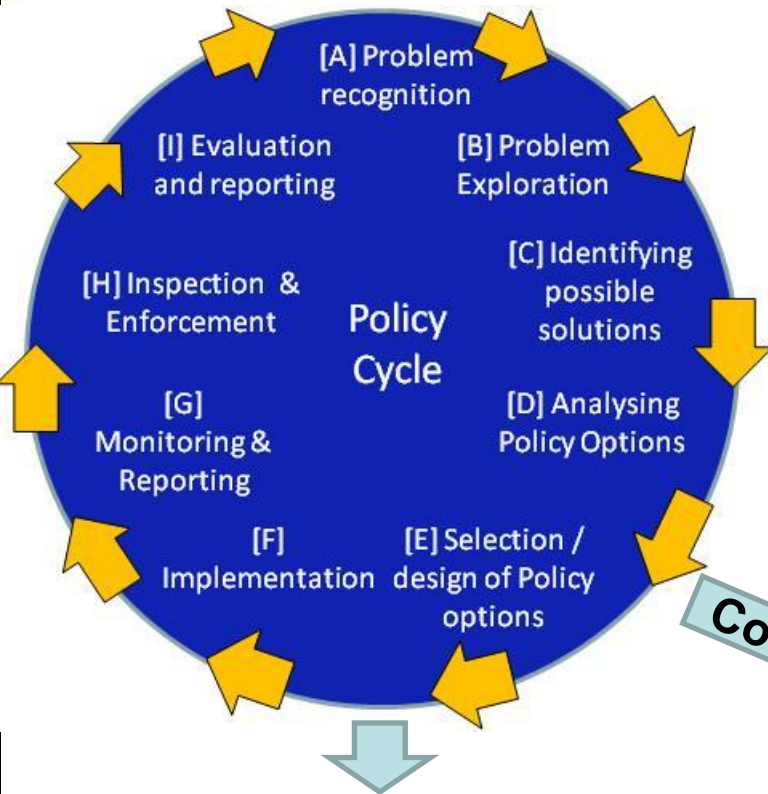


❖ Added value of the policy cycle :

- **Structuring thinking on indicators** around a context specific policy cycle (ie adapted to given policy area)
- **Identification of most indicators** which could be/have been used to inform decisions in a given policy area



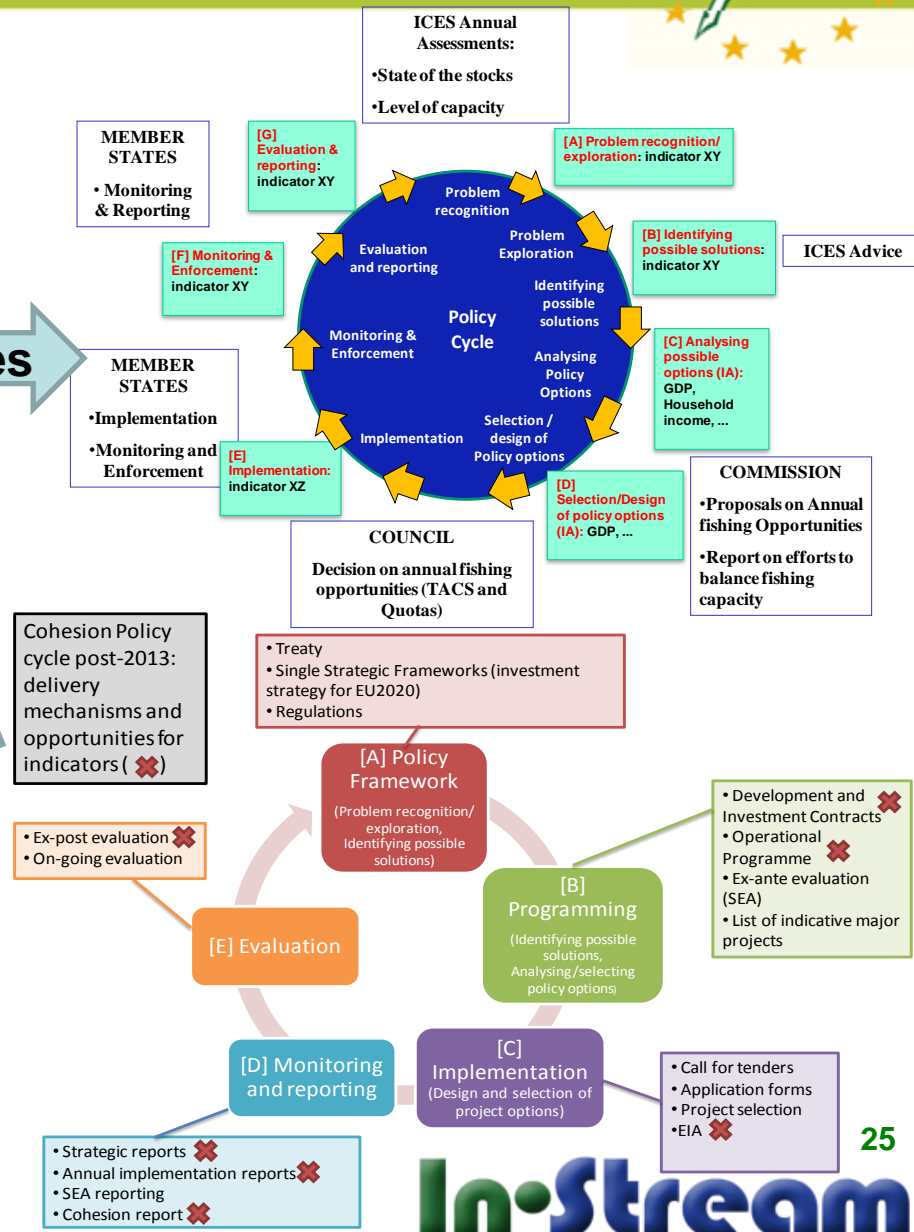
II.2. Adapting the generic policy cycle



Fisheries

Cohesion P

**Resource efficiency,
Agriculture, Climate
Change...etc**



II.1. Objectives of policy-maker consultation



❖ Ensuring policy relevance by taking into account policy context:

- Identify opportunities to improve use of indicators in policy-making
- Identify particular needs for additional/alternative indicators in view of policy priorities

❖ Involving end-users to ensure formulation of informed conclusions:

- On level of integration through the use of indicators
- On the scope for the use of indicators in different policy areas
- On persisting indicator gaps & possible candidates for filling these gaps

II.2. Questionnaire design



- ❖ Interview questionnaire was specifically designed to gather information on:
 - Where **existing indicators** could be **used better** (different point in policy cycle, greater importance given to the evidence) or **improved** (better methodology, better data)
 - Which **new indicators** could complement the current list of **In-stream indicators** known to be used in the different policy areas
 - Where **composite indicators** could have a role to play
- => It also investigates the need for **ESS indicators**, use of indicators to **identify critical thresholds and resource limits**



II.3. On the use of indicators for resource efficiency – presentations of latest findings

II.3. “Resource efficiency”



Resource efficiency as understood in Europe 2020, the Flagship on Resource efficiency and the upcoming Resource Efficient Europe Roadmap 2050:

=> Large in scope: “sustainable use of natural resources” reducing resource use while at the same time limiting the environmental impacts of resource use

=> Reaches out to related policy fields e.g. agriculture, climate change, industry, innovation, transport, etc.

II.3. Key policy areas for resource efficiency indicators and targets



❖ Higher tier Strategic orientations:

- Europe 2020 => Flagship initiative, Resource Efficient Europe Roadmap 2050

❖ Lower tier horizontal and overarching policies:

- EU SDS, Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan, Raw Materials Initiative
- Product policy tools such as the European Ecolabel and GPP, Ecodesign Directive etc.
- Thematic Strategy on the Prevention and recycling of waste

❖ Sectoral policies: will be key as natural resource policy develops

- WFD, Industrial Emissions Directive, CAP, CFP, Energy Policy, Transport Policy, Biodiversity policy

II.3. Resource efficiency: The use of sustainability indicators at present



- Data availability persistent challenge
- Growing experience in collection & analysis, increasing amount of data i.e. material flows (EW-MFAs)
- Some robust indicators e.g. Domestic Material Consumption (DMC) informing on trends in resource use (e.g. 8% increase of DMC of EU in absolute terms from 2000 to 2007)

Potentially interesting indicators:

- the Environmentally Weighted Material Consumption (EMC): identification of resources with most environmentally harmful impacts
- the Total Material Requirement (TMR) : resources embedded in traded goods & products, including hidden material flows such as waste in production.

II.3. Resource efficiency: Successful examples ?



Non-State stakeholders: Regular reporting of **ecological footprints** – to highlight EU's impacts on biocapacity.

Germany: 2002 German SDS: target of **doubling abiotic raw-material productivity**

2008 Resource Efficiency Strategy - two additional targets:

- **Factor 4** (quadrupling resource productivity in the medium term)
- Germany **most resource efficient of all** larger economies by 2020

Finland: 2009 Natural Resource Strategy:

Key **strategic goals** requiring measurement:

- 1) a thriving bioeconomy generating high added value,
- 2) utilise and recycle material flows effectively,
- 3) regional resource generate both national added value and local well-being

II. 3. Future opportunities (I)



- **Proposed regulation on European Environmental Economic Accounts module for EW-MFA accounts data for:**
 - Biomass; Metal ores; Non/-metallic minerals; Fossil energy materials/carriers
 - **EP proposal for additional accounts? Eg.:**
 - Environmental goods and services sector; Ecosystem services accounts; Waste accounts; Forest accounts; Economy-wide material stock accounts (EW-MSA), etc.
- ⇒ **Policy relevance criteria may need to be applied to prioritise:**
- For monitoring & evaluating macro & sectoral policies (e.g. energy, trade...)
 - development of indicators across policy fields & more linking these to economic indicators
- ⇒ **Current phase: emphasis on problem exploration & recognition phase:**
- Aggregate indicators that measure & monitor macro-level issues, i.e. consumption of main resource categories, land-use, water, and carbon



[A] **Problem recognition**: e.g. primarily pressure indicators: land use; deforestation, land degradation, **waste generation**. Also, but to a lesser extent, impacts: biodiversity loss, pollution, **GHG emissions**. Drivers: **Energy Intensity**. For communication: National/product ecological/water footprint. Useful Frameworks/Data: HANPP, land use changes.

[B] **Problem exploration**: Robust Economy wide material flow accounts (EW-MFA) as prerequisites for the development of indicators: Domestic materials consumption (DMC, t/cp/year); Domestic Material Input (DMI) or DMC per unit of GDP/Material productivity; Raw Material Equivalents (RME); Raw Material Consumption (RMC), Total Material Consumption (TMC), disaggregated material flows, Raw material equivalents of imports; environmental impact indicator per unit of resource use, i.e. Environmentally weighted Material Consumption (EMC); Freight transport volume.

[C] **Identifying possible solutions**: e.g. identify sustainable levels of resource extraction/exploitation, increasing collection & recycling rates of certain materials, identify possible targets.

[D] **Analysing possible options (IA)**: e.g. impact of different options incl. targets on resource use and associated pressured and impact on GDP, Household income, (prices), employment, implementation costs, etc.

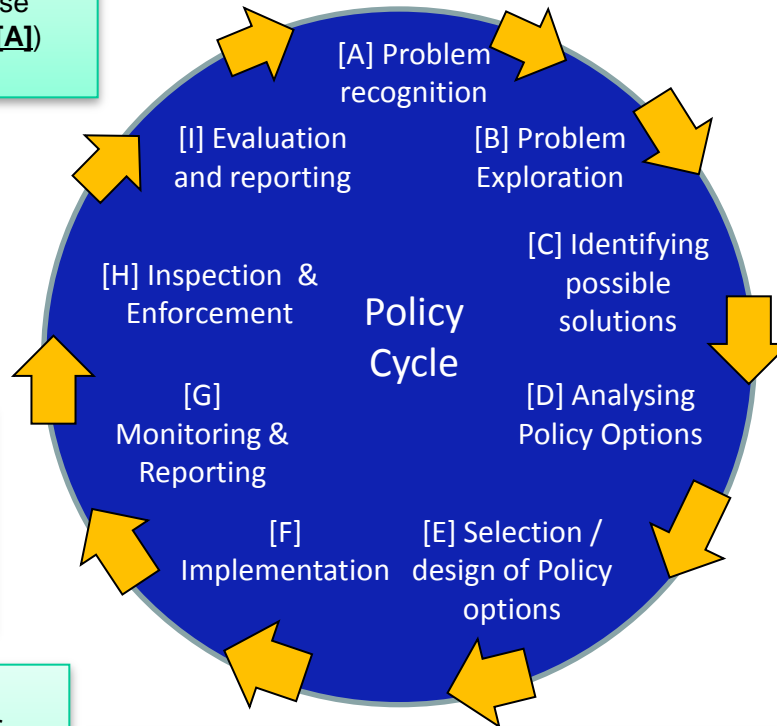
[E] **Selection/Design of policy options (IA)**: e.g. refine standards/ targets which could be set: aggregate and policy area specific (material flow per unit of GDP; sustainability criteria for biofuels, HANPP), disaggregated material productivity targets (relative decoupling); product ecological/water/Carbon footprints

[F] **Implementation**: e.g. development of criteria for granting of funding to support innovation & investment;
Communication: Footprints (cf. [E])

[G] **Monitoring & reporting**: trends in moving towards the targets identified in step [E], monitoring effects on impacts identified in [A]

[H] **Inspection & enforcement**: Input output indicators at industry/firm level, where targets have been set at this level

[I] **Evaluation & reporting**: DMC per unit of DGP (per sector, per material). Also indicators of resource use drivers and impact (cf. [A])



II.3. Some of the key recommendations



- More work needed on **resource/ecological thresholds** which should be linked to targets/limits.
- Continue to develop an **Environmentally Weighted Material Consumption indicator** (while already taking measures on identified priority materials)
- For overall resource use, move from domestic material consumption (DMC) to **raw material equivalent (RME)** as intermediate step to moving towards total material requirement (TMR) at least for selected material categories
- Further work on product **life-cycle associated indicators** needed, disaggregating RME/TMR to the product level
- Targeted policies on specific resources require **special indicators**
- Consider role of the **Index for Environmental Pressures** in monitoring resource efficiency policy and for problem identification. Ultimately objective should be to take a **multi-criteria approach** rather than deal with impacts in isolation

II.3.Next steps...



- **Further interviews (until end of April)**
- **Submitting the draft final version of this section for review & feedback to experts having expressed interest**
- **Finalisation of the section on the use of indicators for an effective European resource efficiency policy**

II.3. Questions for discussion



- **Would some policies require the development and use of indicators which would need to be based on data collected consistently at sectoral (or firm) level across EU MS? Could such data realistically be collected?**
- **Have critical thresholds been used enough with regard to resource use and has their consideration influenced policy outcomes?**
- **Is there a role for ecosystem service indicators in resource efficiency policy?**



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Thank you

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