

“Capacity Building and Strengthening Institutional Arrangement”

Workshop: “Sustainable Development”

# **Guidelines for Environmental Protection Aspects of Sustainable Development**

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# 1. Environmental protection aspects of sustainable development

Since the definition of Sustainable Development has been conceived and endorsed by the international community, the comprehension of environmental issues has encompassed the only understanding of natural phenomena (physical, chemical, geological), but it has been included in a global vision, that acknowledges the interdependent and mutual relationship among three “pillars”:

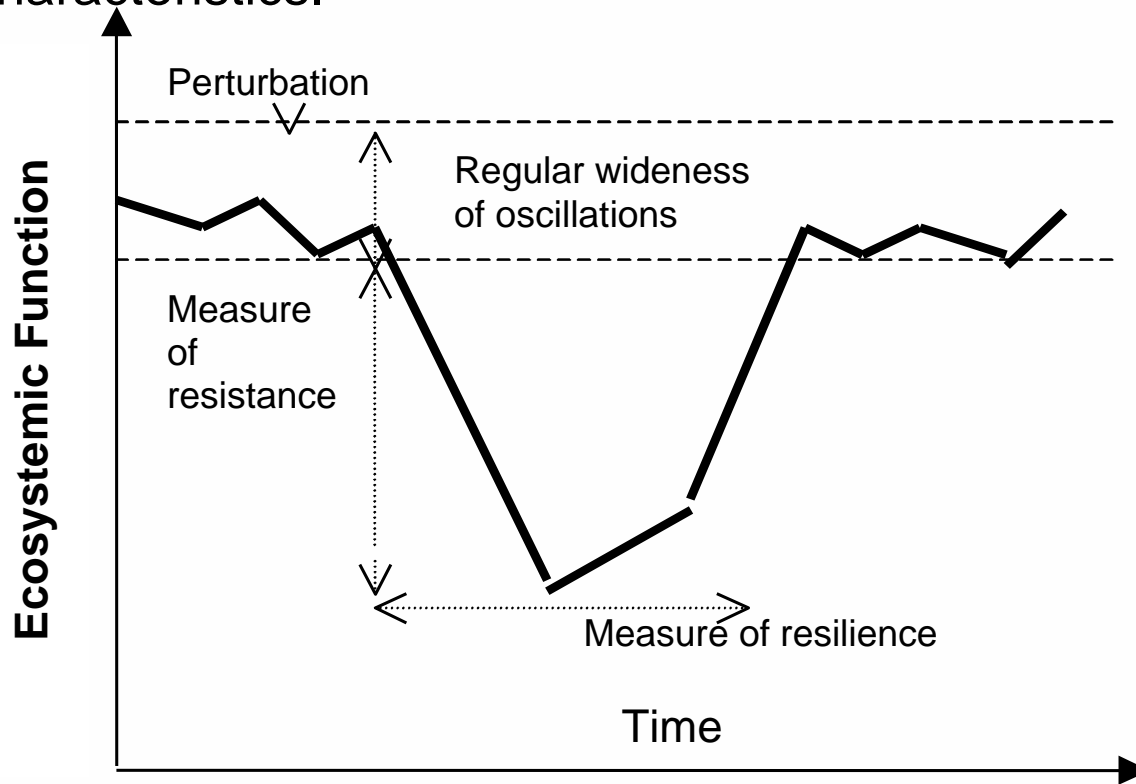
- Economic
- Environmental
- Social.

Thus, the problem of conservation of earth’s natural resources is strictly linked to the quality of life of 6 billion people in the world, and also to the political and economic strategies of Governments, in order to guarantee the future well-being for the whole human kind.



# 1. Environmental protection aspects of sustainable development

In order to achieve the goal of sustainability, the ecosystems' stability must be considered, as the capability to regenerate themselves and to renew their primitive characteristics.



**Fig.- Stability of resistance and resilience**

## 2. Environmental indicators



To choose some reference parameters is needed for the understanding of the complexity of environmental sustainability aspects.

There are many kinds of such parameters, that are used to measure aspects of our daily life, as for example:

## 2. Environmental indicators

### Example 1: speed control (taximeter)



## 2. Environmental indicators

### Example 2: flight control (aeroplane dashboard)



## 2. Environmental indicators

### DEFINITION:

*“Indicator is a parameter, or a value derived from parameters, which points to, provides information about, describes the state of a phenomenon / environment / area, with a significance extending beyond that directly associated with a parameter value”.*

### FUNCTIONS AND CHARACTERISTICS:

- they should be regarded as an expression of “the best knowledge available” on the issues considered;
- they reduce the number of measurements and parameters that normally would be required to give an exact presentation of a situation. (In fact, the size of an indicator set need to be limited);
- they simplify the communication process by which the results of measurement are provided to the users.

*From “Environmental indicators for environmental performance review”, OECD, 1993*



## 2. Environmental indicators

### CRITERIA OF SELECTION

The main criteria for selecting environmental indicators are:

- policy relevance and utility for users
- analytical soundness
- measurability

### OBJECTIVES

An indicator of sustainability should:

- provide a definition and a synthetic evaluation of the achievement of a sustainable development objective through the measurement of a set of considered significant indicators, both qualitative and quantitative.

### 3. DPSIR Framework for the classification of sustainability indicators

The DPSIR Framework (Driving Force, Pressure, State, Impact, Response) is a model developed by the EEA (European Environmental Agency), on the basis of the PSR Model by the OECD, inserting two new logical key variables in the process: the *driving forces* and the *impacts*.

**D** = Driving force: economic and social processes

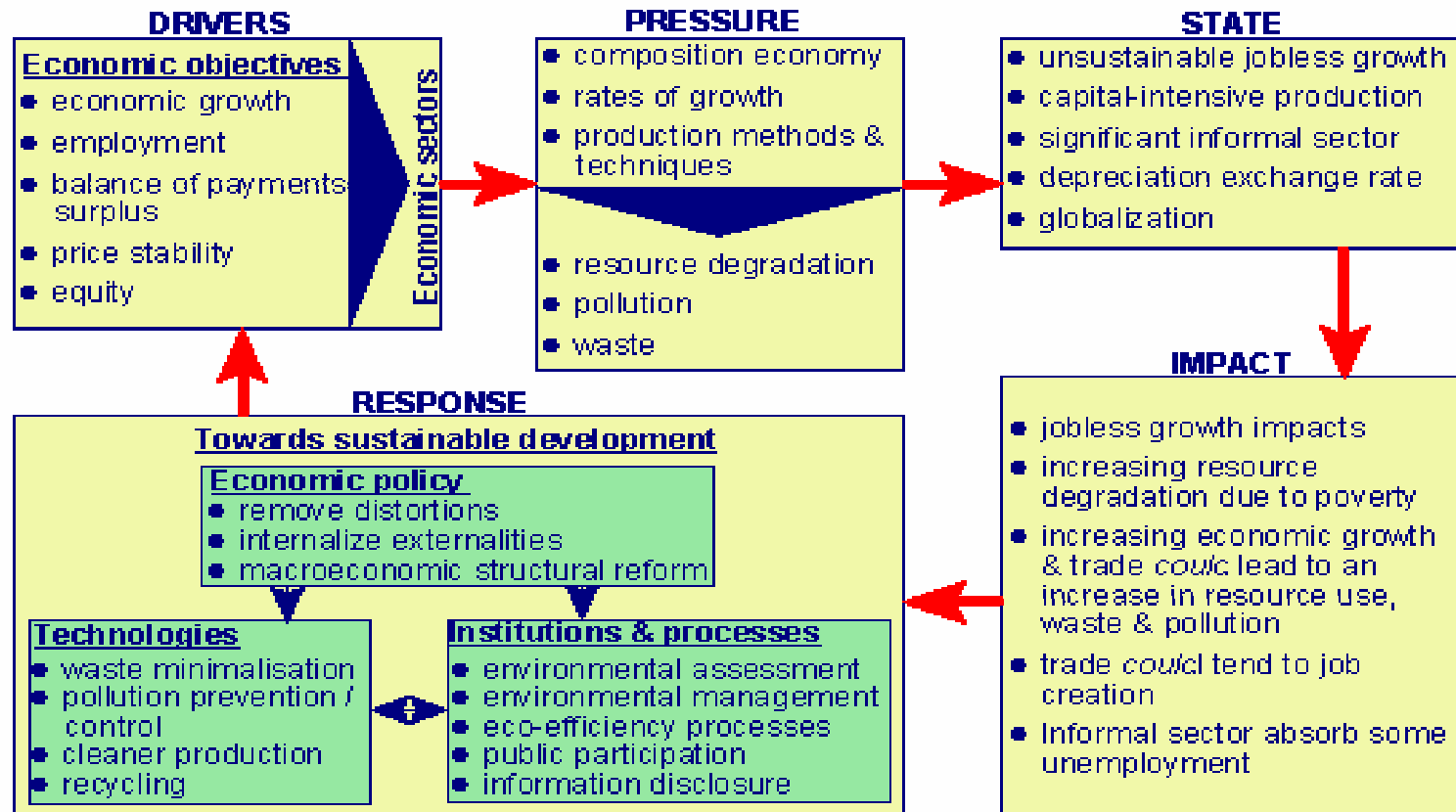
**P** = Pressure: the activities of the driving forces which cause modifications in the environment

**S** = State: the description of the environmental state at the present

**I** = Impact: the outcomes of pressures and responses that modify the state of the environment

**R** = Responses: policies and actions adopted (in order to reduce impacts).

### 3. DPSIR Framework for the classification of sustainability indicators



The DPSIR model was also adopted a conceptual and operative methodology for the elaboration of the APAT Environmental Yearbook, which collects about 150.000 data, divided in 250 indicators.

## 4. C.S.D. Sustainable Development Indicators

In 1995 the Commission for Sustainable Development of the United Nations approved the “*Programme of Work on Indicators of Sustainable Development*”, aimed to build a set of sustainable development indicators to be usefull in national policies and in the reporting activities of CSD and of other intergovernative organizations.

A set of **134** social, environmental, economic and institutional indicators, together with a metodological framework was early tested in a limited number of Countries, then was spread and used to build the “Country Profiles”.

Namely, for the Environmental Thematic Area, the following framework has been defined:

## 4. C.S.D. Sustainable Development Indicators

ENVIRONMENT		
Theme	Sub-theme	Indicator
Atmosphere	Climate Change	•Emissions of Greenhouse Gases
	Ozone Layer Depletion	•Consumption of Ozone Depleting Substances
	Air Quality	•Concentration of Air Pollutants in Urban Areas
Land	Agriculture	•Arable and Permanent Crop Land Area •Use of Fertilizers •Use of Agricultural Pesticides
	Forests	•Forest Area as a Percent of Land Area •Wood Harvesting Intensity
	Desertification	•Land Affected by Desertification
	Urbanization	•Area of Urban Formal and Informal Settlements

## 4. C.S.D. Sustainable Development Indicators

ENVIRONMENT		
Theme	Sub-theme	Indicator
Oceans, Seas and Coasts	Coastal Zone	<ul style="list-style-type: none"> <li>•Algae Concentration in Coastal Waters</li> <li>•Percent of Total Population Living in Coastal Areas</li> </ul>
	Fisheries	<ul style="list-style-type: none"> <li>•Annual Catch by Major Species</li> </ul>
Fresh Water	Water Quantity	<ul style="list-style-type: none"> <li>•Annual Withdrawal of Ground and Surface Water as a Percent of Total Available Water</li> </ul>
	Water Quality	<ul style="list-style-type: none"> <li>•BOD in Water Bodies</li> <li>•Concentration of Faecal Coliform in Freshwater</li> </ul>
Biodiversity	Ecosystem	<ul style="list-style-type: none"> <li>•Area of Selected Key Ecosystems</li> <li>•Protected Area as a % of Total Area</li> </ul>
	Species	<ul style="list-style-type: none"> <li>•Abundance of Selected Key Species</li> </ul>

5 Themes

13 Sub-themes

19 Indicators

## 5. E.U. Environmental Indicators

Since 2000 the European Union has defined six domains of interest in the European Strategy of Development:

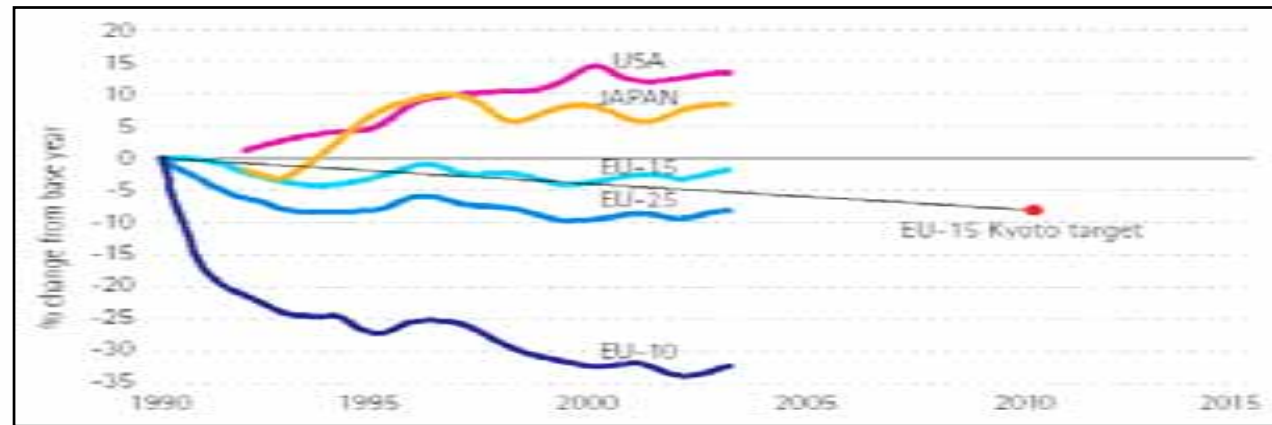
- General Economic Background,
- Employment,
- Innovation and Research,
- Economic Reform,
- Social Cohesion,
- **Environment.**

For each domain a list of Structural Indicators has been identified. In the follow the Environmental Indicators adopted are described.

They were also endorsed by the E.U. Sustainable Development Strategy, adopted by the European Council in Gothenburg in June 2001 and renewed in June 2006.

## (I) - Climate change - Greenhouse gas emissions

The EU-15 Kyoto target is an 8% reduction in greenhouse gas emissions compared to base year 1990 levels by 2008-12.



Data for 2003 show that the EU-15 had archived a 1.7% reduction over 1990 levels, showing a reversed trend compared to 2002.

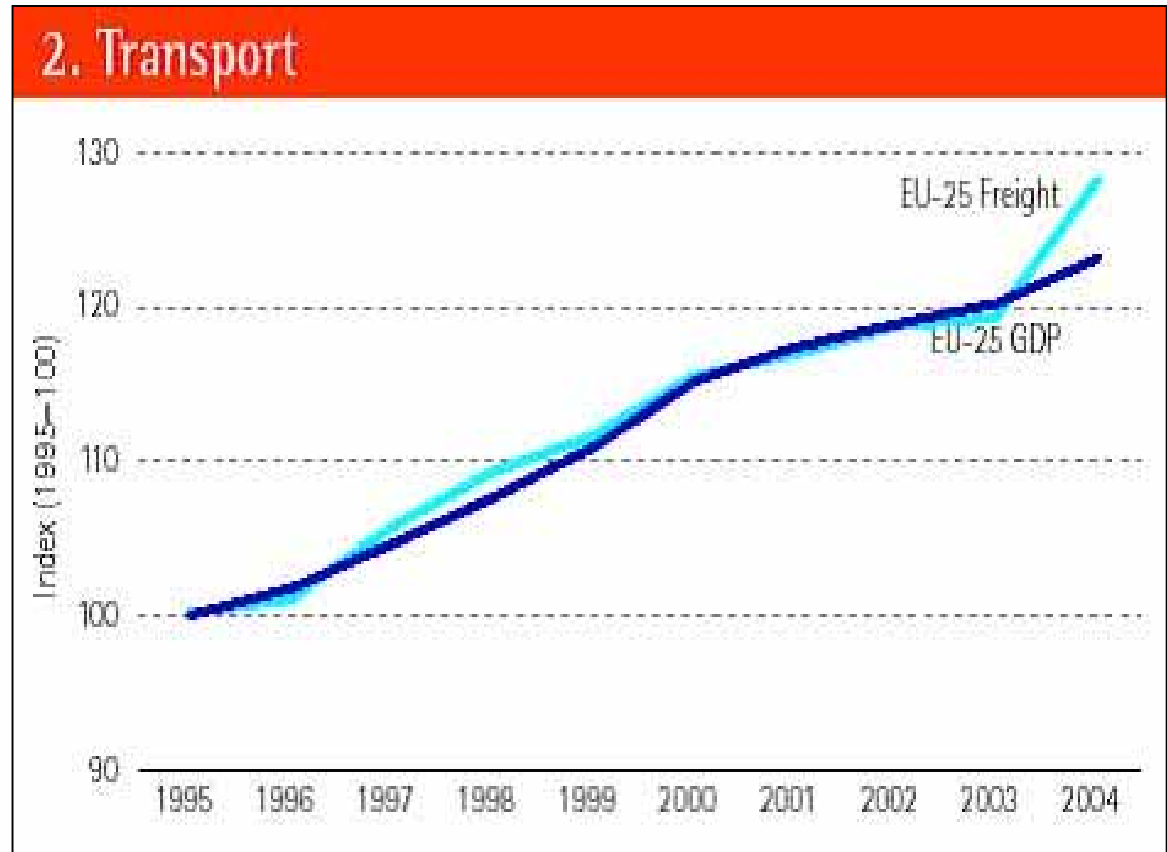
In order to meet its Kyoto target, the EU-15 needs to implement additional policies and measures as well as make use of Kyoto 'flexible mechanisms'.

All 10 new EU Member States have ratified the Kyoto Protocol and the eight (Cyprus and Malta do not have emissions reductions targets under the Kyoto protocol) that have committed to reduce their emissions by either 8% or 6% had, in 2003, already managed to successfully exceed their Kyoto target (except for Slovenia).



## (II) – Transport

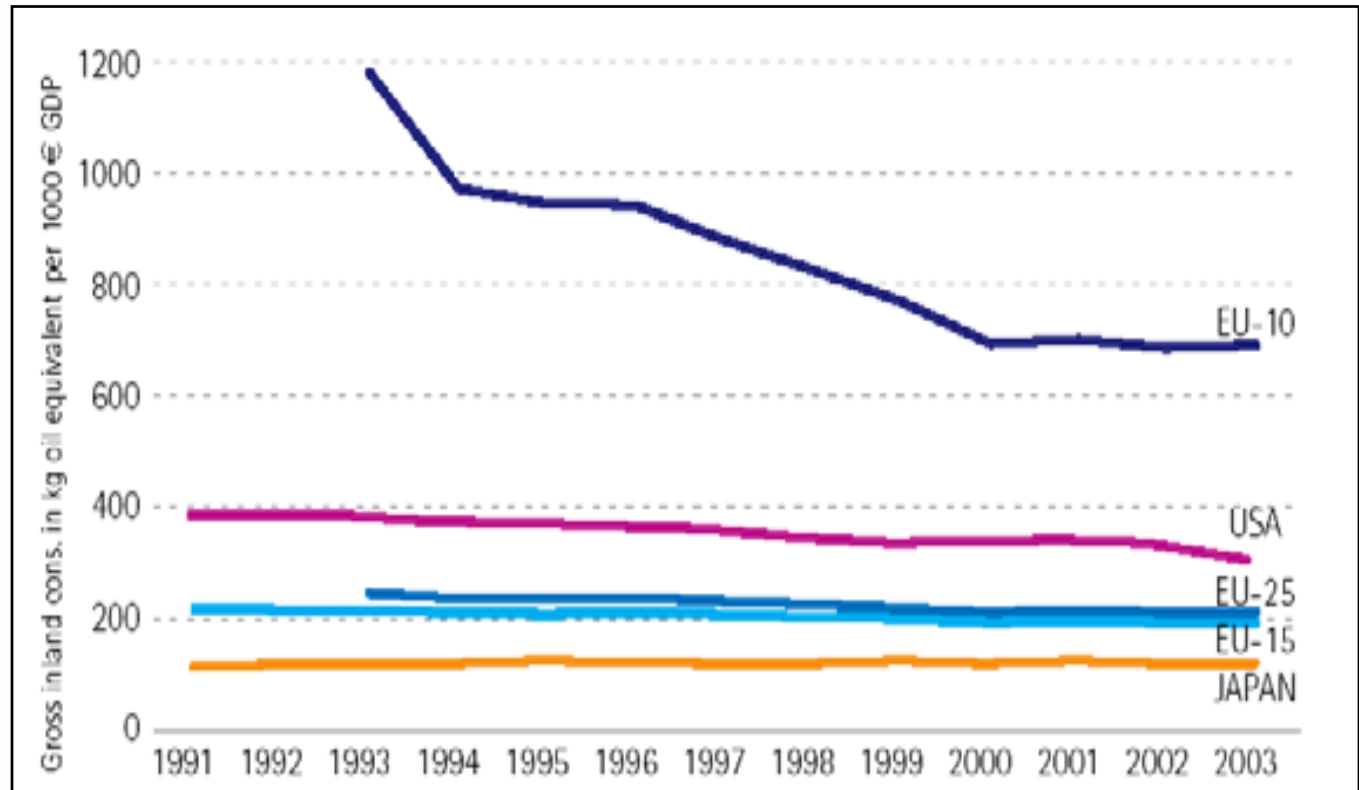
The EU aims to decouple transport growth from economic growth. Between 1995 and 2004 freight transport has increased by 28 % while GDP increased by 23.1 %. The increase is mainly due to road transport, which increased by more than 32 %. The growth in freight transport has been far from uniform. A sharp increase in the freight transport statistics in 2004 partially reflects a change in statistical methodology.



Moreover, greenhouse gas emissions from transport continue to grow on average by 1 % per year.

### (III) - Energy intensity

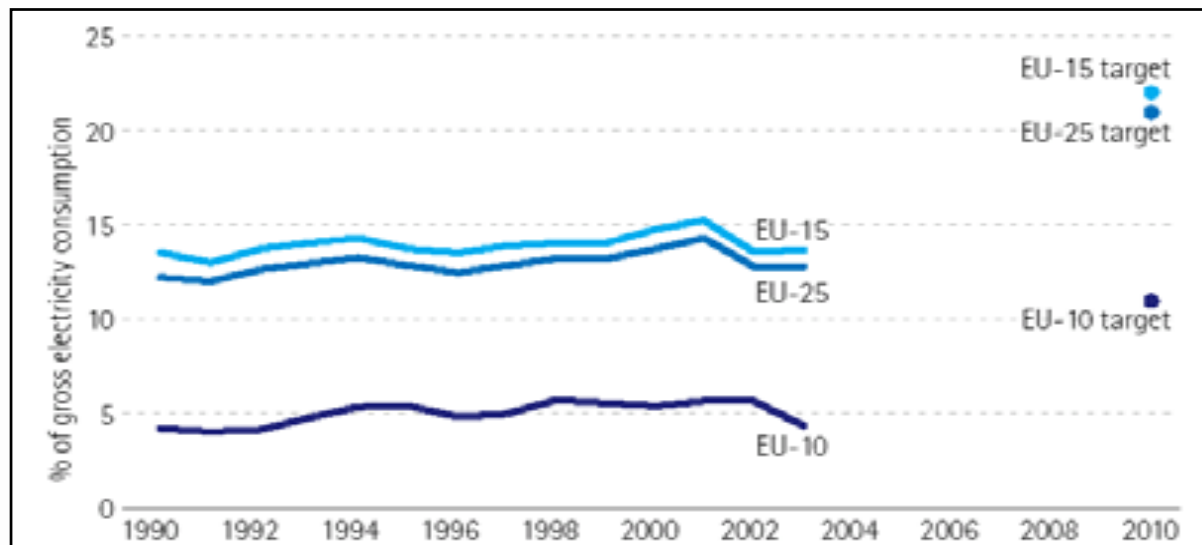
During the 1990s energy intensity steadily decreased in the EU, but since 2000 there has been no change. In 2003, as in 2001, energy intensity increased compared to the previous year.



Only seven Member States show a continuous and significant decrease in demand for energy per GDP, partly due to specific energy efficiency measures. The European Commission has proposed (2005 Green Paper on Energy efficiency) to set an EU target of reducing energy consumption by 20% compared to 2020 baseline as forecast in 2005.

## (IV) - Electricity from renewables

The EU's indicative target is to produce 21% of all electricity from renewable sources by 2010. The share of electricity produced from renewables in 2003 was 12.7%, as it was in 2002.



Increases in additional new renewable capacity are countered by lower production in hydroelectricity, which represents almost 80% of total renewable electricity but is largely determined by the weather conditions. Member States are showing varying trends; in particular renewables have increased significantly in Denmark and Spain. Certain countries have a greater natural potential for producing renewable energy. Policy discussions on EU targets beyond 2010 have commenced. The share of renewables in EU-10 has decreased in 2003 to reach 4.3%. This is largely due to the fact that in some countries, like Latvia, Slovakia and Slovenia, renewables decreased by more than 3.5%.

## (V) Energy indicators – Biodiversity – Bird populations

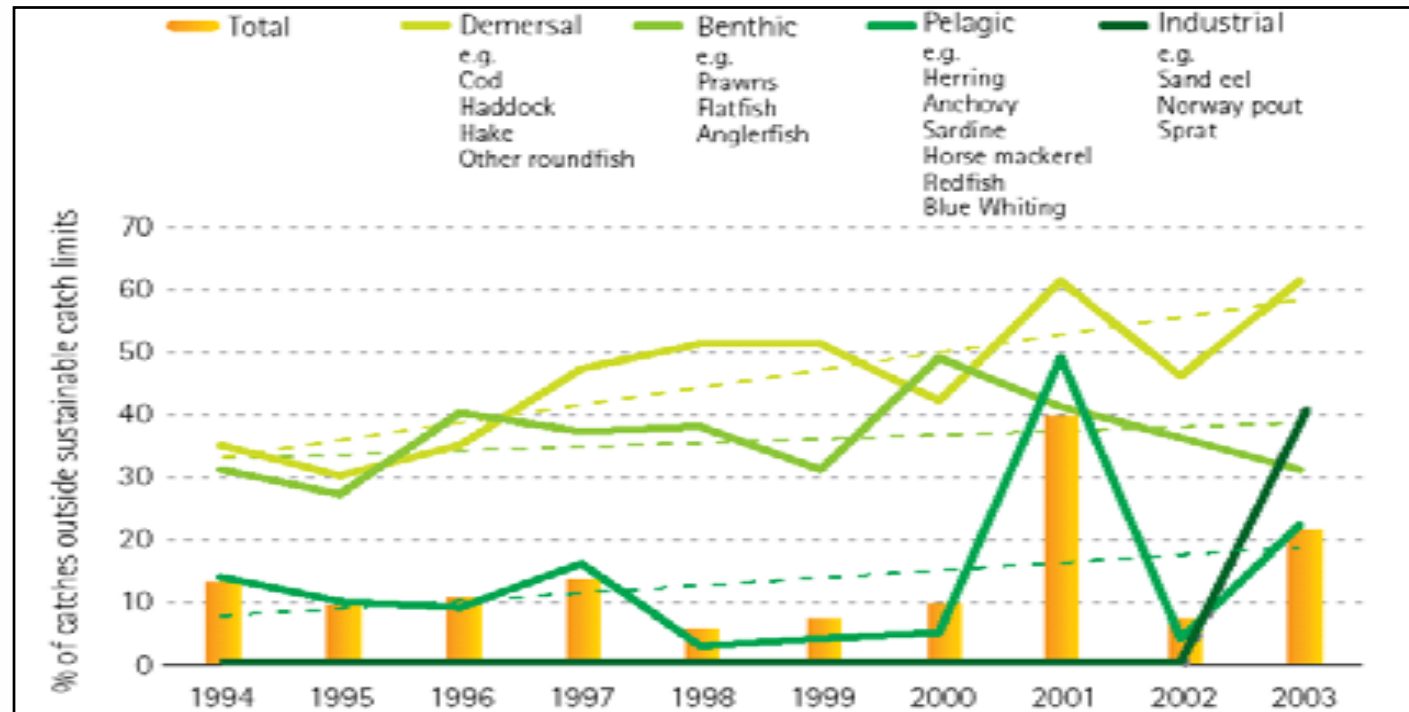
The EU has an objective of halting the loss of biodiversity by 2010. The trend in common armland bird species dependent on agricultural land for nesting or feeding is considered a good indicator of trends in farmland biodiversity.



Although the 2003 value of this indicator shows an increase in the common farmland bird population compared to 2002, there is concern about the general negative trend, in particular during recent decades. Changes in land use may explain part of this decline.

## (VI) Energy indicators - Fisheries - Catches outside safe limits

In 2003 22% of total catches were outside safe biological limits marking a substantial worsening compared to 2002 (8%).

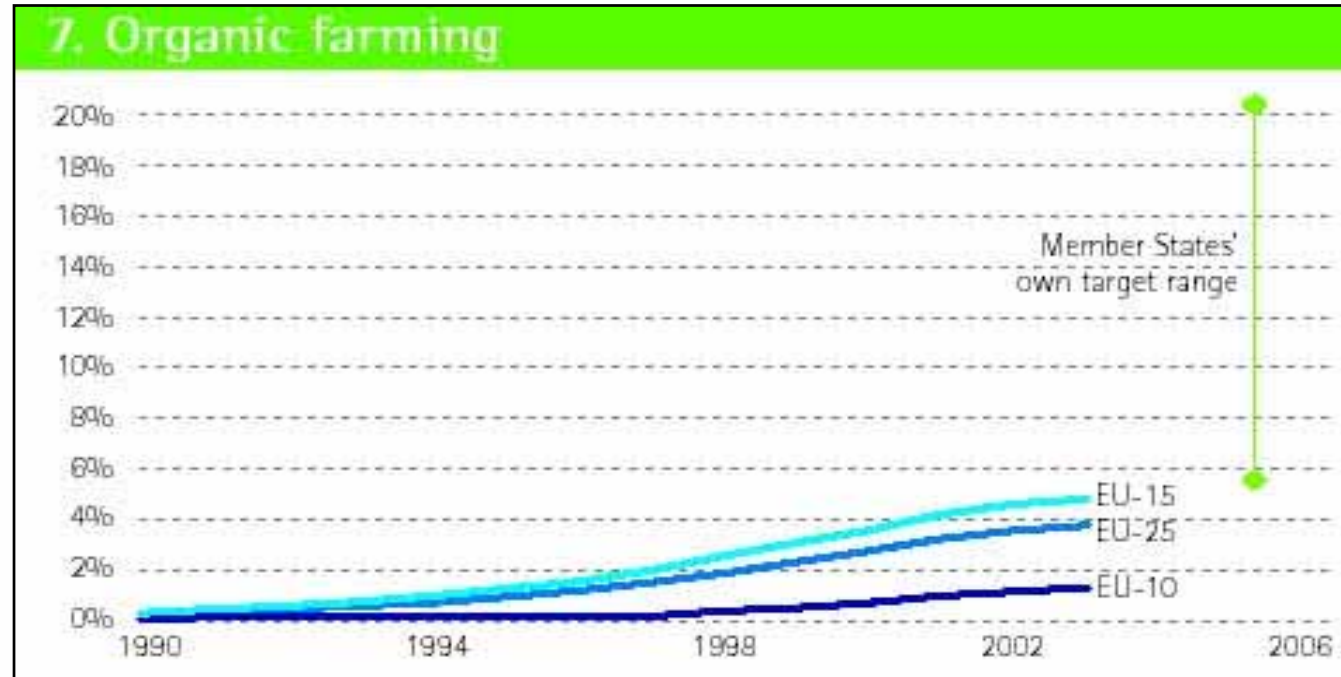


While the situation of benthos stocks improved since 2000 (31% stocks outside safe biological limits in 2003), bottom stocks have shown a constant deterioration (61% in 2003).

In 2001 and in 2003 some important pelagic and industrial stocks, which supply large catches, fell out of outside safe biological limits for the first time, causing the large variations in the indicator for these years.

## (VII) – Organic farming

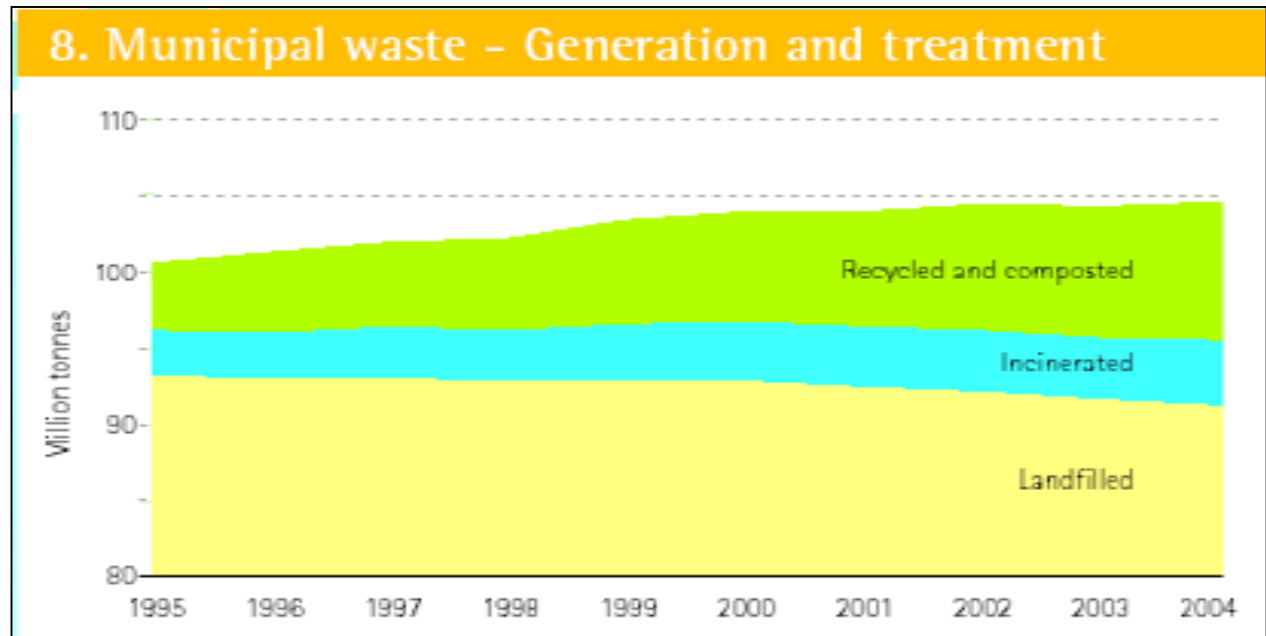
Organic farming is one way in which environmental concerns are incorporated into agriculture policy. Though organic farming has increased greatly since the 1980s, the growth rate has decreased from 18.9% in 2001 to 4.5% in 2003.



In 2003 organic farming was practised on 3.8% of total farmland, with differences between EU-15 (4.8%) and EU-10 (1.3%). 15 Member States show a continuous increase in recent years, in particular Greece. The countries which have the highest share of organic farming are Austria and Italy, with at least 8%.

## (VIII) – Municipal Waste

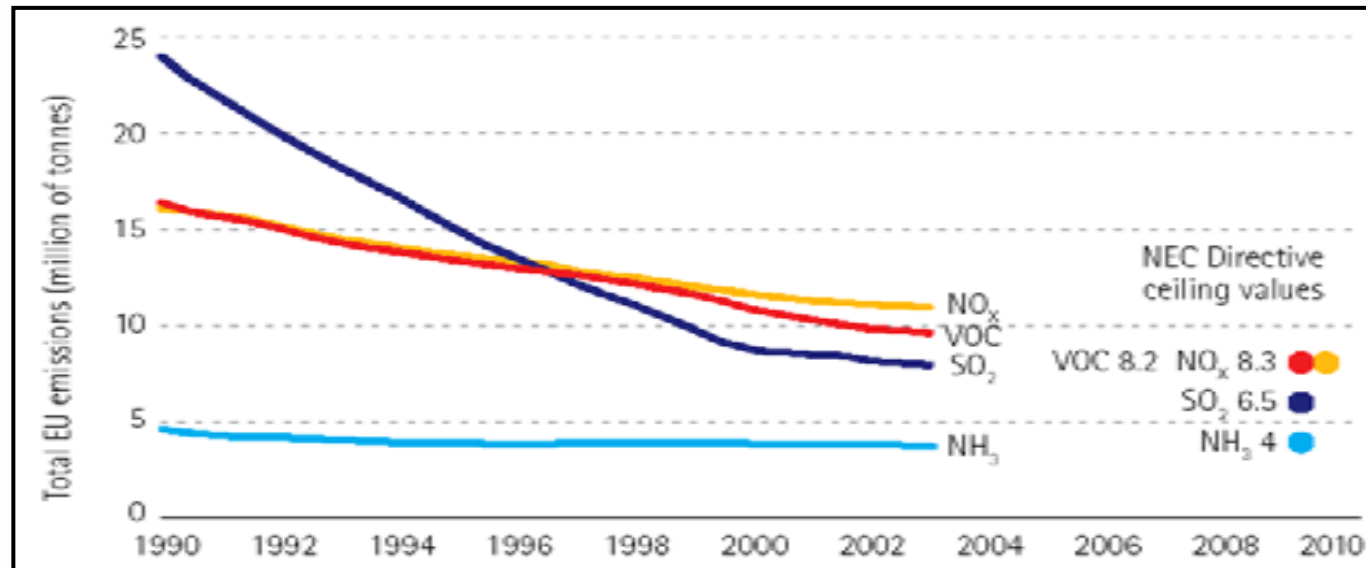
Between 1995 and 2004 municipal waste increased by 19.4%. No significant decoupling between the increase in waste generated and the increase in GDP seems to have been achieved, as they both follow roughly the same trend.



The amounts of municipal waste sent to landfill have been declining very slowly over the years. Recycling of municipal waste doubled between 1995 and 2004 to reach 89.4 million tonnes. Energy recovered by incineration is slowly increasing and in 2003 has generated about 8.8 million tonnes oil equivalent of energy.

## (IX) Energy indicators - Air emissions

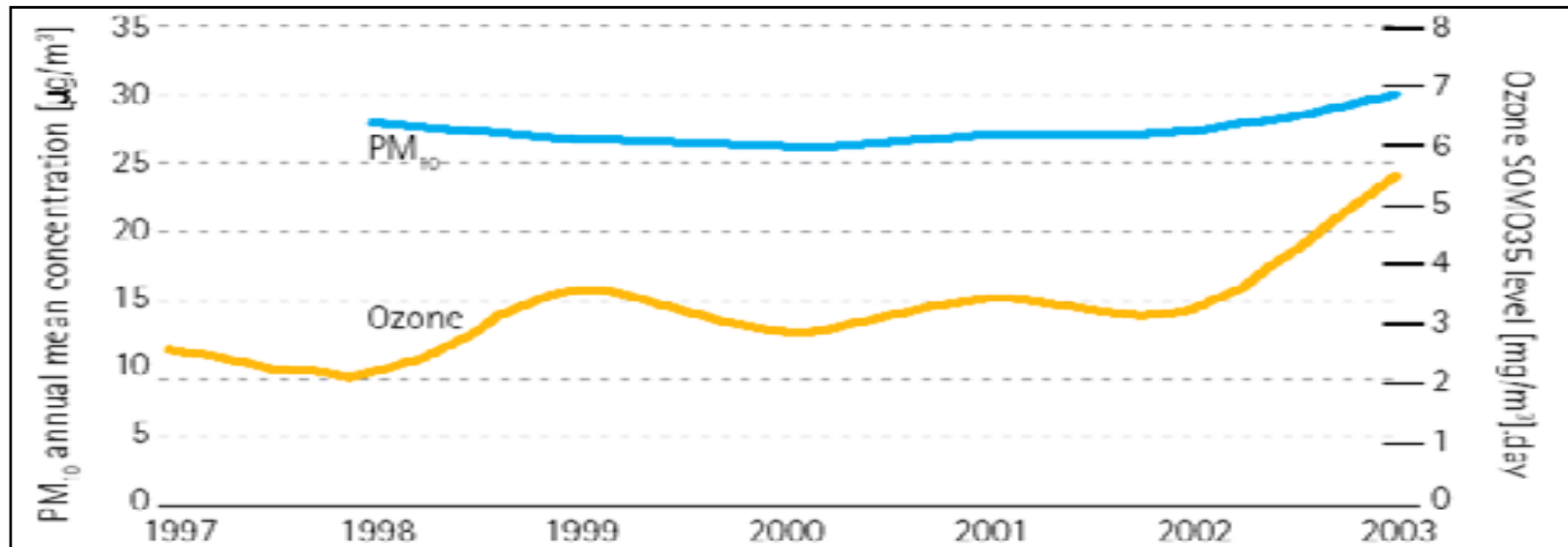
The EU has to reduce air emissions to 2010 targets as set by the National Emissions Ceiling Directive.



Since 1990 the EU-25 has reduced its sulphure dioxide (SO<sub>2</sub>) emissions by 66,9%, its nitrogen oxides (NO<sub>x</sub>) emissions by 32.2%, its volatile organic compounds (VOC) emissions by 41,5% and ammonia (NH<sub>3</sub>) emissions by 17,4%. Sulfure dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), volatile organic compounds (VOC) and ammonia (NH<sub>3</sub>) have harmful effects on human health and on the environment. They result in acidification, eutrophication and concentration of ground-level ozone and particulate matter.



## (X) Energy indicators - Urban air quality



Data from some large European cities indicate that concentrations of particulate matter (PM<sub>10</sub>) (including cities from 12 Member States AT, BE, CZ, DE, ES, FI, NL, PT, SE, SK, UK) are high and increased slightly in recent years. The increase in 2003 is partly due to unfavorable weather conditions. However, in many cities the situation did improve. Particulate matter has serious health implications, reducing life expectancy in the EU by about nine months and causing illness. (Source: Impact Assessment of the thematic strategy on air pollution).

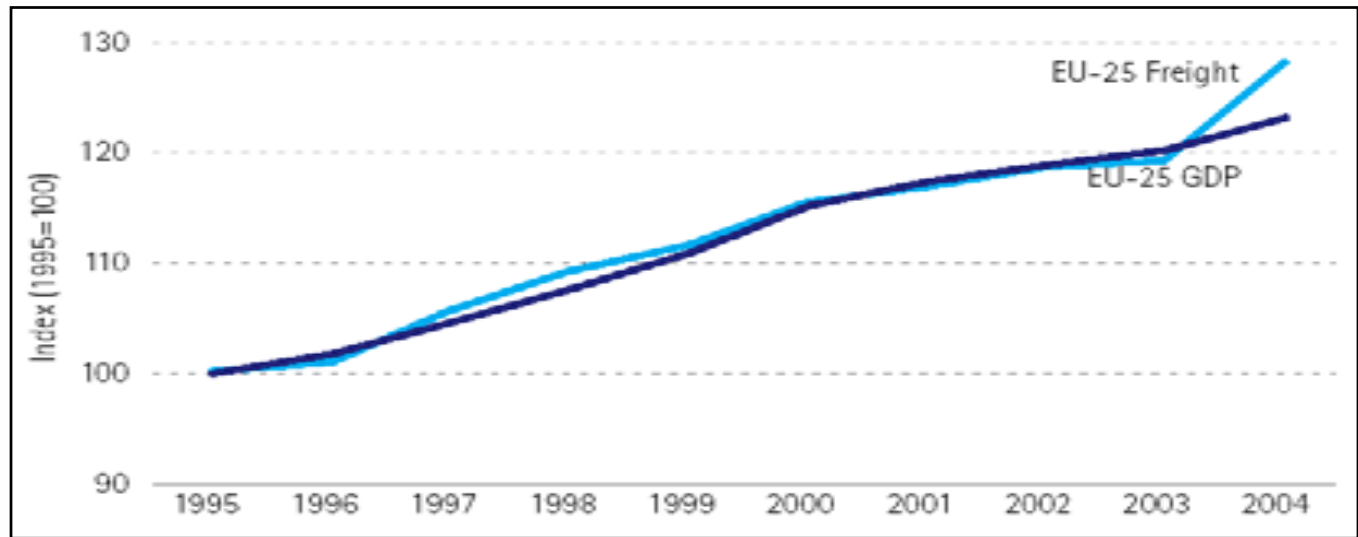
## (X) Energy indicators - Urban air quality (follows)

For ground-level ozone, concentrations seem not to be improving. (Results are based on “urban background station” in cities having a population over 250000 inhabitants, using  $PM_{10}$  annual mean concentrations and for the ozone indicator “sum of means over 35 ppb ozone” – SOMO35 – calculated from daily eighth-hourly maximum concentrations.

Population weighting is applied. Further information may be obtained from: [env-airquality@cec.u.int](mailto:env-airquality@cec.u.int) Differing annual weather conditions, like the heat wave in 2003, influence air pollution levels and cause variations unrelated to emission changes. Ozone causes respiratory diseases and is linked with premature deaths. It is a major health concern for vulnerable groups such as asthmatics, children and the elderly.

## (XI) - Energy indicators: example of decoupling indicators of phenomena

The EU aims to decouple transport growth from economic growth (Economic growth is measured by growth of Gross Domestic Product - GDP).



Between 1995 and 2004 freight transport has increased by 28% while GDP increased by 23.1%. The increase is mainly due to road transport, which increased by more than 32%. The growth in the freight transport has been far from uniform. A sharp increase in the freight transport statistics in 2004 partially reflects a change in statistical methodology. Moreover, greenhouse gas emissions from transport continue to grow on average by 1% per year.

## 6. European Common Indicators for Urban Sustainability

An other important tool to measure and evaluating progress towards sustainability in the urban context, is the **European Common Indicators Initiative**, launched by the European Commission (Hanover, 2000).

The project was co-funded also by the Italian Ministry of Environment and the **Italian National Environmental Protection Agency (today APAT)**.

A core set of **10 indicators** was built, to be used by local authorities as a shared system of evaluation and decision-making, in order to establish good practices of sustainability across Europe.

This core set is an example of integration among environmental, social and economic aspects into the same instrument of evaluation.

## 6. European Common Indicators for Urban Sustainability

### PRINCIPLES USED FOR INDICATORS' SELECTION

#### **Equality and social inclusion**

(guarantee to everyone the access to essential social services)

#### **Participation/democracy/governance**

(people's involvement in every aspect of the decisional processes)

#### **Interrelationship between local and global dimension**

(satisfaction of needs using local resources, the most the possible)

#### **Promotion of the local economy**

(occupational initiatives that have low impact on natural resources)

#### **Environmental protection**

(adoption of an ecosystemic approach in the land planning)

#### **Cultural heritage/quality of urban environment**

(protection and conservation of historic, cultural and architectural goods, spaces and buildings).

## 6. European Common Indicators for Urban Sustainability

### LIST OF INDICATORS (\*):

1. Citizen satisfaction with the local community
2. Local contribution to global climatic change
3. Local mobility and passenger transportation
4. Availability of local public open areas and services
5. Quality of local ambient air
6. Children's journeys' to and from school
7. Sustainable management of the local authority and local business
8. Noise pollution
9. Sustainable land use
10. Products promoting sustainability

(\*) In a second phase of the ECI project, the Ecological Footprint Index (EF) has been included as the eleventh indicator (or umbrella indicator) in the set, due to its integrated nature and its suitability for awareness raising and scenario evaluation.

## 7. The Italian experience: the Environmental Strategy for Sustainable Development

In Italy, a national Strategy for Sustainable Development was elaborated by the Ministry of Environment and formally approved by the Economic Committee in 2002.

The Strategy is mainly inspired to the principles and priorities of the VI European Environmental Action Plan, and to the objectives of the E.U. Sustainable Development Strategy.

Namely, the priority thematic areas are:

1. Climate change and ozone layer's protection
2. Protection of Biodiversity
3. Quality of life in urban environment
4. Sustainable management of natural resources, in particular in the field of water, production and consumptions patterns, waste management.

## 7. The Italian experience: the Environmental Strategy for Sustainable Development

The **OBJECTIVES** of the Strategy are:

- ✓ *To integrate environment in sectoral policies*
- ✓ *To adopt responsible life-styles*
- ✓ *To improve the global efficiency in the use of resources and to reduce wastes*
- ✓ *To extend the life of consumer's goods*
- ✓ *To use the Life Cycle Assessment*
- ✓ *To develop local production and markets*
- ✓ *To promote the participation of all social stakeholders*



## 7. The Italian experience: the Environmental Strategy for Sustainable Development

The following **INSTRUMENTS** for the implementation are namely recommended:

- ✓ *Application of the environmental protection legislation*
- ✓ *Integration of environmental concerns into all policies and in the develop of markets*
- ✓ *Ecological fiscal reform*
- ✓ *Strategic Environmental Evaluation (SEA) and Environmental Impact Evaluation (EIA).*
- ✓ *Environmental accounting*
- ✓ *Scientific and technologic research for sustainable development*
- ✓ *Indicators for environmental sustainability*

## 7. The Italian experience: the Environmental Strategy for Sustainable Development

**Sustainability INDICATORS** are identified for each Thematic Area, related to general and specific objectives, targets and time schedulings.

In particular, they have been elaborated with reference to:

- ✓ the *Environmental Indicators for the European Union*
- ✓ the *Environmental Indicators of the European Sustainable Development Strategy*
- ✓ the *European Common Indicators for Urban Sustainability.*

## 8. Conclusions

- The Environmental Indicators sets elaborated at international, european and national level are fundamental instruments to represent the state of the environment in the different thematic fields, to improve the knowledge, to provide citizenship with a better scientific information about the environmental-social-economic factors.
- They also help Government and Local Authorities to plan appropriate and more efficient programmes and actions in the environmental policies, and to spread best practices of territorial governance.

## 9. References

<http://www.un.org/esa/sustdev/>

[http://europa.eu/pol/env/index\\_en.htm](http://europa.eu/pol/env/index_en.htm)

<http://www.sustainable-cities.org>

<http://www.apat.gov.it>