

TOOLS AND METHODS FOR THE GREEN ECONOMY

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(February 2013)

Executive coordination: Aster

May 2013

This publication is implemented through the PLASTICE project - www.plastice.org, CENTRAL-EUROPE programme
co-financed by the ERDF

The pathway of a sustainable economic development, carried out during the last two decades, has delivered several technological and methodological tools which became a key “tool box” for the industrial system and Public Administrations (local government) which act as principal drivers and managers of sustainable land services. The recent economic crisis (2008-2009) and the global climate change are increasing the interest and concern of common people and policy makers about availability and efficiency of the tools to integrate economy with social equity, reducing the environmental risks and the ecological scarcities.

These tools are useful to deliver a really sustainable product or service, and contribute to define the Green Economy as a “growth in income and employment driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services” (<http://www.unep.org/greeneconomy/AboutGEI/WhatsGEI/tabid/29784/Default.aspx>). Moreover, the impact assessment of products and services on the environment and society is crucial to define their sustainability and thus to derive the choices of the consumers, the end users and Public Authorities responsible for land governance. Private enterprises and industries are, instead, the target to improve the environmental added value of products in terms of the competitiveness and the new potential markets.

Since the 2002 Johannesburg World Summit, the international community is stimulating a transition of productions and consumption standards towards environmental sustainability by means of appropriate ‘green’ programmes and actions. The UNEP recent report¹ discusses a number of recommendations that would provide the necessary conditions for a successful transition to a green economy such as green investment and sustainable consumption patterns through tax incentives and market-based instruments, green public procurements, promotion of the trade of green goods and services, investment and subsidies on measures that promote the greening of the economy, education and training, public building, energy efficiency. However, a transition to a green economy should be supported by the necessary policy measures and the enabling conditions and it should be financed primarily by private investments, although public finance would be needed to initiate the transition.

The most relevant event in 2012 on the Sustainable Development themes, **Rio+20**², starting from the pathway of the twenties last years, has reaffirmed the global challenges facing the world today, and indicated the necessary actions at political level: to address an inclusive green economy in the context of sustainable development and poverty eradication, and the institutional framework for sustainable development.

The green economy has been recognised as one of the most important available tools able to provide options for policymaking without becoming a rigid set of rules. It should contribute to eradicating poverty as well as sustained economic growth, enhancing social inclusion, improving human welfare, creating opportunities for employment and decent work for all, while maintaining the healthy functioning of the Earth's ecosystems and enhancing our ability to manage natural resources sustainably, increasing resource efficiency and reducing waste (ref. A).

European Union has addressed a sustainable consumption and production approach as a prior and crucial challenge in the current decade. The main goal would be to improve the environmental performances of the products and to increase the demand of the low impact technologies and services using several synergic approaches on the policy measures, subsidies on the ecolabels products, multi-lateral environmental agreements. Each Member State should have adopted several strategies through framework programs, national action plans and regulatory intervention on clusters and product chains in order to boost the regional excellences, the environmental driven performances and the improvements in the local governance.

Finally, the Council of European Union, after Rio+20, has affirmed the intention of designating a UN Member State body, taking any necessary steps towards the full, effective and timely operationalization of the "10-Year Framework of Programmes on Sustainable Consumption and Production"³ adopted at Rio+20, which contains decisions on SCP (Sustainable Consumption and Production) agreed at the global level that should be implemented as soon as possible in the coming years; it has also confirmed its determination to work for its successful implementation (ref. B, C).



According to the orientation⁴ of the European Commission, **strengthening the research on sustainable development and the link between science and policy** are strategic targets to foster a factual Green Economy. It should be based on:

Green Management: the systems of governance need efficient policies, regulators and control mechanisms which are going to be more and more crucial in next years to foster effective change in business models. The use of mandatory or voluntary tools will support this change and the training of stakeholders and operators will be fundamental for the real mainstreaming of the environmental governance as a cross-cutting action in all sectors of interest.

Green Production: there is a continuous need of enterprises committed in a sustainable way for the manufacture of high ecological value products and services. This objective is fostered by the enhancement of the industrial driven research and the setup of efficient, adequate and simple to use tools and methods. Moreover, the correct dissemination of the results and the appropriate communication to the citizens about the sustainable economic development can contribute to avoid the upcoming green washing actions.

Green Lifestyle: the sustainable consumption addressed by European policies should target the growth of a new kind of consumer, a change of lifestyle and a different way of economic models implementation.

Green Technology: the contribution of innovation technology is a key issue, and it involves the development of adequate tools for the implementation of useful and environment-friendly technologies in compliance with the decrease of pollution and the sustainable exploitation of natural resources.

The identified key tools can be grouped in four main categories:

1. Tools for a sustainable governance,
2. Tools and methods for the environmental, economic and social assessment,
3. Tools for the environmental management and certifications,
4. Tools for the sustainable design.

1.

TOOLS FOR A SUSTAINABLE GOVERNANCE

At first, a “command and control” approach has characterised the track of sustainable development built up on new environmental driven regulations and legislations; thereafter, several voluntary tools have been set up and applied by enterprises and organisations to improve their environmental performances.

The Environmental Impact Assessment (EIA) and the Strategic Environmental Assessment (SEA) are the most important mandatory tools. The EIA is an assessment of the possible positive or negative impact that a proposed project may have on a sustainable development, consisting of the environmental, social and economic aspects, and it rapidly have become a keystone of the European legislation for the environment. The SEA is a systematic decision support process, aiming to ensure that environmental and, if possible, other sustainability aspects are considered effectively in policy, plan and programme making.

Major lacks in EIA reports still concern the difficulty to address the impacts on environmental components as a whole system according to an holistic approach for the evaluation of a project.

Moreover the legislation on EIA and SEA is experiencing several modifications both at national and local level causing adjustments in administrative procedures and the need for a new scientific expertise.

The quantity and the quality of products and services are responsible of the high consumption of resources and energy and other environmental impacts that should be adequately evaluated by analysing their entire life cycle of them (e.g. extraction of raw materials, production, distribution, usage, end of life). In fact, several improvements are envisaged as a consequence of the innovation in technologies and a better organization of the production chain.

The European Commission is promoting an integrated approach for environmental policies in order to support prevention and decreasing of impacts by means of the coordination of existing tools and regulation (e.g. taxes, subsidies, procurements) and their implementation in products and services. This approach is evident in the “Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan”, published by the Commission in 2008 (ref. C), which intends to be a dynamic framework to improve the energy and environmental



performance of products and to foster their uptake by consumers. The approach will address products that have high potential for reducing environmental impacts. The challenge is to create a virtuous circle by improving the overall environmental performance of the products throughout their life-cycle, promoting and stimulating the demand of sustainable products and production technologies and helping consumers to make proper choices.

Green Public Procurement (GPP) (ref. D, E) is a voluntary instrument defined in the Communication (COM (2008) 400) "Public procurement for a better environment" as "a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured." GPP will be further strengthened by voluntary measures, which will act as a complement to the mandatory measures described above, consistent with the rules of the Internal Market.

European Commission has established the criteria (ref. F) for some types of products based on data from an evidence, on existing eco-label criteria and on the information collected from stakeholders of industry, civil society and Member States. The evidence based uses available scientific information and data, adopts a life-cycle approach and engages stakeholders who meet to discuss issues and develop consensus. Moreover, Member States should adopt their own and specific National Action Plans for the national criteria definition according to the European ones in order to harmonize the Internal Market. The Italian National Action Plan was approved by the Italian Ministry for Environment and Territory and Sea in 2008 (ref. G); one of the main objectives was to identify the priority market categories for the development of the "Minimal Environmental Criteria (CAM)" (ref. H). The research activities in this field includes the setup of BREF (Bat References), the identification of minimal criteria on wide variety of products categories and the circulation of BAT (Best Available Techniques) in each production sector.

2.

METHODS AND TOOLS FOR ENVIRONMENTAL, ECONOMIC AND SOCIAL ASSESSMENT

The **Life Cycle Assessment** (LCA) methodology is one of the most widespread and proficient approach as a standard ISO 14040⁵; it allows to perform an environmental impact assessment of a product “from cradle to grave”, including the extraction and processing of raw materials, the manufacture, the transport and distribution, the use and re-use, the collection, the storage, the recovery or recycle, the final disposal of wastes.

International organisations such as UNEP⁶ and SETAC⁷ are currently carried out several initiative to widespread the life cycle approach (Life Cycle Initiative) (ref. I) and to support the development of principles and practices for protection, enhancement and management of sustainable environmental quality and ecosystem integrity. In this framework the European Platform on Life Cycle Assessment (EPLCA) (ref. J) was sponsored by the European Commission, allowing the development of several useful tools as a dedicated handbook (ILCD Handbook) and the European LCA database (ELCD database). The Life Cycle Thinking approach applied to products and services is envisaged to be the winning one to reach the major abatement of pollution and consumption of the natural resources.

In the framework of the sustainable development, **the environmental modelling** has a fundamental role to gain a better understanding of the territory as a whole and the environmental impacts and risks, to define strategies and policies, to support innovation technology.

In particular the integrated atmospheric modelling systems provide fundamental elements for counting the environmental impacts induced by the production such as the emissions of carbon dioxide CO₂, nitrous oxide N₂O, methane CH₄, nitrogen oxides NO_x, sulphur oxides SO_x, ammonia NH₃, carbon monoxide CO, particulate matter, lead Pb. Moreover the assessment of the impacts of the major emissions on the human health and vegetation could be addressed allowing the definition of aggregated parameters such as “greenhouse effects”, “acidification”, “tropospheric ozone”.

In Italy the Decree 155/2010 accomplishes the European Directive 2008/50/CE on ambient air quality and cleaner air for Europe which aims at the protection of human health and the environment. The emissions in atmosphere are one of the most important parameters

of the Environmental Accounts (EA) used in the Regional Accounting Matrix (RAMEA) (ref. K). This is an account scheme that allows to perform integrated analysis of economic and environmental datasets in support to specific regional policies concerning the environmental sustainability of the productive system.

The air quality assessment is addressed through the characterization of atmospheric pollutants and the simulation of their fate and transport in atmosphere. The Integrated Assessment Modelling System MINNI⁸ (ref. L, M), developed by ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development) on behalf of the Italian Ministry for Environment and Territory and Sea, has been implemented at national scale to simulate the dispersion of the principal atmospheric pollutants and to assess the costs and efficiency of alternative emissions' scenarios.

The use of the integrated assessment modelling systems to support policies for the emissions reduction is well-known in the framework of UNECE⁹ initiative for the revision of the Gothenburg Protocol and in the programmes¹⁰ promoted by the European Commission. Indeed, there is a trend towards the implementation of the environmental models for the translation of the energy and productions scenarios into the emissions scenarios and greenhouse gases impacts, in order to define specific strategies for the reduction of atmospheric pollution.

In the framework of an ecosystemic approach, the development of several tools for the integration of atmospheric modelling systems with impact assessment and cost/benefit analysis is a step ahead to foster the assimilation of sustainable environmental objectives in the local policies and the socio-economic development plans.

Furthermore, the application of the multimedia models for the analysis of the concentration and dispersion of the major pollutants in air, water and soil, represents a key priority to drive a thorough understanding of the environment as a whole.

3.

TOOLS FOR THE ENVIRONMENTAL MANAGEMENT AND CERTIFICATIONS

Sustainable development indicators (SDI) have the potential to turn the generic concept of sustainability into action. Though there are disagreements among those from different disciplines (and influenced by different political beliefs about the nature of the good society), these disciplines and international organizations have each offered measures or indicators of how to measure the concept.

While sustainability indicators, indices and reporting systems gained growing popularity in both the public and private sectors, their effectiveness in influencing actual policy and practices often remains limited.

A large and still growing number of attempts to create aggregate measures of various aspects of sustainability created a stable of indices that provide a more nuanced perspective on development than economic aggregates such as GDP (see the next paragraph).

At the heart of the debate over different indicators are not only different disciplinary approaches but also different views of development. Some indicators reflect the ideology of globalization and urbanization that seek to define and measure progress on whether different countries or cultures agree to accept industrial technologies in their eco-systems. Other approaches, like those that start from international treaties on cultural rights of indigenous peoples to maintain traditional cultures, measure the ability of those cultures to maintain their traditions within their eco-systems at whatever level of productivity they choose.¹¹

A kind of successful indicators on which have captured the researcher's interest are the "**footprint Indicators**".

The ecological footprint is a measure of human demand on the Earth's ecosystems. It is a standardized measure of demand for natural capital that may be contrasted with the planet's ecological capacity to regenerate. It represents the amount of biologically productive land and sea area necessary to supply the resources a human population consumes, and to assimilate associated waste. This approach can also be applied to an activity such as the manufacturing of a product or driving of a car.¹²

The more used definition of the carbon footprint is: "A measure of the total amount of carbon dioxide (CO₂) and methane (CH₄) emissions



of a defined population, system or activity, considering all relevant sources, sinks and storage within the spatial and temporal boundary of the population, system or activity of interest. Calculated as carbon dioxide equivalent (CO₂e) using the relevant 100-year global warming potential (GWP100).” Greenhouse gases can be emitted through transport, land clearance, and the production and consumption of food, fuels, manufactured goods, materials, wood, roads, buildings, and services.

The concept name of the **carbon footprint** originates from ecological footprint. However, carbon footprints are much more specific than ecological footprints since they measure direct emissions of gasses that cause climate change into the atmosphere.¹³

The **water footprint** of an individual, community or business is defined as the total volume of freshwater used to produce the goods and services consumed by the individual or community or produced by the business. Water use is measured in water volume consumed (evaporated) and/or polluted per unit of time. A water footprint can be calculated for any well-defined group of consumers (e.g., an individual, family, village, city, province, state or nation) or producers (e.g., a public organization, private enterprise or economic sector). The water footprint is a geographically explicit indicator, not only showing volumes of water use and pollution, but also the locations. However, the water footprint does not provide information on how the embedded water negatively or positively affects local water resources, ecosystems and livelihoods (ref. N).¹⁴

One of the most recent indicators, it gives an indication of potential risk posed by a product based on its chemical composition, the human and ecological hazard properties of the ingredients, and the exposure potential of the ingredients during its life cycle.

Currently, the methods for determining a **chemical footprint** are underdeveloped, leaving suppliers with no industry standard approach. With the input of stakeholders, a standard can be developed. Ultimately, chemical footprint analysis should include a comprehensive quantification of the chemicals used, consumed, produced, or modified throughout the life cycle of the product of interest, and the risks posed, such that manufacturers can make informed decisions regar-

ding the chemicals they use. For some products this will be a monumental undertaking, but the stakes are high for both suppliers and manufacturers, making it well worth the effort to establish a transparent and risk-based approach to this up and coming environmental performance metric.¹⁵

Environmental Accounts, the most diffused tool for a sustainable governance, has been developed to introduce environmental considerations in statistics measuring the economy and take into account environment in public strategies and politic decisions, i.e. it is the tool established in order to identify environmental aspects in human activities and improve the sustainability of adopted politics. In particular, environmental accounts can be used to analyse the impact of current Consumption and Production patterns on natural resources and the environment and the effects of economic policy measures.

Much effort has been put into harmonising environmental accounts across Europe, including links to other areas of statistics as well as harmonised concepts and compilation guidelines to improve comparability and timeliness.

More than this, the accounts are a very slow and timing process due to the need of historical data series, and so an expensive and challenging process, unsustainable for a lot of countries.

Recently, the “Beyond GDP initiative”, aiming at the development of indicators as appealing as GDP but more inclusive of environmental and social aspects of human well-being and progress, has given a strong push for the development of more effective environmental accounts and Regulation (EU) 691/2011 (ref. O) which provides a legal framework for harmonised data collection as well as for future expansion with different modules when they become methodologically mature.¹⁶

A revised version of the “System of Environmental-Economic Accounts (SEEA)” was adopted by the UN Statistical Commission in February 2012 as an international standard for use throughout the world (organised by the United Nations Committee of Experts on Environmental-Economic Accounting (UNCEEA) together with technical expert groups: London Group, the European Commission, the International Monetary Fund, OECD and the World Bank).¹⁷

The **Management Systems (Environmental, Energy, etc.)** have been demonstrated to be the most successful tool in Sustainable Development path. They are the most diffused and effective tools, among the voluntary ones, and their implementation has not decreased also during the present economic crisis. This is probably due to both the fact it is the best operative and strategic tool able to continuously improve environmental performances of an organization and to the great visibility related with environmental systems certifications (regulated by ISO 14001, EMAS (ref. P), ISO 50001, etc.). Scientific interest for certification tools is increased due to the business potentialities and the possible integration with recent Energy Management Systems, in the spotlight at the moment for the great world attention paid to the energy problems.

Many approaches to environmental protection continue to be based on end-of-pipe solutions, focused on a single medium (air, water, soil), a single stage in the product's life cycle (production, use, disposal), or a single issue (e.g., individual chemical limits). These strategies do not always lead to an overall reduction in environmental impacts. Implemented changes could lead to unexpected impacts elsewhere in the product's life cycle. Thus, there may be a shift of the burden to other phases of the life cycle or to other regions of the world or to different kind of impacts. Hence the need to use a **Life Cycle Thinking (LCT) approach** and related life cycle based methods.

LCA and other **life cycle-based methods** offer a well-defined basis, which however needs to be coupled and/or integrated with inputs from other domains of knowledge. Such an assessment is in fact quite challenging for three main reasons. Firstly, emergent technologies like nanotechnologies deliver products which often are not end products, but can be applied to a quite broad range of (unforeseen) applications.

Secondly, many of these technologies are at laboratory scale and thus data availability and scale up effects are open questions which strongly affect the assessment. Finally, rebound effects may occur, when the increased benefit/efficiency gained by the new technology is partly spoilt or turned into a loss (ref. Q).

LCA is also at the basis of systems and tools supporting environmental management like as EPD (Environmental Product Declaration (ref.

R)), supported by ISO 14020, or the voluntary European Ecolabel (ref. S), which help identifying products and services with a reduced environmental impact throughout their life cycle, from the extraction of raw material through to production, use and disposal.

A Sustainable Industrial Area (SIA) has technical and organizational requirements able to minimize and manage environmental pressures and taking into account also social and economic aspects and problems. You can find a lot of experiences all over the world but with different nomenclature (APEA (Ecologically Equipped Productive Area), AEA (Ecologically Equipped Area), Eco-Industrial Park (EIP), etc.) and, often, with different characteristics applied (sustainable industrial buildings, centralized infrastructures and innovative services: shared plants, IT services, environmental management services, environmental management systems and certifications, etc.). The crucial economic crisis has focused attention on SIAs; but there are some difficulties; in Italy, for example, also if a national law (D. Lgs. 112/98, art. 26) exists, the Regions have often differently applied it. So the main research objective is to establish a minimum set of relevant requirements to be satisfied by SIAs and try to standardize and diffuse a common management model, which allows flexible and comparable applications in different Regions and Countries (ref. T, U)¹⁸.

4.

TOOLS FOR THE SUSTAINABLE DESIGN

In the last years, a lot of public and politic attention has been paid in order to establish **Sustainable Consumption and Production (SCP)**¹⁹. In 2008 the European Commission presented the "Sustainable Consumption and Production and Sustainable Industrial Policy (SCP/SIP) Action Plan" that includes a series of proposals on sustainable consumption and production that will contribute to improving the environmental performance of products and increase the demand for more sustainable goods and production technologies. It also seeks to encourage EU industry to take advantage of opportunities to innovate.

In order to realize more sustainable products during the last years have been developed methodologies of **Ecodesign**, process integrated within the design and development aiming to reduce environmental impacts and continually to improve the environmental performance of the products, throughout their life cycle from raw material extraction to end of life.

The recent ISO 14006 is a guideline which helps incorporating eco-design in production, in an organization having already an Environmental Management System. In order to carry out ecodesign in a systematic and manageable way, it is intended that organizations implement an appropriate process and then have, or have access to, the necessary competence to carry out and manage this process. An ecodesign process takes place within an organization's design and development area, and it is here that the knowledge required in carrying out and managing ecodesign is to be found.

However, when it is intended that ecodesign be carried out under the umbrella of an environmental management system (EMS), then the person responsible for the EMS needs to have an understanding of what this process is and how it is going to be managed and controlled. In this way, the integrity of the EMS is not jeopardized and the environmental objectives for the products can be achieved (ISO 14006) (ref. V, W).



REFERENCES

- A. *UN General Assembly*, Resolution adopted by the General Assembly 66/288. The future we want, 2012.
- B. *Council of the European Union*, Conclusions on Rio+20: outcome and follow-up to the UNCSD 2012 Summit, Luxembourg, 25 October 2012.
- C. *European Commission COM(2008) 397 final*, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions on the Sustainable Consumption and Production and Sustainable Industrial Policy Action Plan, July 2008.
- D. *European Commission COM(2008) 400 final*, Public procurement for a better environment, July 2008.
- E. *European Commission*, Environment, GPP: http://ec.europa.eu/environment/gpp/index_en.htm.
- F. *European Commission*, Environment, the European Criteria: http://ec.europa.eu/environment/gpp/gpp_criteria_en.htm.
- G. *Italian Ministry for Environment and Territory and Sea*, Decree n. 135, Approvazione del Piano d'azione per la sostenibilità ambientale dei consumi nel settore della pubblica amministrazione, 11 aprile 2008.
- H. *Italian Ministry for Environment and Territory and Sea*, the Italian criteria: <http://www.dsa.minambiente.it/gpp/page.asp?id=79>.
- I. *UNEP-SETAC Life Cycle Initiative LCI*. <http://www.unep.fr/scp/lcinitiative/>.



- J. *Joint Research Centre European Platform on LCA*.
<http://lct.jrc.ec.europa.eu/>.
- K. *Bonazzi E., Sansoni M.*, (2010) "Fare i conti con l'ambiente, le matrici NAMEA E RAMEA" *ecoscienza* Numero 2.
- L. *Zanini G., Mircea M., Briganti G., Cappelletti A., Pederzoli A., Vitali L., Pace G., Marri P., Silibello C., Finardi S., Calori G.*, (2010) "Modeling Air Quality over Italy with MINNI Atmospheric Modeling System: from Regional to Local Scale" (2010) *Proceedings of 31st NATO/SPS International Technical Meeting on Air Pollution Modelling and its Application* held 27 September - 1 October, 2010 in Torino, Italy.
- M. *D'Elia, I., Bencardino, M., Ciancarella, L., Contaldi, M., Vialetto, G.* (2009) "Technical and Non-Technical Measures for air pollution emission reduction: The integrated assessment of the regional Air Quality Management Plans through the Italian national model" *Atmospheric Environment* 43 (39), pp. 6182-6189.
- N. *Hoekstra, A.Y., Chapagain, A.K., Aldaya, M.M., Mekonnen, M.M.*, 2009. *Water Footprint Manual: State of the Art 2009*. Water Footprint Network, Enschede, The Netherlands. 2009.
- O. *REGULATION (EU) No 691/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL* of 6 July 2011 on "European environmental economic accounts" (Text with EEA relevance), 2011.
- P. *EMAS*, http://ec.europa.eu/environment/emas/about/summary_en.htm.
- Q. *G. Barberio, L. Rigamonti, A. Zamagni*, edited by, *What is sustainable technology? The role of life cycle-based methods in addressing challenges of sustainability assessment of technologies*, Roma, ENEA, September 27th, 2012.
- R. *EPD*, www.environdec.com
- S. *E.C. – DG Environment* http://ec.europa.eu/environment/ecolabel/index_en.htm.
- T. *A. Dominici Loprieno, R. Preka, M. Tarantini, M. Litido, A. Zamagni*, "Promoting innovation and sustainability in Mediterranean industrial areas: the MEID managing model", in *Proceedings of 18th IGWT Symposium-Technology and Innovation for a Sustainable Future: a Commodity Science Perspective*, ISBN 978-88-8286-269-5, Rome, 24-28 settembre 2012.
- U. *R. Preka, A. Dominici Loprieno, M. Tarantini, M. Litido*, "Mediterranean Sustainable Industrial Areas: which development potentials?", in *Proceedings of MOTSP 2012, Management of Technology - Step to Sustainable Production*, 4th International Scientific Conference, ISSN 1847-6880, p. 418-425, Zadar, Croatia, 14-16 Giugno 2012.
- V. *Brezet, H. and van Hemel, C.*, Editors, 1997. *ECODESIGN – a promising approach to sustainable production and consumption*, United Nations Publication, UNEP, Paris, France.
- W. *ISO 14006:2011, Environmental Management Systems – Guidelines for incorporating ecodesign*, 2011.

NOTE

1. UNEP (2011) Towards a Green Economy: Pathways to sustainable Development and Poverty Eradication-A synthesis for Policy Makers. www.unep.org/greeneconomy.
2. <http://www.earthsummit2012.org/>
3. <http://www.unep.fr/scp/marrakech/10yfp.htm>
4. Council of the European Union, Improving environmental policy instruments. Council conclusions, Brussels, December 21th, 2010.
5. www.iso.org -UNI (Ente Nazionale Italiano di UNificazione, www.uni.com).
6. United Nations Environment Programme [http:// www.unep.org](http://www.unep.org)
7. Society of Environmental Toxicology and Chemistry [http:// www.setac.org](http://www.setac.org)
8. [http:// www.minni.org](http://www.minni.org)
9. United Nation Economic Commission for Europe [http:// www.unece.org](http://www.unece.org)
10. http://www.airclim.org/policy/sub6_10.php
11. <http://epp.eurostat.ec.europa.eu/portal/page/portal/sdi/indicators>
12. <http://www.footprintnetwork.org/en/index.php/GFN/>
13. http://www.footprintnetwork.org/it/index.php/gfn/page/carbon_footprint/
14. <http://www.waterfootprint.org/?page=files/home>
15. From J. Panko, K. Hitchcock, Chemical Footprint. Assuring product sustainability, 12 EM, December 2011
16. <http://www.beyond-gdp.eu/>
17. http://epp.eurostat.ec.europa.eu/portal/page/portal/environmental_accounts/introduction and <https://unstats.un.org/unsd/envaccounting/seea.asp>
18. See the project site www.medmeid.eu
19. http://ec.europa.eu/environment/eussd/escp_en.htm

