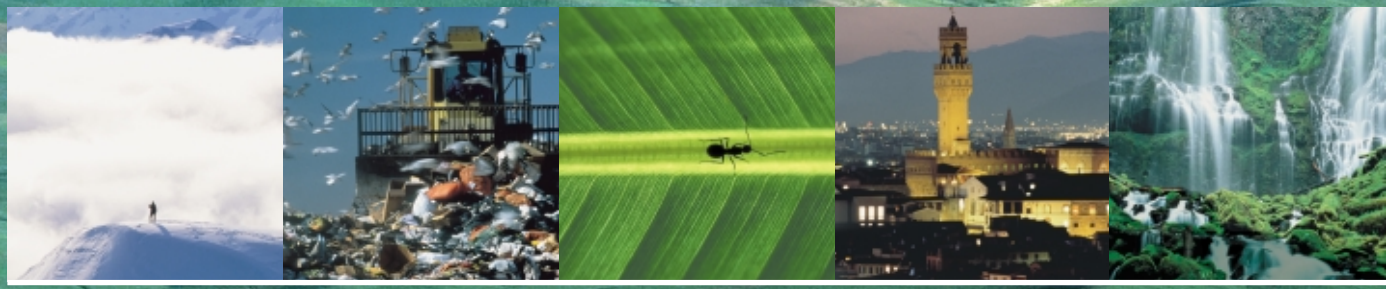


MINISTRY FOR THE ENVIRONMENT AND TERRITORY

ENVIRONMENTAL ACTION STRATEGY FOR SUSTAINABLE DEVELOPMENT IN ITALY

CONTENTS

The environmental action plan in Italy

The growth rate of the world population shows an increasing trend although the pace is slowing down, while in some countries, such as Italy, it has come to a standstill. The most industrialized countries constantly deplete resources, such as water and energy from the environment. They also spread pollutants and waste thus irreversibly affecting the quality of land, air and water. However, while economic systems need an ever-increasing growth, the environment demands balance and stability. In order to reach sustainable development, the self-subsistence and self-organization of ecosystems must coexist with anthropic processes, otherwise their imbalance will in turn lead to self-induced entropy.

Sustainable development and environment

The population of industrialized countries exploits ten times more natural resources per capita than those living in developing countries. The economic and demographic growth of developing countries, entailing new consumptions, can only resort to natural resources. On the other hand, nowadays and in the years to come, our wealth standard requires unpolluted air, water and food, unspoilt landscapes, enticing sea waters and shores, towns wisely striking a balance between their huge historical heritage preservation needs and their ever-changing operational and organizational requirements.

At the end of the second millennium, our civilization conceived sustainable development, designed to meet present needs while preserving the expectations and requirements of future generations , pursuing at the same time different aims such as quality of life, peace, an equitable wealth and a clean and healthy environment. This is not a brand new concept. In fact, many cultures have thoroughly accepted the need to strike a balance among different economic, social and environmental requirements. Today, this standpoint has been restated in industrialized and developing countries eventually aware of the exhaustibility of global natural resources . However, sustainable development urges a changeover of growth patterns and socio-economic relations.

Ecologic foundations of sustainability

A developing economical system can be regarded as sustainable only if it exploits natural resources up to a set quantity and quality limit within the earth renewal capacity by never exceeding this threshold. If this does not occur, the economy will continue to use and to jeopardize the quality of natural resources which sooner or later will be exhausted or not anymore useable.

The earth, being a shut-down ecosystem with limited natural resources, can only rely on solar energy. Every natural resource, such as food, water, timber, ores oil and natural gases, is restricted by the availability and absorption capacity of the ecosystem. The ecologic foundations of sustainability suggest to preserve the stability of internal processes of the ecosphere and implies a dynamic self-organizing structure, for an undefined long-term period, to avoid ever-increasing entropic consequences.

The greatest acceptable values of deposition and concentration in the environment of human activity pollutants and waste are known as *critical loads* and are set according to the typologies, the specific chemical, biodegradable and storing peculiarities and properties. The greatest flow of natural resources extracted and disposed from a given ecosystem represents its *carrying capacity*.

Well-grounded fears suggest that in some cases the carrying capacity of the Earth is failing since we have almost exhausted it. As the anthropic sphere is increasingly stretching behind the earth through new technologies, innovations and explorations, a great deal of destructive interactions are occurring at the border with the ecosphere.

Environmental action

New sustainability-oriented projects are most needed in order to reset ecological balances, to change consumption and production patterns, to promote ecological efficiency and to restore social equity conditions. The environmental action, as part of this overall planning, aims at: easing frictions between the anthropic sphere and the

earth, eliminating the exploitation of non-renewable natural resources, phasing out pollutants, enhancing the value of waste through its reuse, recycling and recovery of both energy and secondary raw materials, changing the balances of generation and absorption of GHG emissions, interrupting biodiversity erosion and desertification processes, safeguarding landscapes and habitats.

However, although a few positive results have been achieved, earth warming, biodiversity shrinkage, disposal of household and hazardous waste, poor quality of urban areas, increasing exploitation of natural resources, and the spreading of environmental criminality have become crucial issues thus jeopardizing the environment. Other factors negatively affecting the health of both environment and the inhabitants are the following: unhealthy food due to biotechnologies and Genetically Modified Organisms, unconscious use of private transport, increase of personal and mass mobile communications and electromagnetic pollution. The Environmental Action remains therefore a fundamental pillar of a strategy for a new development model.

Since carrying capacities and critical loads cannot be exactly estimated, the Environmental Action relies on the *precautionary principle*, according to EU-set guidelines.

Sustainable development cannot be based on a mere environmental action, nor it can promote only bans, rules and limits. A sustainable economy must be focused on a long-lasting stable development, including high employment rates, low inflation rates and international trade stability.

Economic growth is generally measured by the GDP rate, which does not register any environmental damages and thus their social costs. The time has come to measure our economic growth by a wide range of physical and monetary parameters integrating environmental and economic factors so as to show the results achieved in protecting the environment and the quality of life as well as the stock decrease or increase of natural resources.

Social sustainability has to do with distributive equity, human and civil rights, social conditions of children, teen-agers, women, elderly and disabled people, immigration and cooperation between countries. Sustainable development targeted actions and commitments are closely linked to the implementation of policies to eliminate social exclusion and poverty. Such objective, as expected by the 2001-2003 National Action Plan of Interventions and Social Services, can be achieved through a fair distribution of resources, a decrease of the unemployment rate, the accomplishment of economic measures by means of investments in the national health system, in education and, in social programs that guarantee the access to services and social cohesion.

The inspiring principles of the environmental action strategy for sustainable development in Italy are the following:

- integration of environmental issues into other policy making processes;
- the preference for an aware economic and environmental lifestyle;
- an increase in the global efficiency of resource usage;
- refusal of the “end cycle” intervention approach and promotion of prevention policies;
- general waste reduction;
- stretching the lifetime of goods;
- ending of material cycles of production-consumption;
- development of local markets and local productions;
- promotion of typical products and traditional cultures;
- involvement of social parties in setting goals, commitments and sharing responsibilities.

National strategy breakdown

The national environmental action strategy ensures continuity to the EU action, namely through the Sixth Environmental Action Plan, with the targets regarding social cohesion, full employment and environmental protection approved by the Council of Europe in Lisbon and Göthenburg. Moreover, according to the guidelines of Barcelona 2002 European Council , the strategy must ensure the setting of tools needed for the concertation, participation, sharing of responsibilities at a national level and reporting.

The objectives and actions of the Strategy must find their continuity in a system of Regions, autonomous provinces and local authorities according to the subsidiary principle through the definition of sustainability strategies at every level. In order to achieve these objectives, according to their own peculiarities, it is strongly recommended to adjust contents and priorities through co-operation and partnership with local authorities and any involved party. For this purpose, Regions must locate and divert from their budgets the needed financial resources. In turn, the Government itself must allocate its budget to support the regional action wherever strategies ensure the fulfilment of large-scale objectives and macro-actions. The same guidelines may apply to special-autonomous Regions and Provinces such as Bolzano and Trento, abiding to the

principles issued in their own statutes.
The environmental action strategy distinguishes first its operational tools of general purpose within four broad priority subject matters, the same stated by the Sixth Environmental EU Action Plan, as follows:

- climate change and ozone layer protection;
- protection and sustainable valorisation of Nature and Biodiversity;
- quality of the environment and quality of life in urban areas;
- exploitation of resources and waste generation.

Environmental action tools

An effective environmental action strategy demands every social party's voluntary behaviour towards environmental protection so as to overcome a mere "bid-and-check" approach.

Environmental policy instruments need to be reviewed in order to achieve the following aims: enhancement and enforcement of the environmental protection laws; integration of the environment within sectoral policies and markets; implementation of an ecologic taxation reform; removal of unfair subsidies and softening environmental externalities; introduction of environmental accounting; improving the awareness, the knowledge and the involvement of citizens through a stronger public information; increasing the decision-making role for citizens; implementing technological and scientific research other than promoting information and training.

The environmental action strategy, by meeting the above-stated requirements, needs to be regarded as a flexible tool able to constantly adapt to newly-arising environmental needs and chances. To this end, a Forum will be set up, involving every concerned party, aiming at:

- ensuring a full participation;
- monitoring the achieved results;
- checking the effectiveness of the strategy;
- proposing timely-needed amendments and the updating of the strategy;
- contributing in the creation of sustainable development information, education and training.

Application of the legislation on environmental protection

The framework of the environmental protection laws and regulations, along with an effective techno-logistic monitoring system, at the basis of the so-called "bid and check" approach, can be regarded as inadequate to ensure and support on its own a sustainable development strategy, even though they must be still considered as an essential requirement for any effective environmental action.

The environmental protection requirements provided, throughout the years, the set-up of new standards for emissions, waste, sewage and other pollutants, with positive effects on the environment, the modernisation of plants and the development of new technologies, creating a strong incentive towards innovations. In order to spread and consolidate this positive outcome, there is the need to proceed with clear and effective goals applying the analysis principle which measures the impact of the regulations on Public Administration, citizens and enterprises, according to Act 50/1999, "1998 Streamlining Act".

The present complex legal reference framework calls for a streamlining revision. In fact, too many regulations do not entail environmental benefits and lower the efficiency of administrative and thus industrial systems. However, mutually agreed Environmental Texts can overcome these obstacles and make the legal reference framework easily enforceable and less uncertain, such as the Italian environmental legislation.

Moreover, it is required that all infringements, occured within the industrial sector throughout the years, are revealed in order to carefully review the past, incoherent and hardly-enforceable regulations.

The completion of a national network of agencies for the environmental protection (ANPA/ARPA) is a priority goal that must be achieved to ensure the availability of a technical support entirely developed for all monitoring activities, thus overcoming the present approach, made of inspections to repress illegal activities. This in turn will strengthen the role of the service provider, which represents a support tool for the management of environmental policies and for the processes of citizens information. A necessary national environmental information system (SINAnet) is being accomplished by the National Environmental Protection Agency and is gradually made accessible on line to the general public through the web.

A strategic breakdown, made up by complex actions and objectives skilfully designed and planned, implies an effective monitoring of global changes, cross-sectoral processes and development patterns. Although it will not be an easy task, a strategy implementation audit must point out the gap existing between a mere statement of principles and a real action plan.

The integration of the environmental factor within sectoral policies

The integration of policies is a constitutional principle for the whole of Europe. Art. 6 of the Amsterdam Treaty, asserts: *"requirements for environmental protection are to be included in any definition and implementation of EU activities and policies ……, especially to promote sustainable development."*

The *"Integration Principle"* affirms that the environmental protection must not be considered as a sectoral policy, but as a common denominator for all policies. Environmental action must be coupled with new actions by other sectors, which must *internalise* the environmental concern.

The Environmental integration with any field programme, plan and policy drawing as well as decision-making procedures requires the introduction of a widespread Strategic Environmental Assessment (SEA), which proved successful in the early stages of Agenda 2000-2006, and an in-depth revision and standardisation of the procedures functional to the decisions of the Inter-Ministerial Committee for Economic Planning and the State-Region Conference, supported by the full involvement of environmental authorities for sustainable development. Hence, within the State-Region Conference a permanent technical board has been set up to fulfil an important sustainable development task.

A further sustainable development basic principle promotes vertical integration between different administrative levels, as well as between public and private sectors, according to the so-called "shared responsibility" principle. This principle aims at strengthening and promoting the role of every involved party as the recipient and protagonist of actions promoting the environmental development. Therefore, co-operation projects supporting the contribution of stakeholders and each party must be promoted and carried out.

The institutional reorganization, assigning important land and environment governance tasks to regions and to local territorial authorities, urges more consistent and functional planning, designing patterns and the introduction of appropriate decision-making procedures. A new scale of plans and contents is most needed, stemming from the enforcement of sustainability Strategies at every level coherent with the national-set scheme, under the new system of autonomies, provide citizens and enterprises with timely clear-cut transparent procedures as well as a more dynamic and effective protection of land and environment resources. The criteria which outlines objects and areas subject to partial or total protection must be granted,- whether natural, cultural, archaeological, landscape or hydro-geological , identifying a competent institution to establish terms and techno-scientific grounds for the safeguard. However, an integrated scheme of protected areas and resources must be periodically checked with the involvement of citizens and their associations.

Environmental Assessment of Plans and Programmes

The perspectives of realizing wide infrastructure works, entailing irreversible ecosystem alterations, nonetheless the consistent flow of investments to be allocated to southern regions under Objective One over the 2000-2006 period, enforcing the Community Support Framework, highlight the need to resort to suitable tools to assess and steer the sustainability of infrastructure works and to minimise their impact on the environment.

The improvement of the assessment tools demands two different categories of actions. The procedure for the Environmental Impact Assessment must be systematically enforced by making it more effective, also by setting up efficient environmental Observatories, aiming at the assessment related to the compliance of environmental compatibility judgements, and to monitor the environmental concerns of the outstanding works during their realization.

The assessment of the environmental impact of each work cannot ensure an overall sustainability. The Environmental Impact Assessment procedure is to be integrated at the early stages with plans and programmes that envisage, since their initial drafting, the required criteria for environmental sustainability. To this end, new methodologies programmes and plans of the Strategic Environmental Assessment are to be developed, widening and arranging the ongoing initiatives regarding the draft of guidelines, lists of indicators and computerized data bases to overcome a mere environmental protection and address the planned modifications towards sustainable development.

The SEA procedure envisaged by Directive 2001/42/EC calls for an integrated and interactive cross-sectoral approach which ensures the involvement of the public during the consultation process, the introduction of environmental qualitative objectives and modalities for their practical fulfilment among urban and territorial infrastructure planning and designing tools. The evaluation process within SEA, following the planning and designing procedures, will verify the coherence and the contri-

bution of policies, plans and programmes to the objectives, criteria and actions defined by sustainable strategies at each level.

The SEA enforcement within intervention programmes of municipalities, provinces, metropolitan cities, regions and states, through detailed negotiation procedures with concerned communities, will renovate the perspective between plans and programmes which imply environmental and territorial transformations, also to ensure the coherence and the contribution to locally-defined sustainability strategies, also through local Agenda 21 processes.

The integration of the environmental factor in the market

The demand of consumers and enterprises shows an increasing interest for products and services with high ecologic qualities. The Italian marketing success is due to the functional aesthetic features of its products, therefore the new *"global quality"* competitive marketing potentials has still not been thoroughly understood; the concept encloses the following three stages: dematerialization, greening, that is the proactive integration of the environmental factor, the qualitative innovation of the manufacturing processes, the quality of services and products. This is partially due to the difficulty for innovation to penetrate the SMEs peculiar structure as well as to our overall lack of fiscal, welfare and development promotion policies.

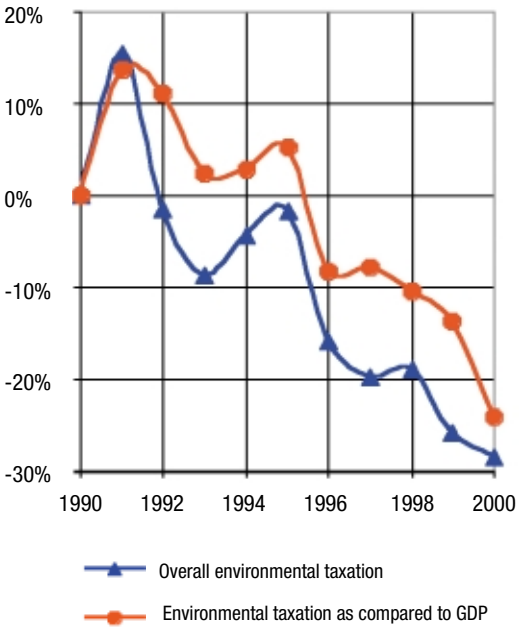
The attitudes of the leading consumers ought to be changed, among them first of all the public sector that covers 15% of EU overall services and products, followed by banks, universities, hospitals, etc. Therefore the internalisation of environmental requirements into Public Administration purchases must be considered a compulsory step towards the integration. To this end, adequate actions must be designed to set and make available guidelines and data bases which promote environmental quality in purchases and supplying orders. Thus an ad Hoc legislative measure, the "Delegation to the Government regarding infrastructures and strategic productive settlements and other measures to re-launch productive activities", was approved on the 6th of December 2001, envisaging at its section 6, paragraph 16, that any public office must buy at least 40% of recycled handmade plastic items out of its yearly demand, according to regional regulations which should be issued within six months from the law enforcement date. The 2001 Finance Act envisages supporting provisions for the purchase of recycled products. Moreover, the use of flexible environmental tools such as voluntary agreements between PA and the industrial sector need to be eased.

Ecological taxation reform

The key objective for any sustainable policy consists in a re-definition of the economic incentives and disincentives. To this end a thorough ecologic taxation reform needs to be implemented, by gradually shifting the present taxable base from the manufacture usage, that is from value-added production generally speaking, to the exploitation of natural resources. The possibility of correspondently softening the tax burden on work is at the base of what is known as *"a double dividend "*, so-called by the economists, that is an eventual workforce demand increase coupled with a decrease of the environmental pressures at a global economic level.

Figure 1
Environmental taxation trends In Italy

1990-based index numbers



Note: Reference year's values:
Overall environmental taxation 11.6%;
Environmental taxation as compared to GDP 2.9%

Source: Ministry of Treasury 2001.

Similarly to the Carbon Tax implementing regulation, an ecologic taxation is not going to worsen fiscal levies but rather replace them, so that its measured introduction will allow a gradual adjustment of consumption patterns and technologies which are both slowly evolving processes (see figure 1). However, the effects of these new measures in the market access must be taken into account, especially as far as developing countries are concerned, and namely in any case where the phasing out of business obstacles and unfair circumstances in favour of environmental products and services, would strengthen the trade, the growth and the environment.

The fiscal reform must enforce the principle of *"polluters pay"* together with voluntary energy-efficiency agreements, the acknowledgment of environmental credits to those sectors which fulfil sustainable development criteria, the incentive to emission trade permits so as to achieve Kyoto's targets without implying a planned pollution trade and without favouring the containment of end-cycle pressure factors: waste and emissions.

The use of resources is to be levied to favour dematerialization of our economy, the software, the thriftiness of both final and industrial consumptions, the de-coupling of the economic growth from-resource exploitation through the introduction of environmental burden offsetting measures also on a territorial basis.

Subsidies and environmental externalities

Negative environmental externalities are generated whenever the environmental costs of production activities are higher than the overall social costs. Therefore these costs lie heavy on the community at large. This negative imbalance brings about competitive distortions and increases the usage of natural resources and the emissions, therefore the goal to achieve is to ease companies towards the internalisation of their full externalities. All activities that induce positive environmental externalities must be supported, by using products of long-lasting materials which benefit the economy in the use of non-renewable resources and by adopting materials, which contain, after recycled, the same features.

The environmental standards of the market strongly affect external environmental costs; there is no market distortion if prices reflect the overall manufacturing costs; if so, no environmental externalities occur. This is a very rare opportunity for the company's products to compete at the same conditions, although they offer extremely different environmental standards and internalisations of the costs. Firms operating with less internalisation costs take competitive advantages from polluting.

Local or national deep-rooted outdated policies for production and consumption subsidies must be radically revised since in Italy they have caused most environmental loads, the detriment of materials and an intensive manufacturing exploitation. Nowadays a few subsidies are granted to achieve environmental aims but many others cause negative effects.

The set-up of national and regional funds for sustainable development and environment can positively affect this overall picture, such as the set-up by the European Commission of EC EuroSeed and EuroTech Funds, designed to back the international partnership of high-tech companies through the investments of capital risk funds.

Quality and environmental certification

The environmental certification lies on the company's aware voluntary agreement on the integration of environmental factors, on the concept of global-quality and on a modern interpretation of competitiveness. This tool aims at enhancing the environmental performances of companies by stating the environmental policy commitments and their implementation modalities, by introducing and realising schemes for environmental management, by carrying out a periodical and systematic objective *audit* of the effectiveness of these systems, by publishing data regarding the environmental performances, thus establishing an open dialogue between the public and the involved parties. This instrument aims at internalising environmental qualitative goals in corporate management and at changing the consumption and production attitudes. Therefore, the introduction of *ecolabels* is meant to meet the market preferences of consumers for products with a high environmental quality.

In Europe and in Italy, EMAS, the Environmental Management and Audit Scheme, is regarded as the reference scheme for environmental certifications. Italy has endorsed EU Regulation 1836/1993 - later updated by Regulation 761/2001 - through the 1996 Ministerial Decree which introduces EMAS II.EMAS is a voluntary instrument, to be associated with direct regulation provisions such as *"command and control"* measures, finalised to internalise environmental quality objectives into the managing processes of organisations and enterprises. EMAS provides companies with the opportunity of a public recognition and the possibility to spread information on the improvement of their environmental performances. Every EMAS-certified manufacturing site is recorded on the Gazette of the European Union and gets a quality mark by the Commission for the registration of EMAS sites and ecological marks, which operates in Italy since 1997.

EMAS may be regarded as a contract by which a company ensures environmental transparency and improvement, a higher efficiency, a market competitive position and enhanced relations with stockholders, concerned parties and citizens. Over the medium-term this entails financial benefits, lower insurance premiums, better contract terms, a wider civil society consensus and sharing. The new EMAS II certification allows in the meantime the endorsement of ISO standards of environmental quality.

ISO quality standards come from the private sector, where environmental studies led the ISO *Technical Committee TC207*, established in 1993, to standardize environmental corporate management. Then ISO standard 14000 was worked out envisaging ecolabels for products and a lifecycle analysis, respectively referred to ISO 14020 and 14040. In fact ISO regulation addresses the issues of first-type labels, (or third-type, i.e. European and national ecolabel), the self-certification and a potential scheme of the environmental declaration of products, respectively through ISO 14024, 14021 and 14025.

The Italian latest available data, which refers to year 2001, records 83 EMAS registered sites (10 in 1999), 553 ISO14001 certified sites (243 in 1999) and 236 products (10 in 1999) manufactured by 16 different companies obtained ecolabel certifications. In the EU framework, the Italian delay is being compensated by its ever-increasing trend of environmental enrolments, certifications and marks. This time lag is due to many different reasons, such as a technological gap, insufficient investments in research, corporate atomisation, obsolete advertising strategies, public administration responsibility, corporate incentives, delays in the eco-taxation reform and inadequate credit policies. Therefore an environmental commitment for entrepreneurial associations and banks will contribute to reverse these unfavourable circumstances in every sector, representing the twofold condition for the fulfilment of essential targeted environmental qualitative objectives to our sustainable production and consumption growth.

Furthermore, environmental management systems can be potentially applied to different geographical areas, such as industrial districts and territorial manufacturing systems, where small and medium sized enterprises share similar goals. Administrative authorities and manufacturing associations can develop initiatives to survey the environmental impact and to co-ordinate the endorsement of a joint management scheme among the concerned parties. Thus joint implementation synergies between environmental certifications and local Agenda 21 processes will contribute to this purpose.

Awareness and decision-making skills of citizens

The environmental concerns, closely linked to issues such as development and quality of life, are to emphasize the need for changes in education, training and information processes as a key factor to promote among citizens the sharing of criticisms, proposals and decision-making processes. In Italy, to this end, relevant actions are achieving greater importance and attention thanks to the involvement of national, regional and local authorities. Targeted actions for a wider awareness and involvement of citizens and young people must be pivoted by new planning guidelines to be concerted among state, autonomous regions and provinces on Environmental Information, Training and Education (INFEA). The INFEA Technical Board will play a permanent comparison and a sharing decision-making role in actions aiming to promote a new awareness in personal and collective responsibility as far as the implementation of environmental qualitative standards and policies are concerned. The role of schools, therefore the Ministry of Education, Research and University, will be basic - in teaching young people a durable management of natural resources.

Citizens must become aware of environmental issues and of sustainability targets in order to ensure an effective participation to decision making processes. To this end, public authorities, in particular local authorities, will play a basic role in raising the awareness of sustainable development implications, suggesting the most suitable behavioural patterns and the best choices to be made. Moreover, innovative solutions, goal-sharing behaviours and a general public consensus must be actively pursued. Residents and tourists are to be thoroughly informed on their surrounding habitat features and on environmentally-correct behaviours. This goal calls for suitable information and communication campaigns through publications and computerised information access backed by new technologies and scientific research.

Many visible signs let us think that citizens are undoubtedly acquiring a deeper environmental consciousness. Evidence shows a positive trend in the evolution of household private habits, such as separate garbage collection (presently still not supported with incentives), an increasing demand for renewable-energy, etc., supported by numerous ecological rallies such as “Let’s clean the world”, “Sunday walks”, etc. However, despite initiatives taken by Non-Governmental Organisations and citizen committees, this deeper environmental consciousness has not been matched with clear and exhaustive environmental information campaigns by public authorities nor with a stronger environmental

decision-making role for citizens.
Undoubtedly *the introduction of the so-called interactive computer-science technologies*, would allow an enlarged dialogue among public authorities, administrations and citizens. The effective use of these new tools plays a major role among the primary objectives of the Italian environmental action plan in order to spread information and reach an opinion consensus entitling citizens to exercise their democratic rights.

Lifestyle changes demand economic feasibility conditions, true incentives and disincentives, the informed active involvement of each concerned party.

This new culture will be promoted by ad Hoc competences, training tools and professional skills thus fulfilling sustainable development – targeted objectives. The integration of environmental policies, among economic and social ones, can spur the labour market and the active awareness of workers. The promotion of an environmental sustainability-oriented training system will open new professional outlooks and stir employment by linking environmental and territorial concerns to economic growth requirements, as proved by the cases: Energy and Mobility Managers.

Local Agenda 21 processes

Processes of citizen's aware participation have been achieved by local Agenda 21, a new way to plan sustainable development-oriented actions through interdisciplinary, participatory and responsibility-involving tools and methodologies. Local Agenda 21 has been established in 1992 by UNCED and since then it has spread all over the world. Being sustainable development its founding philosophy, local Agenda 21 provides strategies, objectives, tools, actions, criteria and techniques to assess the outcomes. The outline of objectives is closely linked to the actual achievement of action prerequisites such as consensus, interest, synergies, human and financial resources.

Local Agenda 21 methodology foundation focuses on the integration of environmental concerns into each economical sector, such as industry, transport, energy, farming, tourism, and into every social issue, employment, status of women and young people, training, health, quality of life, especially as far as children and elderly people are concerned. This process is broken down into the following steps:

- the co-ordination of social, economic and environmental audit actions;
- the organisation of a forum/open debate for the aware participation of stakeholders;
- definition of medium and long term strategies for territorial sustainable development;
- the endorsement of environmental action plans including the operating plans and the actual steps of every party;
- monitoring and auditing the implementation and the effectiveness of the Plan.

Therefore, the fulfilment of local Agenda 21 processes will most effectively ensure a consistent contribution of local planning to higher level sustainability strategies, respecting the characteristics of each single area.

Indicators and accounting for environmental action and sustainable development

Traditional economic instruments for wealth estimates such as the GDP need to be supported with new environmental quality indicators and this view has become largely shared. Therefore, on one hand economic reasoning is being combined with an environmental sustainable development analysis, while on the other hand the statistical information needed as a support to the decision making process is being worked out, while suitable accounting and statistical tools are being provided to encourage integration. The consolidation of Italian environmental accounting well matches the EU widespread trend in this respect. However it does not only apply to public decision makers or authorities but also to private sectors, such as initiatives for the certification and modernisation of processes.

The draft of the Framework Act on Environmental accounting, currently under the Parliament's scrutiny, can be regarded as a far-reaching innovation that introduces an integrated economic and environmental accounting into the public administration. This *"Framework Act"* calls political decision-makers to their full responsibilities. This legal initiative has already brought about a significant outcome, although it has not yet been approved, such as the implementation of experimental processes for local environmental accounting, implied by the objectives of local Agenda 21. As far as data availability to backup decision-making, the development, within national statistics, of environmental accounting, indicators and statistics can be regarded as a new strategic tool. The National Institute of Statistics (ISTAT) –works out environmental accounting modules concerning the accounting of material flows (MFA); the environmental account matrix integrated with national economic account (NAMEA); the expenditure estimate for environmental protection (SERIEE-EPEA). These

modules are worked out according to EU standardized concepts, definitions and grading. The actions developed within international organisation are considered to be a strategic reference for future advances. Therefore, a special importance will be attributed to SEEA-2000, the manual of integrated economic and environmental accounting presently undergoing the scrutiny of the UN Statistical Commission as well as the recommendations worked out by an ad Hoc Task Force regarding the European environmental-accounting strategy.

Accounting and estimating significant aspects for sustainable development requires the systematic use of indicators. The use of indicators comes natural in many human activities. In fact, they are measurable values which set, in turn, useful values to understand aspects and make suitable decisions; they reflect reality providing a partial, in some cases uncertain, picture of reality. However, many indicators are needed because of the complexity and variety of environmental and ecosystem aspects. A sustainable development indicator undoubtedly differs from an indicator of the environmental state or pressure[1], since the former aims at different objectives, targets and accomplishment times can be integrated on a variety of aspects, also uneven ones which reflect environmental and socio-economic aspects of development.

National and international organizations have worked out a list of different indicators. The subject matter lists of this Strategy are consistent with the indicators of the Italian 2001 State of the Environment Report.

Indicators play a basic role in any reporting and audit of the implementation of the strategy's effectiveness. Both instances must take into account the EU action standards and obligations for sustainable development. To this respect, the levels of environmental action must be distinguished from those of the overall action. For the environmental action, recently planned by the Sixth Environmental Action Plan, the European Commission has adopted a restrained list of eleven environmental indicators, named Headline Indicators[2]. The Strategy enlists these indicators, displaying them wherever possible as "EU HL", marked with time series and EU sequence numbers; the same criterion applies to local indicators referred to the "EU LC" acronym. As to the overall audit action on the state of execution, the Strategy endorses the principles of the 2002 European Council in Barcelona, relating to the general process follow-up of sustainable development[3]. The Council recommends the fulfilment of *"national strategies and local Agenda 21"*, suggesting *"wide suitable national consultations to develop a broad social consensus"* and *"the introduction of assessment procedures through the use of indicators"*.

Sustainable development financing

In Italy as in Europe, the environmental protection budgetary commitment has become a crucial issue regarding the strategic agenda of competitiveness within a debate on the environmental sustainability of development. Beyond ordinary expenditure for land and environment protection, the Financial Act 2001 envisages a sustainable development fund for the Ministry for the Environment and Territory, recently re-allocated through the Deliberation of the Inter-Ministerial Committee for Economic Planning dated March 28th 2002.

Banks can play an essential role in the creation of successful paths towards sustainability. Many financial companies have started to include environment, health and safety among their strategic corporate choices. Banks have acknowledged that the environmental behaviours of companies affect, in the long term, the reliability of investments.

Moreover, the Italian insurance market has established an insurance coverage pool for civil polluting liabilities in order to share their financial resources and technical field skills.

The strategy of the financial sector envisages the institutionalisation of the integration of environmental factors in any loan granting and insurance policy through the feasible following steps :

- training and awareness projects regarding the environmental issues: at present the local development fund for the National Operation Plan has already financed some projects and two memorandum of understandings have been signed with banking institutes;
- enhancing the bank's promotion of environmental-friendly policies such as green investments and funds, evaluation procedures for the concession of credits keeping into account the environmental risks, loan-granting facilities for EMAS-recorded companies;
- an active involvement in projects aiming at spreading the principle of environmental damage liability;
- initiatives finalised to regulate sustainability evaluation in banking loan-granting facilities (such as banking investigations envisaged by Promotion and Incentive Acts 488/1992, 341/1995, 588/1994, 1329/1965).

Techno-scientific research for environment and sustainable development

Sustainable development challenges urge Italy to reinforce commitments in environmental science and techno-scientific research, according to the Fifth and the Sixth Framework Programme, such as the VFWP on European Research, assigning at least 50% of its funds to scientific and applied research activities in order to promote lifestyles and technological innovations for sustainable development. The new National Plan for Scientific Research envisages encouraging actions for environment and sustainability. In this case, social and administrative demand for scientific knowledge is stronger than the performance capacity of scientific institutions.

A different strategic approach needs to focus on the following priorities:

- communication enhancement among researchers, administrators and citizens;
- improvement of Italy's participation in the international scientific institutions and in technical body Conventions;
- the explicit adoption of the environmental paradigm by research institutes and universities through new faculties, specialisations, etc.;
- the strengthening of analysis, decision-making and planning methodologies and instruments;
- information and scientific knowledge web/internet approach to underline the interdisciplinary and multi-factor scope of environmental science;
- an increasing major role in data acquisition, processing and software for the National Institute of Statistics, National Environmental Protection Agency and Regional Environmental Protection Agencies;
- increase of domestic research funding and of its relevant environment and sustainable development shares.

1) The Pressure State Response pattern was first submitted by the OECD in the early 1990s and later enriched by the UN CSD through the "Driving Force" concept, that is DPSR and DPSIR introduction patterns.
2) 2000 EC and EEA "Headline Environmental Indicators for the European Union" updating is expected soon.
3) 2002 Barcelona European Council "Chairman Conclusions".

Climate and atmosphere

Climate change and green-house gas effects [4]

Since the end of the19th century, the global average temperature is increased between 0,4 and 0,8°C; moreover, over the last few decades it is increased of 0,2°C per decade. The climate change could be at the origin of socio-economic effects such as famines, drastic agricultural yield changes, the spreading of infective diseases such as cholera and malaria.

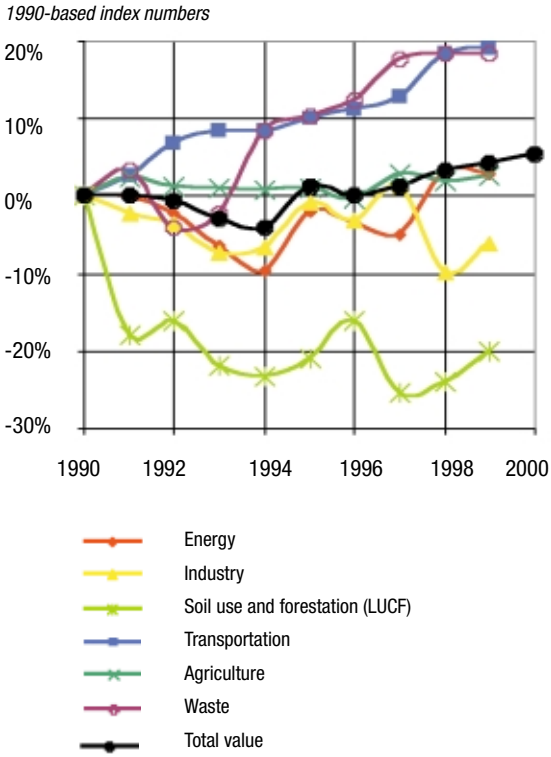
A survey on regional effects points out gradual extension of dryness in central-southern Italy with soil degradation, water-bearing strata salty infiltrations, agricultural yield changes, frequent floods, an increase of coastal erosion, severe rainfalls and floods as a consequence.

The emissions in Italy account for 2% of the global release and carbon dioxide represents the worst discharge. In 1990, UNFCCC reference year, Italy released 518.5 Mt CO_2 equivalents, of which CO_2 (84.4%), CH_4 (7.8%), N_2O (7.7%), regardless of soil exploitation sinks. Figure 2 shows the Italian GHG emission trend pattern and highlights the failure to achieve the 2000 European Programme stabilization goal, promoted by the Italian Presidency in 1990.

Priorities, objectives and actions

The Framework Convention on Climate Change was approved and signed by 154 countries in New York on the 9th of May 1992. The Kyoto Protocol represents, so far, the Convention's first and only implementation tool, approved by the third Conference of the Parties (COP3) held in Kyoto in December 1997. Both industrialized and transitional countries (as enlisted in Annex1 of the Protocol) pledge to cut their main GHG anthropic emissions by an overall 5.2%, between 2008 and 2012. Different reference years have been chosen as follows: 1990 for CO_2, CH_4 and N_2O reduction; either 1990 or 1995 for the reduction of HFC, PFC and SF_6. The overall emission reduction in European countries must reach 8%.

Figure 2
Italy GHG emissions in some sectors (EU HL 1)



Note: reference year value
Energy- transportation and industry excluded: 238 Mt CO_2 eq
Manufacturing industry: 121 Mt CO_2 eq
Transport: 102 Mt CO_2 eq
Agriculture: 43 Mt CO_2 eq
LUCF: -20 Mt CO_2 eq
Waste: 13 Mt CO_2 eq
Other emissions - outside the table: 22 Mt CO_2 eq
Overall amount: 519 Mt CO_2 eq

Source: National Environmental Protection Agency, 2001.

4) Green-House Gases enlisted in Kyoto's agreement are the following: carbon dioxide (CO_2), methane/natural gas (CH_4), nitrogen protoxide (N_2O), hydro fluorocarbons (HFC), perfluorocarbons (PFC) and sulphur hexafluoride (SF_6). Green-House Gases shielding effect is measured by CO_2 equivalents. Carbon dioxide emissions are caused by fossil fuel exploitation in every industrial and power activity, transportation, deforestation, land use change. Methane emissions come from waste landfills, zootechnical husbandry, rice crops; while nitrogen protoxide emissions come from agriculture and chemical plants. Hydro Fluorocarbons, Per Fluorocarbons and Sulphur HexaFluoride are used in chemical and manufacturing plants, HFC to replace CFC, that is ChloroFluoroCarbons (see Stratospheric ozone 2).

At the Sixth Conference of the Parties – COP6 - held in Hague on November 2000, the negotiation on flexible mechanisms of implementation of the Protocol came to a standpoint due to different opinions regarding the national commitments for the reduction of emissions. However, the EU reaffirmed at Göthenburg in 2001 that the ratification of the Protocol remains a priority for each country, at least every European one, even though it represents a first small step, not sufficient in order to solve the problem of stabilising GHG worldwide concentrations. At the COP6 bis (Bonn, 2001) and COP7 (Marrakech, 2001) the breakdown of reduction targets has not been changed but flexible mechanisms (Joint Implementation, Clean Development Mechanism and Emissions Trading) and sinks connected to the use of land and forest have acquired different weights and importance.

The Protocol, coming into force legally binds Italy to cut its emissions by 6.5% as compared to 1990 figures, thus 17% of its emission trends. Since Italian emissions per-capita are the lowest compared with other industrialized countries, this commitment is remarkable. By 2012, Italy must reduce the emissions by 6.5% as compared to 1990. According to the estimates of the National Agency for New Technology, Energy and the Environment - ENEA - the overall emission trend for 2012 will amount to 579 million tons of CO_2 equivalents, therefore a 6.5% reduction will account for 61 million tons of CO_2 equivalents.

The Italian Parliament, with Act 120/2002, ratified the Kyoto's Protocol, fully implementing it through a National Action Plan, approved by the Inter-Ministerial Committee for Economic Planning (CIPE) – and a report on the fulfilment state of IEPC resolution 137/1998. This Act attributed 75 million euro for the first three year period to reduce and sink the emissions through pilot projects and from 2003 the Act authorizes a yearly subsidy of 68 million euro to reduce GHG emissions in Developing Countries. The new National Action Plan will update the operational aspects of the environmental action strategy for sustainable Development (actions, tools, field targets and monitoring).

The active involvement of Regions is essential. In 2001 the Italian Regions signed the Turin Protocol, pledging to achieve the following targets:

- reduction of GHG emissions ;
- co-ordination projects and subsidies ;
- identification of an optimal strategy to reduce emissions within the Air-Quality Protection and Remediation Plans;
- elaboration of Energy-Environment Plans mainly pivoted to renewable resources, technological innovation, rationalization of energy consumption and electric power generation;
- increase in value of macroeconomic fiscal, tariff and incentive tools;
- promotion in the productive sector of eco-efficiency and international co-operation .

The development of renewable energies must proceed on singling out relevant economic subjects and introducing them in a framework of reliable clear-cut rules and incentives based on environmental worthiness of projects. Moreover, the market competitiveness of renewable energies must be achieved by multiplying investments in research and development.

For policies and measures in the climate change sector, according to the precautionary principle, there is the need to develop methodologies which can estimate quantitatively the environmental benefits and costs compared to the economic burdens. The monitoring process *in itinere* related to the effectiveness of the measures is equally essential. These evaluation mechanisms, which could be extended to energy policies entailing environmental implications, allow the possibility to appropriately correct and update the interventions.

For each objective, the following *"ad Hóc"* provisions and tools have been envisaged. However the suggested actions need to find an agreement at an European level to avoid environmental dumping and dangerous market imbalances.

Efficiency increase of thermo-electric equipment
Technological innovation allows a substantial improvement of such equipment. This modernization process, implying large investments, will benefit both the environment and the economy of this sector, bringing about the so-called "double dividend". Adequate investments are essential in order to bridge this gap as the recent Californian crisis has proved.

The use of the best available techniques to protect the environment and to produce energy, drawn by Directive IPPC 96/61/EC, LD 372/99 and 79/99 and the measures for the liberalisation of the market and the efficient use of electric energy, Directive 96/92/EC, contribute to the fulfilment of this objective. Measures needed to be taken include the revision of incentives and taxation policies, the implementation of agreements, contracts and program arrangements in order to promote the setting up of an adequate number of new combined-cycle natural-gas-powered plants, replacing obsolete plants, plants for industrial and civil electric power and heat cogeneration, residues and emulsion gasification plants,

according to the voluntary agreement attained among the Ministry for the Environment and Territory, the Ministry of Industry and ENEL, the National Electric Power Utility, in July 2000. All the thermo-electric equipment in Italy whose present performance is lower than 40%, accounting for at least 12.5 GW, must be replaced.

Reduction of energetic consumption within the transport system. In any EU transport system sector, the GHG emissions are expected to be rising due to a steadily increasing demand and the current poor flexibility. The transport policies envisaged by the EU White Paper and the Italian General Transport Plan (PGT) set a number of guidelines to ensure sustainable development of transports and to improve the effectiveness of the approved policies. Therefore, the priority goal to be achieved is represented by the creation of an efficient and sustainable transport system for both passengers and goods through suitable technological, organizational, fiscal and infrastructure measures. Italy has to rebalance its transport system towards sustainability facing the significant impairments represented by a strong widespread road mobility, such as trucks, private vehicles and urban public transport, whose size and extent are unknown in any other EU country.

The Italian mobility habits in both industrial and civil activities resist to any change since our development pattern regards car oriented transport as a key aspect for its progress. Between 1990 and 1998, the railway circulation of passengers registered +4% mobility increase (passengers per kilometre), while road and air transport, respectively account increases for 24% and 40%. In urban areas, public transport, such as buses, underground trains and surface trams, underwent a 5% decrease as against a 25% increase of private-car transport. In this context, it will be appropriate to foresee that the ever-increasing traffic share up to 2010 is directed towards low environmental impact procedures.

GHG emissions in transport must be curbed essentially through urban mobility planning actions, the improvement of national transport service and the adoption of standards which favour a reduction in the use of high-polluting fuels. Only through *"ad Hóc"* stimulating measures and the creation of suitable opportunities it will be possible to develop alternatives to road-transport. Modal rebalance, which represents the main challenge, must be mainly directed to investments for the infrastructure sector and non-road transport network as well as interventions in the management and regulations and the optimisation of the actual transport system. The railway conveyance market needs to be promoted by encouraging the competition among different transport systems (air, sea and railway) and within the single transport sector. The long-distance transportation of goods, the promotion of intermodal transport and integrated road-rail and sea-rail transport techniques (heavy vehicles carried by sea or train) requires investments on technologies and organization, interoperability of the national network and accurate manoeuvres regarding the prices of the service. The sea transport could represent a feasible alternative, due to the opening of sea routes. According to recent estimates, coastal trading, presently accounting for 2.4 Mt/year, should reach within 2010 10-12 Mt/year by taking up 32-38% of road transport. Voluntary agreements stipulated between passengers and ship-owners have significantly improved the environmental standards for sea carriage eliminating obsolete ships, see the 2001 Voluntary Agreement among the Italian Association of Industrialists (Confindustria) the Ministry for the Environment and Territory and the Ministry of Transport. Middle-term urban planning must support concepts of urban integration and permanence selecting policies and stances which reduce the need to move both goods and passengers.

Therefore the following projects ought to be timely accomplished: railways and tramways for an efficient mass transport in urban areas; improvement in the maintenance and the adjustment of infrastructures; promotion of private car sharing; introduction and implementation of cycle-pedestrian paths; limitation (Limited Traffic Zone – ZTL) and a more efficient regulation of urban traffic; shift from road transport of goods to rail and coastal trading; development of equivalent telematic services of mobility. The General Transport Plan (PGT), recently improved by the Ministry for the Environment and Territory and the Ministry of Infrastructure and Transport, the Urban Traffic Plan (PUT) and the Urban Mobility Plan (PUM), adequately co-ordinated, represent the implementing tools of such actions. The *"Auto Oil"* EU Directive regarding road-vehicle emissions and Directive 96/61/EC on air-quality protection recommend electrically-powered vehicles or low-consumption public transport, low-exhaust vehicles, diesel/gas oil and petrol bio-additives and bio-fuels.

In this field, great evidence is put on the importance of technological and scientific research in devising more efficient clean gas, methane-driven or even hybrid engines; the use of highly-recyclable and recoverable lighter materials; the promotion of fast disposal for obsolete high-exhaust vehicles and the future introduction of Zero Emission Vehicles (ZEV) based on fuel-cell and hydrogen-cycle entailing environmental benefits such as an overall phase out of GHG emissions. The Kyoto's Protocol ratification Act 120/2002, prescribes these provi-

sions at section 2, paragraph 4. Nowadays the achievements of alternative drives provide us with a clear-cut technological progress setting. Fuel-cell and hydrogen-cycle drives can supply feasible alternatives through further technological innovations in a medium term period. Moreover, the reduction of oil-dependence and a changeover to lower-polluting fuels represents viable solutions to be pursued through substantial investments in technology and research.

Increase of energy production from renewable sources. To this end the EU White Paper (1997) sets as a minimum target by 2010 the doubling of energy production from renewable sources. According to the White Paper for the energetic valorisation of alternative sources, approved by the Inter-Ministerial Committee for Economic Planning, the electric power generation from renewable sources will shift from 10.2 Mtoe in 1997, to16.7 Mtoe between 2008 and 2010 in terms of fuels, due to a ever-increasingly use of alternative power sources such as biomasses, wind, photovoltaic, geothermal heat, hydro-electric power, waste and biogas. Moreover, according to EC Directive 77/2001, the amount of electric power produced from renewable energy sources compared to the national gross consumption of electricity in Italy should move from 16.0% in 1997 to 25.0% in 2010. Programme agreements, arrangements, contracts, territorial pacts must ensure the implementation of development projects for renewable energy sources. Starting from 2002, leading manufacturers and importers must compulsory generate or purchase through saleable green certificates a minimum 2% share for new plants from renewable energy sources, complying with Law Decree 79/1999. Furthermore, the National Plan for the Valorisation of Forest and Agriculture Biomasses, adopted by the Inter-Ministerial Committee for Economic Planning, envisages that 120,000 ha should be allocated for the production of biodiesel and 70,000 ha for bio-ethanol production, besides the collection of forest wooden materials and agricultural residues to produce electricity and heat from biomasses.

Reduction of the energy consumption in the industrial, housing and service sector. The above-mentioned IPPC Directive on the "Integrated Prevention and Control of Pollution" imposes the adoption of Best Available Technology (BAT) and the maximization of energetic efficiency in the industrial processes. The EU Programme SAVE promotes initiatives regarding energetic efficiency. In all the final uses of energy the promotion of fuel mixtures with higher percentages of hydrogen, starting with methane, is important and it can be achieved through a network improvement and adequate incentives.

In the industrial system, actions consist in: product and process innovation, increasing use of Best Available Technology, observance of the emission standards, labelling energetic equipment, promotion of ecolabel and ecoaudit, promotion of environmental management system incentives, such as EMAS and ISO 14001, implementation of the Life Cycle Assessment (LCA), wide promotion of voluntary agreements.

In civil, housing and service sectors, the reduction of energetic consumption of heating and conditioning systems can be achieved with technological innovations, by reducing thermal losses in buildings through the maintenance of heating appliances (Presidential Decree 412/93) and by implementing bio-climatic architectural technology. Public lighting power consumptions could be reduced by over 20%, as an average saving, only by facing the problem of light pollution. Automatic temperature regulation and control devices are to be installed in buildings. As far as final consumptions are concerned, information campaigns for citizens and consumers have become essential to ensure an effective Demand Side Management.

Absorption of CO_2 emissions from forests. Agricultural lands and forests, due to their capacity to absorb carbon, can play a key role in restraining and mitigating climate changes. Kyoto Protocol allows in its inventories crop and forest soil CO_2 sink deduction, although it has left many questions still unsolved regarding in particular the methodologies to calculate the balances of carbon in agro forestry ecosystems. This priority issue has been discussed, among other crucial points, at the COP6 meeting. The National Program to Enhance Agriculture and Forest Biomasses and the European Forestry Strategy – already partially implemented through Council Regulation 1257/99 and EC Regulation 1750/99 on rural development – support forestation of agricultural land with species suitable for local conditions. The Inter-Ministerial Committee for Economic Planning has highlighted the basic importance of forest protection and extension to ensure carbon sinks, among other national actions to be taken to restrain Green-House Gas emissions and preserve as well the Italian territory.

Reduction of the emissions in the non-energetic sector: to this end, the 1998 Resolution of the Inter-Ministerial Committee for Economic Planning has set the following targets per action to be taken:

- cut 13,500 t of N_2O emissions from industrial processes;
- cut 0.4 Mt of CH_4 emissions from waste disposal sites, also through glass, paper and plastic recycling;

—— cut 21,000 t of CH_4 from agricultural breeding;
—— reduce HFC, PFC and SF_6 emissions from industrial processes.

The Italian participation to the *co-operation programs in the area flexible mechanisms*. Italy is involved in singling out co-operation projects, together with Developing Countries and Countries in Economic transition, to ensure the development of renewable sources, to enhance and restore the existing thermo-electric power plants, to implement infrastructures and programs for a quick urban mass transport, to plant forests for energetic targets and to increase the carbon absorption capacity. Moreover, there is the need to define methods and measures for the trading authorisation, according to the EU emission trading scheme, before its implementation in 2005.

Public information and training. The National Program for Climate Change Information envisages initiatives from both private and public sectors to work out and promote information on the causes of climate change and on the prevention strategies.

Table 1 Objectives, indicators and targets for the sustainability of climate change and stratospheric ozone.

OVERALL OBJECTIVES	SPECIFIC OBJECTIVES
Reduction of GHG emissions at national level by 6.5%, compared to 1999, to be accomplished in the period 2008 - 2012	Increasing the efficiency of thermal power plants through: new natural gas combined cycle; new co-generation plants for civil and industrial purposes, re-powering of existing plants; gasification of emulsions and residual products; introduction of the hydrogen cycle (in medium term).
	Reduction of energy consumption in the transport sector through: enhance alternative means of transport for private use; spread of low consumption vehicles; adoption of fuel cells for electric motor propulsion; shift passengers and goods transport from roads to railways/coastal fleets.
	Increase the use of renewable resources for power production; Use of biofuels as part of the traditional petrol and diesel; Implementation of biogas recovery procedures within the existing disposal sites.
	Reduction of energy consumption within the industrial, residential and service sector; Reduction of thermal losses, among new and existing buildings.
	Reduction of emission in the so-called non-energy sector; Increase the use of natural gases for both civil and industrial use; Cutting of N_2O emissions within industrial processes; Cutting of CH_4 emissions within disposal sites; Energy recycling and recovery from waste; Cutting of CH_4 emissions within agricultural farming; Reduction of HFC, PFC, SF_6 emissions within industrial processes and equipments.
	CO_2 uptake from forests and soils.
	Participation to co-operation programmes in the framework of Kyoto's flexible mechanisms.
Training, information and research on climate	Training and information to citizens.
	Thorough examination of climate change related issues.
Reduction of GHG emissions by 70% in the long term period	Establishment of climate-safe GHG emission thresholds.
Adapting to climate change	Reduction of vulnerability against climate change.
Reduction in the release of stratospheric ozone layer-depleting gas	Maintaing the ban of already phased out substances (that is on CFC, halogen CFC, halogens, carbon tetrachloride, methylchloroform and hidrobromo fluorocarbons).
	Phase-out of HCFC and methyl bromide production, market introduction and exploitation.
	Uptake of ozone depleting gas form dismissed goods and plants.

In depth study regarding origins and effects of climate change. Reduction of the vulnerability to climate change effects. The implementation of a "National Program for Climate Research" is envisaged and should carry out the following tasks: census of research activities; development of new programs linked to the international community; study of the climate change effects on the Italian territory and in the Mediterranean area; definition of national policies of adjustment to climate changes, as emphasized in the Sixth EU Environmental Action Program. To this end, the promotion of scientific and technologic research plays a basic role to devise domestic policy facilities such as incentive grants for renewable energy sources, an enlargement of the range of international initiatives, the promotion of firms that use instruments to improve their environmental performance.

The targets to reduce national GHG emissions were quantified in terms of CO_2 equivalent emissions to be achieved through phased steps referring to years 2002-2006 and 2008-2012 period. Objectives, target indicators and actions have been stated in table 1, under the

INDICATORS	TARGETS
CO_2 eq emissions from combustion processes; CO_2 eq emissions per unit of energy produced; CO_2 eq emissions from losses of combustible.	-4/5 Mt of CO_2 eq by 2002; -10/12 Mt of CO_2 eq by 2006; -20/23 Mt of CO_2 eq by 2008/2012.
CO_2 eq emissions from the transport sector; Consumption of oil equivalent tons in the sector.	-4/6 Mt of CO_2 eq by 2002; -9/11 Mt of CO_2 eq by 2006; -18/21 Mt of CO_2 eq by 2008/2012.
Contribution of renewable resources to the national energy account (MWh/year).	-4/5 Mt of CO_2 eq by 2002; -7/9 Mt of CO_2 eq by 2006; -18/20 Mt of CO_2 eq by 2008/2012.
Total energy consumption in the industrial sector (Mtoe/year) Total energy exploitation in the industrial sector (toe/million of euro)	-6/7 Mt of CO_2 eq by 2002; -12/14 Mt of CO_2 eq by 2006; -24/29 Mt of CO_2 eq by 2008/2012.
CH_4 and N_2O emissions from agricultural activities; CO_2, CH4 and N_2O emissions from waste treatment processes.	-2 Mt of CO_2 eq by 2002; -7/9 Mt of CO_2 eq by 2006; -15/19 Mt of CO_2 eq by 2008/2012.
Annual increase of forest surface.	-0.7 Mt of CO_2 eq by 2008/2012.
Numbers and amounts of co-operation programmes.	
Initiatives and resources specifically devoted to information on climate changes issues.	
Percentage of resources devoted to research on climate changes related issues such as mitigation of effects and adaptation.	
CO_2, CH_4, N_2O, HFC, PFC, SF_6 concentration in the atmosphere.	Reduction of GHG global emissions by 70% compared to 1990 (-20/40% by 2020).
CFC, whole halogen CFC, halogens, carbontetrachloride. HCFC; HBFC, methylcloroform and methyl bromide production.	Bromide production, market introduction and usage ban by 2005; HCFC market introduction ban by 2010; HCFC exploitation ban by 2016; HCFC production ban by 2026.

1998 Deliberation of the Inter-Ministerial Committee for Economic Planning awaiting the indications which will derive from the implementation of Act 120/2002.

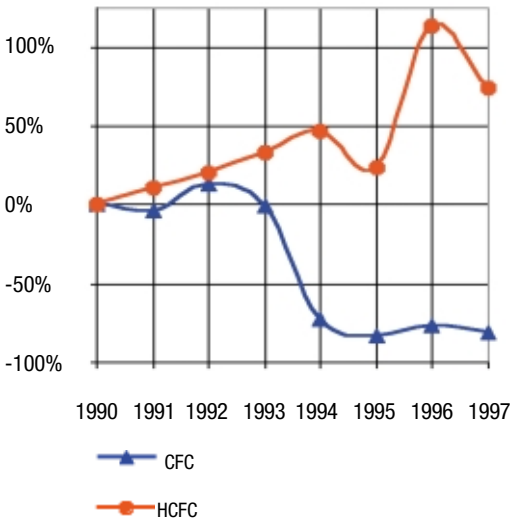
Stratospheric ozone

Ozone, that is O_3, is a molecule made up by three oxygen atoms. Troposphere ozone is a pollutant which directly affects human health and the state of the environment. The ozone in the stratosphere, instead, filters ultraviolet solar radiation. The failed absorption allows the UV-B radiations, dangerous for flora and fauna, to reach the earth surface. The main effects are: immunity deficiency system, skin cancer, sight impairment, impact on oceans, namely on the life of plankton and any other organism essential to the marine feeding balance, negative impact on flora, especially undermining atmospheric nitrogen-fixing micro-organisms, atmospheric pollution and material damages.

The level of the atmospheric ozone-layer is constantly measured. Stratospheric ozone shrinkage, especially in the Antarctic stratosphere, is linked in particular with the emissions of artificial compounds such as halogen hydrocarbons, chlorofluorocarbons being the most dangerous ones, mainly used in refrigeration systems, as spray can propellants, in the electronic industry, in the preparation of paints and solvents, in some plastic manufacturing and industrial processes. Huge stocks of CFC and Halon, already produced and stored in plants and operating equipments, represent a threat for the stratospheric ozone layer.

Figure 3 Ozone-layer depleting gas emissions

1990-based index numbers



Note: reference year values
CFC= 36.4 tons of Ozone-Depleting Potential, ODP
HCFC= 375 tons of Ozone-Depleting Potential, ODP

Source: 2001 National Environmental Protection Agency, 2001.

Hydro Chlorofluorocarbons can be regarded as a viable technical alternative to CFC exploitation, due to their low ozone-depleting potential in the long term, although they entail an atmospheric chlorine charge raise in the short term and considerable green-house effects, whose CO_2 equivalence parameter stands at 93-2000. Moreover, methylene bromide may also considerably damage the ozone layer; it is mainly released by agricultural usages, such as soil fumigation, and by synthesized chemical manufacturing exploited as raw material.

The ozonosphere depleting issue has been tackled quite early so that international measures have been promptly enforced, in view of undeniable negative effects from UV-B radiation on human health and ecosystems. The Montreal 1987 Protocol and its subsequent amendments have curtained, even by means of proclamations, the production and consumption of Ozone-Depleting Substances (ODS) such as CFC, halogen CFC, halogens, hydrobromofluorocarbons, hydro chlorofluorocarbons, carbon tetrachloride, methyl chloroform, methyl bromide.

The National Legal Framework of Stratospheric ODP is made up as follows: Act 549 - dated December 28th 1993 - and its subsequent amendments by Act 179 - dated June 16th 1997; Ministerial Decrees dated March 26th 1996 and October 3rd 2001. Act 549 singles out in the program agreement with firms the most suitable tool to fulfil the set objectives. Moreover, the schedule to reduce and ban ODS is defined by Regulation (EC) 2037/2000 of the European Parliament and the Council of Europe.

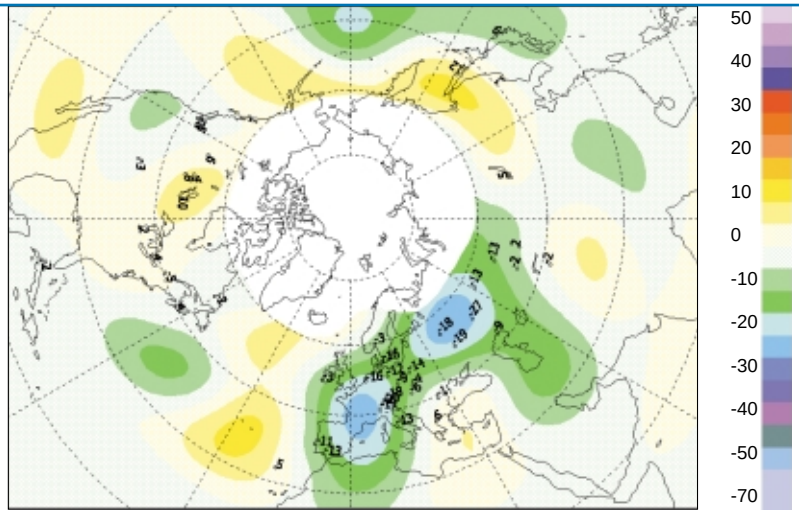
Priorities, objectives and actions

The following three basic objectives must be met:
- interrupt production, promotion and use of ODS;
- regulate collection, recycling and disposal of ODS;
- constant international cooperation commitment.

The above-mentioned objectives must be achieved with the following measures:
Elimination of the use of ODS. Substances which were already-phased out must be kept under ban. Moreover, the following actions will contribute in phasing out other substances: restrictions in the use of HCFC, PFC and

Figure 4

Northern hemisphere stratospheric ozone concentrations, 2000's data, compared



Source: WHO LAP-AUTH-GR, 2001.

HFC in the fire-fighting sector; definition of a technical regulation to eliminate the use of such substances; proposal of viable alternative techniques; editing reports to integrate the list of hazardous substances; information and education campaigns for citizens; consumer information and product labelling. Such actions will be financed through part of the State budget and an *"ad Hoc"* technological innovation rotation fund.

ODS collection, recycling and disposal regulation. An *"ad Hoc"* Research Fund to convert the production of substances will subsidize ODS separate collection, disposal and recycling. The regulation for waste disposal sites, Ministerial Decree 141, dated March 11th 1998, bans the disposal of ODS in landfills. Moreover, Act 549/1993 and its subsequent amendments (Act 179/1997) compel that all those who own ozone-depleting products, plants and durable goods must gather them in licensed collectors in order to separate, extract and collect hazardous substances. The durable goods which contain ozone-depleting substances are also subject to a deposit, while exemption is granted for those who return such a durable, when they buy a new one.

Constant international cooperation commitment, already stated by the ratification of the Montreal Protocol and London 1990, Copenhagen 1992, Vienna 1995 and Montreal 1997 amendments; while Peking 1999 amendments, envisaging stricter targets, have not yet been ratified.

Furthermore, co-operation projects call for a stronger commitment. To this end the following issues must be carried out, through a biannual project starting from the 1st of January 2001, to transfer alternative technologies to methylene bromide for soil fumigation and the implementation of capacity building in China, in accordance with the agreement between the Ministry forw the Environment and Territory (International Environmental Protection Section PIA) and the Chinese State Environment Protection Administration, SEPA. Finally, the need to ensure the elimination of problems such as ODS black market and the transfer of dangerous obsolete techniques towards Developing Countries.

ODS production and consumption represent key indicators of progresses towards the fulfilment of the national objectives. Table 1 shows the targets for the elimination of production, market introduction and consumption of methyl bromide and HCFC. Other harmful substances have already been phased out, such as CFC, halogens, other halogen CFC, carbon tetrachloride and methyl chloroform.

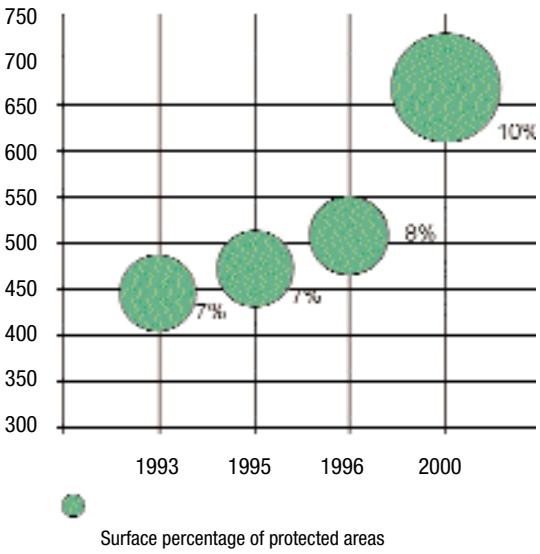
Nature and biodiversity

Living natural resource

Biodiversity is defined, from the 1992 Rio de Janeiro Convention, United Nations Convention on Biological Diversity (UNCBD), as a composition of genetic diversity, specific genders (natural or agricultural and zoo technical), ecosystems, landscapes and cultures, setting man as part of natural processes. Therefore, the preservation of nature is part of biodiversity related main issues. To this regard, the Convention on Biological Diversity emphasizes a significant integration issue that is the great importance given to the sustainable use of living natural resources. Italy through Act 124/1994 ratified the Convention.

The implementation of International conventions and EU Directives provides several preservation tools. In Italy, the preservation of nature has improved due to the Framework Act 349/91 on protected areas, which marked the start-up of the active involvement of local social, productive and political stakeholders in the management of protected areas (see figure 5).

Figure 5
Evolution of protected areas (number and surface) in Italy (EU HL 2)



Source: Ministry for the Environment and Territory, 2002.

However, the enforcement of the Framework Act and the subsequent legislative provisions have brought about a number of obstacles. Weaknesses resulted in the long and medium term planning strategy and planning capabilities and in the overall (legal, technical and administrative) management of protected areas as well as all the difficulties in the co-ordination of Park Management Bodies and interested social parties. With the 426/98 Act (New Environmental Projects), the involvement of local communities and the promotion of sustainable economic actions through traditional activities (farm holidays and eco-tourism), were further promoted.

Moreover, the Framework Act has set up many new protected areas thus entrusting regions with new commitments. The regional social economic and environmental diversity enriches the range of different approaches, strengthening cultural and landscape biodiversity, thanks to the peculiar contribution of agricultural practices to habitat diversification and the creation of ecotones. The EU approach has too long followed the opposite path, thus damaging traditional productions as well as local peculiarities and quality through inappropriate restrictive rules, which have been recently and partially amended.

Over the last few years, the National System of Protected Areas has been integrated with Nature 2000 Network under the 92/43 EEC Habitat Directive and the 79/409 Birds Directive which identifies sites of Community interest. The resolution of the Inter-Ministerial Committee for Economic Planning, dated December 22nd 1998, endorsed, according to the priorities of the Community Suppot Framework 2000-2006, a national ecological network to promote and to develop local natural and cultural resources. The European Commission has focused its attention on the management of the Nature 2000 Network sites system through the publication of *the "interpetration guide of article 6 on the habitat directive"* setting a broad protection and preservation framework of sites with procedure, prevention and proposal provisions. The latter must support farmers as natural heritage safeguards and promote sustainable tourism, codes of good agricultural practices, environmentally low impact and organic farming.

Over the centuries, the Italian landscapes have acquired deep-rooted cultural features making them a national

biodiversity peculiarity. Therefore, the 2000 EU *"Landscape Convention"*, approved in Florence, acknowledges the diversity and the quality of European landscapes as well as the promotion of peoples living habitat. A deep understanding of the landscape is needed in order to outline assessments and objectives, thus interpreting its peculiarities, dynamics and inner changes. The concept of landscape takes on a basic importance in establishing a good living habitat. Therefore, the individual awareness of responsibility towards the protection and management of landscape rises. This Convention underlines that land protection will not oppose to economic growth but it will rather encourage sustainable development and social involvement.

17.8% of the Italian population lives in the mountains. The mountain area accounts for 54% of the Italian territory; national forests for 84%; regional and national parks for 85%. The balance man-nature in mountain areas has been kept for centuries, thus allowing the establishment of a mountain economy, society and culture. While this has played a basic role for the preservation and the improvement of genetic and eco-system wealth of the territory, it is nowadays becoming increasingly weaker. The environmental and social crisis of the mountains deeply affects the safety and the preservation of the territory, bringing about geological disarray, land slides and fires. The seasonal pressure of tourism weighs significantly on the territory and reduces environmental management and monitoring activities. The crisis of the mountain economic system is caused essentially by several aspects: de-population, lack of workforce (due to full time employment outside the area and commuting), crisis of wood and agriculture industries.

The biodiversity of the Italian mountains is extremely rich, notably in the South, featuring socially and economically depressed marginal areas abandoned by productive activities, such as agricultural, forestry and sheep rearing ones. Therefore, activities related to the sustainable use and preservation of biodiversity shall ensure the local development of these areas. Worth mentioning the Convention on the Protection of the Alps, ratified by Act 403/99, stands as the ultimate target on the long way striven to consider the Alps as a whole interdependent ecosystem made up by nature, economy and culture. In fact the peculiarities in the Alps' diversity outline the trans-national identity across geographical, regional and national borders. Moreover, also the Apennines European Park (APE), promoted by the Ministry for the Environment and Territory, must be regarded as a far-reaching project.

The fragmentation of the Mediterranean woodland causes alterations in the natural evolution of the ecosystem. This phenomenon is caused by an exhausting use of land at times due to the presence of holiday resorts and other anthropic activities. However, Regulation 1257/99/EC has abrogated EU economic incentives which had unwittingly set dangerous genetic outlooks.

Over the 1990-1998 period, fires have ravaged an average of 57,000 hectares of woodland per year. Framework Act 353/2000 on forest fires prescribes binding restrictions on fire-stricken areas envisaging as a crime setting fire to woodlands. Regulation 1458/2001/EC, extending the regulatory provision 2158/92, dictates a collection of data, regarding woodland fires, to be done with comparable and even methodologies.

The *"wood degradation"* phenomenon which largely affects Italy, is rather complex and only partially due to atmospheric pollution; it represents a co-factor together with anthropic, climatic and biotic factors. The atmospheric pollution has spoilt approximately 65% of broad-leaved woods and 57.3% of coniferous forests. The EC Regulations 3528/86 and 1484/2001 set a network of observation sites, the constant monitoring of forests, the regular inventory of damages, the promotion of scientific researches, surveying methodologies and pilot projects.

Most of the environmental pressures negatively affecting living marine resources are concentrated along the coastal areas as a result of demographic growth and urbanization impact. The fragmentation and the loss of habitats are due to the over-exploitation of resources, usually only partially renewable, pollution, the direct and indirect effects of chemicals, eutrophication, climate changes, the introduction and the spreading of allochthonous species, tourist pressure and the physical alteration of coasts.

With regards to the protection of the marine environment, it is worth mentioning that the Convention of Bern provides a list of fish species, invertebrates and Mediterranean sea animals; while the *"Habitat"* Directive 92/43/EEC neglects EU-significant marine habitat and species.

The biodiversity is threatened by the impact of alien species on the autochthonous community. In Italy, the introduction of foreign species has lead to a negative impact and it has been proved by economic and scientific evidence in a number of sectors such as agriculture, forestry, fishing, nature preservation and land management. In the marine area this problem has aroused considerable interest and concern. In fact the sea is the most

suitable natural passive spreading vehicle for new species. Therefore it has become a priority issue to accomplish studies and researches targeted to the extirpation, containment and monitoring of invasive alien species. In the same field, coordination and co-operation with similar projects are most needed, such as the Official Plan on Invasive Species IUCN, FAO, the Convention of Ramsar (Wet Areas), Bern (European Wildlife), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the International Plant Protection Project. Later on, the collection of scientific data will outline a legal framework regulating the voluntary or occasional introduction and spread of potentially dangerous or invasive species to protect the environment and the public health in Italy. Much can be done in this sector by preventing their occasional spreading through general public information and awareness campaigns.

The preservation of biodiversity is undermined by a number of factors concerning agricultural activities: the decrease of farmed agricultural areas, crops concentration, pollution of non-agricultural activities and agricultural abandonment of marginal areas. Moreover, this situation is even worsened by the shrinkage of the genetic variety of plants used in agriculture.

Tourism is to be regarded as a twofold phenomenon bringing about positive and negative effects at the same time. Thus it may contribute to the socio-economic and cultural growth or cause environmental degradation and the loss of social identity. Critical conditions and environmental stress due to tourism are gauged at a systemic level by exploited resources, power, water, food, land (soil, vegetation, etc.), engendered pressures, coastal deterioration, concrete-spreading, solid waste, atmospheric emissions, sewage, desertification phenomena, salty infiltrations in the coastal plain areas and the presence of too many facilities. Moreover, the incorrect management of tourist activities may penalise the social and cultural identity of local communities, thus undermining the land management tradition and culture. Over the last few years, the tourist industry has been paying a growing attention to sustainability issues thus acknowledging the fact that environmental quality represents its main resource and that the loss of identity of local communities negatively affects tourism. Therefore, tourist companies must develop and use facilities accordingly, thus paying respect to their "raw material". Within this framework, local tourism, with new normative instruments may highlight well-known or almost unknown Italian tourist resources through the implementation of systems of local tourist districts.

Italy lacks of information on tourist pressure and its environmental impact, as well as data organised geographically and chronologically. This failure is due to a restrained use of strategic planning and an inadequate control of development. Natural and built environments are often fragile, the infrastructures are poorly equipped and the obsolete resorts must be thoroughly improved. The Italian widespread culture of short-term investment policies has lowered the chance of making tourism a strategic national resource. In Europe, the tourist industry ranks first for its employment rate, turnover and induced economic activities.

Biotechnologies

Nature and biodiversity set a peculiar path for the development of biotechnologies. This innovation sector can bring about many remarkable developments in a number of industries without any environmental release. Some technological branches can lead to extremely innovative developments such as bio mimetic materials, bioelectronics and biosensors, neuro-electronic prosthesis, bio catalysis, fine chemicals, bulk chemicals, bio fuels, RNA technology, de-pollution, decontamination and energy. In the energy industry, biotech research mainly focuses on the development of bio fuels and biomass-derived hydrogen. The OECD recommends a wider use of biotechnologies in the industrial sector.

Genetic engineering is not to be regarded as a unambiguous alternative; the research applied to traditional agriculture must be strengthened and integrated to restrain the danger of biodiversity loss, to limit soil erosion, environment pollution and waste of water resources.

Priorities, objectives and actions

Priorities, objectives and actions are summarized in table 3. The definition of indicators according to the above-mentioned priorities and objectives is still in process. The UNCBD devotes great attention to indicators of status (quality and quantity of ecosystems), pressure and response. These indicators better describe the preservation and management initiatives of biodiversity resources and natural environments, although they need an adjustment to the national environmental situation. Therefore, the setting up of suitable indicators demands first of all a selection and processing of the available data on biodiversity and nature in Italy.

The United Nations Commission for Sustainable Development (UNCSD) recommends, as a biodiversity measuring indicator, to adopt the percentage of endangered species against native species to outline the level of

endurance or loss of specific diversity. The reliability of this indicator is restrained by the actual monitoring effectiveness of the overall species. The table 3 shows the Italian Strategic Environmental Assessment indicators. The implementation of the UNCBD in Italy has so far been negatively affected by the lack of a National Plan to co-ordinate and rationalise initiatives of preservation, sustainable use and equal sharing of the benefits of biodiversity. The rationalisation and the sharing of biodiversity information at a national level is fundamental to plan any suitable biodiversity action.

Ecologically speaking, a connection system among Italian Natural Protected Areas is most needed because of their fragmentation throughout the national territory and the creation of new protected areas. This is required in order to improve the effects of preservation and rebalancing of the natural environment, as envisaged by the National Ecological Network.

The preservation of landscape and habitat must be pivoted to many anthropic activities, such as land monitoring and environmental improvement projects, which ought to be backed especially in protected areas and sites as suggested by EU Directive 43/92 on Sites of Community Importance. To this end the following steps are needed:

- devise technical and legal tools for the management of Sites of Community Interest and Special Protected Areas, involving agricultural entrepreneurs, through models, homogenous at a national level, of impact assessment, differentiated according to the bio geographic area and the type of intervention;
- increase and computerise the territory's natural data;
- promote the dissemination of results and the spreading of knowledge;
- update regional laws on biodiversity preservation, considering the new available data on the preservation of habitats and species;
- include biodiversity preservation among the ordinary requirements of economic and land planning, structural funds and basin planning;
- drawing maps and atlases of species and habitats, which are part of Nature 2000 Network areas;
- setting up regional biodiversity observatories and fulfilling suitable monitoring projects;
- encouraging ad Hoc training for personnel working in the management of Sites of Community Interest, Special Protected Areas and Protected Areas;
- promoting projects in Nature 2000 Network areas through sustainable tourism activities and good farming practices.

In mountain areas, activities of preservation and sustainable use of biodiversity can be planned to ensure local development. This does not exclusively imply curbing and slowing down the depopulation of mountain areas, but it also entails the functional planning, monitoring and surveillance of territory. Therefore, areas must be singled out where forests can lead to productive tasks rather than to a mere preservation. The pasture as well should lead to both economic and preservation tasks, such as ensuring dynamic processes and natural values. Eventually, the improvement of vegetation on mountain sides is decisive in basin planning and in restraining the erosion phenomenon.

The qualitative improvement of the woodlands coenosis is more effective in preventing forest fires than the useless fire-stop lanes - which can also damage slopes - or grazing to clean forests which decreases the forest renewal. River captures also can affect fire hazard, whenever they significantly reduce the action of water courses as fire-barrage.
However the restraint of linear infrastructures could reduce the fragmentation of habitats. In fact their growth has divided the environment into ever smaller pieces part of a mixed mosaic, while there is the need to plan and design the vegetation naturalness, by sewing up its wounds and effectively restoring the functions of land.

The voluntary or occasional spread of exotic flora and fauna, which might invade or damage the Italian environment and health, ought to be kept under control through legal tools. To this end, general public information and awareness-arousing campaigns can play a major role. In order to replace widespread highly-competing infesting plants it is essential to limit the fragmentation of forest habitats and to regulate, giving continuity to occasional cleaning practices.

The tourist fruition, however desirable, ought to be carefully analysed, notably for sea and mountain areas, since it entails negative effects, such as an excessive attendance and disturbance, pollution, natural land deduction, etc. Therefore, tourist facilities must be wisely located in sightseeing areas featuring lower natural hazards and values.

The management of the territory must cover the whole country without any distinction between natural, rural, urban and suburban areas or extraordinary, ordinary and degraded landscapes. Projects must be shared by local people and planned to range from mere nature preservation to safeguard and upgrading brand-new designed valuable contemporary landscapes.

Soil, subsoil and desertification

The impact of extreme natural phenomena on the land is increasing due to the human interventions on its physical asset and also because of the ever-increasing complexity of soil exploitation and territorial structures and infrastructures (see figure 6). The climate change and variability due to anthropic activities has increased the frequency and the strength of natural disasters. Moreover, these problems are even worsened by the complexity of the impact of natural phenomena which are caused by several factors: demographic growth, concentrated in a few large cities; vulnerable population increase (that is the elderly people, the disabled people, etc.); new types of emergency linked to industrial accidents; technological improvements, to reduce risks although increasing complexity; new types of emergencies linked to technological accidents which may lead to environmental disasters; the increase of risks due to disasters that can occur also in remote areas.

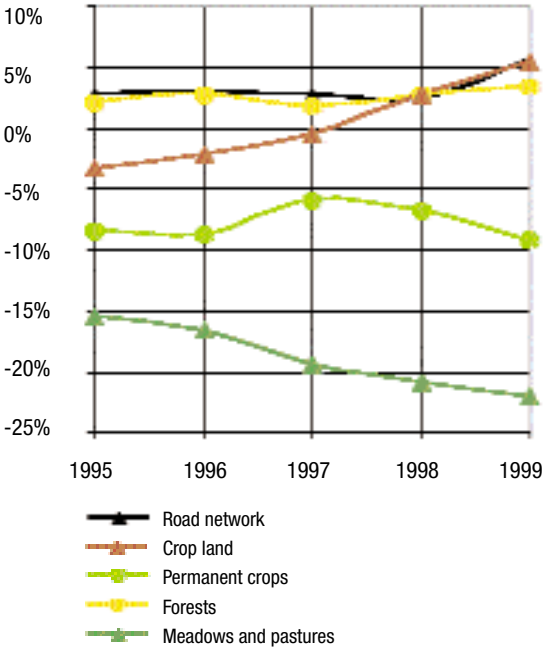
In the past, the so-called "emergency approach" has lead to interventions in lower catchment basins in highly urbanised areas. Therefore there is an urgent need of interventions in mountain and hill areas where the erosion actions are more significant. The overall arrangement of the upper areas of catchment basin will bring about the improvement of drainage systems in the plains, even though just a few in Italy but they gather most of the population and the public-private estates, such as infrastructures and settlements. In the last few decades, a lower rainfall rate compared to last century, together with the number of river dams, have caused a decrease of the solid flow of rivers which, in turn, contributed to the present resumption of coastal erosion, undermining the stability and the safety of our coasts. This is due to the presence of too many infrastructures and holiday resorts - such as roads, railways, urban front-ends, harbours and docks - whose economic development strictly depends on their closeness to the sea.

Between 1961-1990 semi-dryness conditions have affected 5.5% of the Italian territory showing an ever-increasing trend compared to the previous thirty years. Therefore, the international commitments of Italy on combating desertification specifically endorse suitable interventions for soil protection. In Italy, the system of competences on natural hazards is extremely complicated, so much that, from 1994 on, seven different Ministries have been funded to meet flood emergencies.

Act 183/89 and its relevant administrative and legal provisions attempted to strike a balance between principles of land planning and the land's safe management

Figure 6
Data on the Italian soil exploitation (EU HL 11)

1990-based index numbers



Source: National Institute of Statistics, 2001.

although the enforcement emphasized strong delays and inequalities. The main factors negatively affecting the effectiveness are: a narrow vision of planning, conceiving it as a mere restriction rather than a coherent land planning, and an unclear regulatory framework mainly envisaging field activities and almost exclusively meant for peculiar circumstances. Wide range legal provisions and planning tools -on waste, mining, water supply, tourism, agriculture, parks, etc: are all entitled to deviate from other plans regardless of their qualitative parameters. Also ex-post disaster interventions of the Civil Protection often overlap ad Hoc basin planning activities.

Among the internal factors, there is a concern for the following issues: the complexity of rules and innovations, an unclear assignment of competence between State and Regions, the gap between innovation, that is the theoretical drafting of laws, and the availability of inadequate technical structures and operational tools, poor financial resources.

A new impetus came from Law Decree 180/98 and its subsequent amendments that envisage urgent measures for the prevention of hydro-geological risks through

land zoning. This Decree clearly assigns tasks and roles to the Ministry for the Environment and Territory, thus a central role in prevention policies - supported by the National Agency for Environmental Protection and the National Geological Service - by setting up a technical steering and co-ordinating secretariat. Moreover, this Decree recommends the review of Act 183/89.

With regards to the so-called "slow-triggering" geological risks, many EU programmes promote and finance projects which combat desertification also for other relevant sectors concerning water resources, soil degradation, forests, climate change. The Presidential Decree of the Council of Ministers, approved on the 26th of September 1997, set up the National Committee to combat Dryness and Desertification Combat which worked out, together with involved parties, the National Action Plan approved by the Inter-Ministerial Committee for Economic Planning in 1999. This Programme envisages long-term integrated strategies by promoting the sustainable management, preservation and restoration of water resources and soils in order to improve living conditions and land yield in dry, semi-dry and poorly water-supplied areas. According to the resolution of the Inter-Ministerial Committee for Economic Planning, dated 21st of December 1999, regions and basin authorities have worked out a series of aiding proposals to combat dryness and desertification. On the basis of those proposals, the National Committee drafted a national priority scheme approved by the Joint Conference. These programmes envisage in-depth studies and surveys as well as action plans, in some cases already launched, in order to outline targeted strategies. Basic intervention areas are the following: soil protection, sustainable management of water resources, reduce the impact of productive activities, land rebalancing, social and economic aspects, information, education and media awareness.

The Desertification Combat has an international priority scope. The United Nations Convention to Combat Desertification came into force the 26th of December 1996; 162 countries ratified it on the 13th of November 2000, among them the European Commission as a UNCCD member.

Priorities, objectives and actions

The soil protection is an integrated activity, which relies on a complex approach taking into account territorial, physical and morphological features as well as social, economic and institutional aspects of human settlements. To this end, some general basic goals need to be achieved:

- developing effective prevention policies for natural hazards both fast triggering (slides, floods, etc.) and slow triggering (desertification and coastal erosion, etc.) and also effective interventions of sustainable mitigation;
- backing the eco-compatible development of the weakest areas, that is areas featuring a non-sustainable development or urban areas featuring high degradation and low living standards;
- preserving land resilience[5] and the conditions of natural habitats, redressing them if needed, while encouraging the assumption of local responsibility as a response to disasters;
- promoting administrative devolution;
- recognising the importance of the local economy;
- adopting policy of agreement, starting from local communities.

The need to promote territorial interventions, which allow to rebalance the relationship with the environment, will set the basis for a consistent employment growth and the development of new (almost unavailable) professional qualifications. The prevention from natural hazards and the protection of the soil has been long regarded as our country's major public work. On this basis, incentives ought to be devoted to the weakest areas, because of the insufficient technological and scientific State interventions, the need of higher employment rates and the substantial financing envisaged by the 2000-2006 Structural Funds. The full enforcement of Act 183/89 will increase employment opportunities in the following sectors: research, monitoring, planning, engineering, implementation and execution.

The desertification indicators have been studied by a number of research projects, meetings and workshops. The UNCCD devoted particular attention to the accomplishment of the Convention and to impact indicators, describing desertification, socio-economic and environmental aspects.

Moreover, other indicators have been worked out to measure structural vulnerability, bio-physic indicators (mainly climatic) and socio-economic indicators; physical vulnerability indicators, based on the ratio of bio-climatic or geomorphologic-political entities to Mediterranean Basin and indicators of specific land vulnerability compared to the main processes.

These broad objectives can be broken down into specific goals, actions and measures aimed at reducing the consequences of natural disasters and desertification,

5) The ability to endure losses up to a set extent without any external intervention.

while raising the awareness and the commitment of both citizens and administrations:
The development of legal tools and rules for a safe land management. It is essential to co-ordinate general rules whose present enforcement brings about uneven and inconsistent planning procedures.

Increase the safety of high hazardous areas through:
- non-structural actions, such as the de-localisation of facilities and activities, the adjustment of urban planning schemes (integrating land geological hazards, at present not included in most cases) and the increase of the resilience of local communities;
- structural actions and all such interventions affecting the causes of natural calamities, mitigating their effects through low-environmental impact techniques and reducing the vulnerability of exposed properties. Moreover, the improvement of the regulations throughout the country and the training of technicians is mostly needed. These technicians must plan according to set standards and furthermore they must check the correct operational feasibility of the plans. A contribution in such a direction is represented, the proposal for the seismic reclassification of Italian territory.

Upgrading the existing buildings, through a subsidy scheme for the owners of buildings in old towns within seismic hazardous areas willing to improve their safety. A national plan must be promoted to assess critical conditions and single out intervention priorities regarding public buildings and Cultural Assets.

To improve the safety of high-risk plants situated in significant hazardous areas.

To improve the safety of infrastructure networks in hazardous areas and strategic buildings, such as hospitals, power supply plants, civil protection operational centres and prefectures.

To establish tools to support decision-making networks and to complete some networks, such as the case of rainfalls, through innovative systems and real-time measurement techniques, laboratories and other advanced tools such as the scale modelling of the coastal erosion.

To support research in order to evaluate the needed activities for hazard-mitigation, through interdisciplinary studies, socio-economic analysis, impact assessment, starting from expected climate change.

To develop the zoning of regional and local hazards and risks to be accomplished respectively by central and local authorities, according to each risk type. The drafting of extraordinary plans according to Law Decree 180, later translated into Act 267/98 on floods and landslide risks, must be regarded as an initial partial approach to the zoning.

To measure progresses achieved compared to the past experiences in order to outline future goals, such as monitoring the Italian trend and therefore the effectiveness of the actions undertaken.

To introduce systems for the quality certification in compliance with ISO 9000 regulations. Notably, a "quality of process" needs to be established in order to address a comprehensive set of methodological actions and procedures to be endorsed by research, survey, intervention and planning projects throughout the entire country.

To protect the coastal areas from the erosion, through global and local interventions in order to preserve the coastal ecosystems, also along coastal areas already devoted to tourism, thus preventing natural imbalances. This scheme includes also the protection against natural and man-induced subsidence events.

To recover the functionality of agricultural and natural systems, in mountain, hill and plain areas, mainly through forestation, recovery, care, and restoration of forests; re-naturalisation of minute surface water downflow networks and courses as well as forest and water care; incentives for the upkeep of river-bed protective works and to agricultural, forestry and pasture activities which contribute to the protection of soil; interventions which ensure the ecological continuity of the river system. A significant aspect is the drastic regulations for riverbed water collection.

To keep up the maintenance of mitigation works. Most of the past consolidation and reclamation interventions have failed mainly due to the lack of ordinary and extraordinary maintenance activities, which should have preserved the project's effectiveness. Therefore an extraordinary plan for land management is to be adopted pledging ordinary service labourers, such as road upkeep workers, and highly skilled technicians to periodically monitor the effectiveness of consolidation and monitoring systems.

Insurance. In many countries ex-post disaster restoration is covered by insurance instruments. Therefore, premium settlement mechanisms can be designed to favour the local communities which efficiently implement prevention policies. The Italian insurance business has worked out a field scheme and is willing to draft new

initiatives.
To reduce taxes for activities of land restoration. Similarly, and interventions subsidising projects for the consolidation of existing patrimony should implemented.

To streamline procedures for land protection interventions and improve the spending capacity of the implementing authorities.

To set up an informative database in order to spread knowledge, information and training. State and Regions have already agreed upon this initiative, entrusted to the Ministry for the Environment and Territory by Law Decree 297/2000.

To develop guidelines, tools and procedures to be adopted by local administrations and that will outline scientific and methodological processes to which land interventions and executive planning must refer.

The adoption of consensus policies leading to land management procedures and land consolidation interventions. This involves the development of information networks, of capacity and consensus at a local level in order to increase territorial resilience compared to law and rule changes.

The introduction of a new land planning legal framework, in particular when drafting long-term urban planning, since at present it still does not take into full consideration the land's geological hazards.

To improve the intervention capacity of local communities during natural disasters.

Most of the already-stated measures are effective in combating desertification. As envisaged by the Inter-Ministerial Committee for Economic Planning Deliberation of December 21st 1999, the interventions must take place in the following areas:

— *Soil protection*. In the National Action Plan to combat drought and desertification (PNA), soil protection concerns in particular intensive yield and marginal agriculture areas; areas threatened by rapid erosion; areas degraded by contamination, pollution and fire; uncultivated and abandoned areas. The actions concern:
- the updating of the national forest inventory, the proposal of a new framework Act and a new forest plan in order to support a sustainable management and development of the forest heritage;
- the development of nurseries to promote Mediterranean species;
- the promotion of land management procedures dedicated to a more suitable exploitation of the soil in agricultural and non-agricultural activities;
- fire prevention and fire fight information campaigns to point out the link between desertification and fires;
- the increase in value and the co-ordination of Regional Services;

— *The reduction of the impact of productive activities also to restrain desertification processes:*
- the containment of farming lands dedicated to cultivation in sheltered environment; the creation of extensive farming for those cultivations with an excess of supply; the promotion of cultivation of species according to their environmental suitability (climate, soil type and orography) to ensure maximum ecological effectiveness and minimum use of chemical support;
- the adoption of agricultural cultivation systems more compatible with the environment: planning cultivations and rationalising the irrigation activities, adopting a correct agricultural, zoo-technical and forestry practice code;
- the increase in the use of the organic part of urban solid waste derived from separate collection to produce high quality compost;
- monitoring the pressure of tourist activities on vulnerable areas while promoting off-season activities, a wider offer and a reduction in the consumption of water.

Marine and coastal habitats

There is a close connection between mainland anthropic activities and marine environmental quality. The Italian people are increasingly populating the coastal area so that settlements have spread along the Tyrrhenian and the Adriatic shores. Therefore this demographic pressure together with traditional and new conflicting coastal exploitations has further confined the ecosystem, depleting its resources and unevenly deteriorating it.

Most Italian coasts are subject to erosion and the spread of subsidence phenomena, mainly along the northern (-1 mm each year) and central Adriatic shores. Both phenomena, due to natural causes and an unfair land management, might undermine our country's development also in view of oncoming climatic emergencies. Some Adriatic fragile areas, mainly the Venetian lagoon, are affected by these phenomena caused by an increased dynamic of winds, rainfalls and tides rather than by a sea level raising, at present still unrecorded. The Third Assessment Report of the International Convention for

the Protection of Plants emphasizes the need to study and analyse the effects caused by the raising level of oceans on confined sea ecosystems.

The Italian legal system regulates wide sea stretches in which integrated management policies could effectively operate; the Italian full jurisdiction on these waters includes their surface, body, bed and under-bed. Italy, in the continental shelf, is only entitled to explore and exploit the subsea mining resources. Therefore the oil industry exploits these areas.

According to estimates, the Mediterranean sea level has increased by 12 centimetres in the 20th century, while its expected increase over the next three decades stands at 12-18 centimetres, although it might be higher in subsidising areas. This phenomenon will especially affect low coastal areas, towns and deltas causing the following consequences: a) increase of the wave energy along particularly exposed coasts; b) consequences on the advanced port structures; c) increase in the intensity and frequency of floods in delta areas; d) the impact of tides on coastal settlements; e) rapid coastal erosion and coastal floods due to the higher frequency of storms; f) sea water seepage into groundwater tables. However, among the consequences of climate change we must register also alterations of rainfall regimes, diffusion of fires, desertification and soil degradation.

Biomass withdrawal. The first pressure factor for sea ecosystems concerns the exploitation of biomass. An excessive pressure practised by fishing activities and due to the failure in selecting species and to over-fishing, causes considerable modifications in the sea ecosystem considering food chains and substratum alterations, in biologic terms (biodiversity, biocoenosis) as well as in the sediment structure. Therefore this in turn causes the shrinkage of "target stocks" and minor catch species compromising future profitability of the fishing industry. Italy has adhered to the *"Protocol concerning Specially Protected Areas and Biodiversity in the Mediterranean"* adopted in 1982 in the framework of the Barcelona Convention, amended in 1995. Anthropic activities and environmental quality affect fishing; therefore this industry is interested in protecting the environment to maintain productivity and not to undermine the resilience.

Mining activities. The second pressure factor is caused by the increasing exploitation of undersea hydrocarbon deposits, especially in the Adriatic sea, in the Ionian sea and in the Sicilian channel. Italy other than oil is searching for natural gas, which represents the most important offshore production. As far as environmental protection is concerned, Italy has signed the Offshore Industry Protocol adopted in the framework of the 1994 Barcelona Convention.
Maritime transport. The sea transport of oil has increased from 1,159 million tons in 1985 to 1,890 million tons in year 2000. However, the trend of oil spillage in the sea improved due to the prevention and control measures adopted by IMO (Marpol Convention 73/78) adopted over the last three decades and recently strengthened by EU Safety Directives (safety Directives issued after the accident to the oil-tanker Erika). This positive trend can be supported by phasing out one-hull crafts, by adopting incentive schemes to replace small (whose tonnage is below 5,000 tons) obsolete oil-tankers, by ensuring an even enforcement of existing safety rules by any country's ship sailing in the Mediterranean sea, by supporting the adoption of voluntary procedures to continuously improve safety and protection of the environment. Moreover, the pro-active responsible behaviour of the industries must be encouraged through a programme agreement (such as the voluntary agreement for the safety in the transport of dangerous substances in year 2001) and the introduction of environmental certifications.
As to other types of transport of goods, recent innovations in the maritime transport have created the need to set up two ad Hoc ports for container-ship (such as Gioia Tauro and Genoa Voltri); to assign transhipment tasks to certain ports (namely to Gioia Tauro, leader in the Mediterranean Sea, to Taranto and Cagliari as envisaged by the General Transport Plan); to strengthen European inland transit tasks (in Genoa Voltri, La Spezia, Livorno and Trieste). These processes, together with a gradual increase in the demand of transport in the Mediterranean, contributed to increase the merchant-ship traffic in the national waters, both cargo and passenger carriage. Furthermore, the growth of Italian leisure crafts is increasingly affecting the most valuable sea habitat heritage (both surface and sub sea) usually extremely vulnerable.

Coastal areas. Italian coasts are populated by approximately 32-33 million people, between residents and tourists, representing the main human pressure on our coastal system. The climate change increases the frequency of natural disasters thus reinforcing their strength. Damages brought about by these calamities can be even worse if coastal facilities and infrastructures are not designed and built taking into due account environmental conditions and modifications. Italian coasts, referring to the areas above-stated, are exploited in twenty different ways (see table 2); some of them affect the coast alone while some others, increasingly numerous and intrusive, affect also coastal waters. Moreover, riverbed sand and solid drawings together with interventions of regime regulation on water courses have undermined the river transport of solid materials and compromised the coastal ecosystem while

Table 2
Breakdown of the use of coastal areas

CATEGORY	GEOGRAPHICAL AREA			LEGAL FRAMEWORK		
	Mainland	Sea-Land	Sea	National Jurisdiction	Territorial sea	Continental shelf
Preservative fruition						
1 Ecological heritage	●	●	●	●	●	●
2 Cultural heritage	●	●	●	●	●	●
3 Landscape	●	●	●	●	●	●
4 Non-material heritages	●	●		●		
Primary production						
5 Agriculture	●	●		●		
6 Stock-raising	●			●		
7 Woods and forests	●			●		
8 Fish Farming		●	●	●	●	
9 Fishing		●	●	●	●	●
10 Mining	●	●	●	●	●	●
Secondary production						
11 Water	●			●		
12 Energy	●	●	●	●	●	
13 Manufacturing industry	●			●		
14 Engineering	●	●	●	●	●	●
Services-producing sector						
15 Residential settlements	●	●		●		
16 Transport	●	●	●	●	●	
17 Merchant docks	●	●		●	●	
18 Airports	●	●		●	●	
19 Pipes and cables	●	●	●	●	●	●
20 Tourism and leisure time	●	●	●	●	●	
21 Research	●	●	●	●	●	●
22 Defence	●	●	●	●	●	
23 Management	●	●	●	●	●	●

causing the subsidence of sandy shores.
Therefore the re-naturalization of water courses represents the first step in order to rebuild the dynamic balance of shores. However, emergency interventions and beach reconstructions cannot resort to ecologically-unsuitable materials or works altering water and landscape features.

Tourism. According to estimates, in Italy sea tourism represented more than 40% of the overall hotel guests in 1997. Tourism in Italy features seasonal peaks notably towards seaside resorts and particularly high in July and August. This phenomena overexploits natural resources, causes traffic jams and overcrowding thus worsening the quality of life. This in turn does not allow local administrators to correctly plan and manage primary facilities, such as water supply, water softening, the road network, waste cycle and the transport system. Moreover, only 24% of the national tourist movement and 14% of the international one are directed towards shores in the southern regions, accounting for 60% of the Italian coastline, despite their favourable climate, historical and cultural conditions, thus creating a considerable gap between northern and southern Italy.

The present growth rate shows that available seaside resorts will reach their saturation point in ten years. The quality of bathing waters affects the expansion of this industry; however the data in recent years emphasizes a basic positive trend. Yachting, strongly expanding, causes an increasing demand for landings and relevant services, ranging from hotels to technical aid and leisure time resorts – as well as a growing craft traffic in our coastal waters, thus a deterioration in the quality of life. Yachting is becoming a mass recreational activity: this area is registering a continuous growth. Available data on yachting shows an overall 7.7% increase, that is 5,656 new registered yachts over the 1995-2000 period. At the same time, sailing licences recorded a 20.5% increase over the 1997-1999 period.

Moorings. The supply of berths in harbours is low and therefore does not meet the demand. This gap must be bridged mainly through the refurbishment and upgrading of the existing docks and the creation of new docks only where needed and outside the vulnerable areas. The Italian coastal and marine environments offer a massive historical heritage thus attracting forms of cultural tourism in Italian shores and regions; hence the fruition of the coastal area with new advanced technologies (ferryboats and special submarine installations) represents an example of the evolution in the use of coastal areas.

Fish farming. Over the 1993-1998 period, fish farming in Italy increased 3.7 times, while shellfish farming decreased by 40%. This particular use of coastal waters demands high quality environments and may generate pressure on the system while it excludes many other uses, from docking or industrial to bathing uses. Therefore, these activities need an ad Hoc safer regulation to cope with an ever-increasing demand of permits for new plants.
Industrial areas and waterfronts. Coastal industrial sites

are undergoing conversion and shutdown processes. In some cases, these available spaces are taken over by other industrial activities, such as offshore engineering and boatyards, or by non-industrial uses, such as residential areas, service facilities, conference areas and leisure time resorts thus revitalising sea waterfronts, favouring tourism, leisure time activities and advanced services.

The Italian economic development has been backed by the installation of thermal power plants near to fuel unloading docks. However, the rationalisation and a more efficient power scheme has gradually changed this trend. In spite of this, sites of powerful operational plant are still causing problems. Cooling waters indirectly cause an increase of bio-mass; while the storage of solid fuels, which leads to dangerous powder dispersal and negative aesthetic factors, creates great conflicts with bathing and leisure activities.

Nature reserves and marine parks. Act 979/82 on sea protection and the Framework Act 394/91 on protected areas singled out fifty valuable areas (listed areas) to be protected. The set up of new protected areas shows that sea and coast safeguard policies are improving, also due to their new arrangement procedure and management organisation rules. So far in Italy sixteen marine protected areas have been established, thirteen of them have been entrusted to several parties, most of them represented by local authorities, two of them managed by National Park Bodies. Moreover, La Maddalena, Asinara and the Tuscan Archipelago National Parks include in their perimeter marine areas of great dimensions and with a significant preservation interest.

In open sea, sustainable development is implemented through an ecological protection and suitable fishing practices which should rely on international co-operation. In this framework, Italy, among the different priorities, is mainly concerned with bio-diversity preservation and combating pollution.

Over the 1973-1978 period, the MARPOL Convention on Marine Pollution classified the Mediterranean sea as a special area that is under ad Hoc protection provisions. Therefore in the Mediterranean sea, each marine carrier and each country which operates in this region, must comply with these rules and Italy is strongly motivated to supervise them.
Moreover, Italy must respect the dispositions of Barcelona's Convention on the protection of the Mediterranean marine and coastal environment and the implementation Protocols regarding dumping from airplanes and marine carriers as well as sea emergency interventions.

Strictly considering biodiversity, Italy is concerned with the protection of rare species, the excessive exploitation of dominant species, the prevention against the introduction of alien species and organisms. However, the priority objective envisages fishing regulation in international waters to allow the restoration of bio-masses and the protection of rare species.

Priorities, objectives and actions

Sustainable coastal and territorial management must aim at the three following objectives: ecological integrity of land and marine environments; economic efficiency and social equity. The priority aims to be pursued over the medium term are:
- preservation of biological diversity;
- the recovery of the optimum conditions in the coastal environment;
- the preservation of different uses for the coastal area, through the harmonisation of anthropic activities and the reduction of the impact;
- the achievement of environmental safeguard objectives with sustainable costs for the social and economic development;
- the development of institutional skills and human resources.

Hence a complex framework of detailed strategic objectives emerges as follows:
- protection and regulation of the use of resources. In particular a durable management to safeguard living resources and habitats from degradation; the application of criteria of environmental compatibility to the activities such as the exploration and exploitation of mineral resources from the seabed and the optimisation of the use of water resources;
- protection of the coastal areas which are subject to withdrawal phenomena due to the imbalance of sediments, subsidence induced by anthropic activities and phenomena at a global level, such as eustacy;
- pollution reduction, starting from sources such as urban settlements and industrial sites or conveyed by the river system or sources originated from the sea.

According to the carrying capacity of the coastal-marine ecosystem, the regulation and the management of activities must envisage the following steps:
- the reduction of the impacts of structures and activities in the harbour;
- a sustainable development reuse of shut-down industrial sites, with a particular interest for

the revival of urban waterfronts and the recovery of their cultural-historical heritage;
- the protection and the preservation of natural resources and of areas with a significant historical, cultural and landscape value by supporting an integrated land and sea management also through the creation of protected areas;
- the prevention of natural disasters, due to human factors and to extreme events, through the enforcement of planning measures and emergency plan measures;
- the promotion of sustainable fishing practices by adopting times and spaces of biological protection;
- the involvement of public and private sectors and other stakeholders in a correct integrated management of the coastline.

The drafting of guidelines, to promote sustainable development along the Italian coastal areas, is essential to:
- develop strategic guidelines in compliance with the legislation on natural resources and sea protection;
- confer on Italian politics a position of excellency in relation to the technological and scientific approach;
- equipping decision-making centres with agile operational instruments to ensure the coherency of interventions.

The framework of essential provisions must include:
- the strengthening and the harmonisation of the legal and institutional framework aiming at an integrated management of coastal and marine areas;
- the drafting and the adoption of action plans which ensure the co-ordination among different levels of management;
- the consolidation of public information and public training and specific targeted sectors on coastal processes (natural and man-induced) through a deep commitment of environmental associations, mass-media, schools and administrations;
- the implementation and the harmonisation of the knowledge framework of coastal and marine environment to work out a suitable control and monitoring system; to this end, the Ministry of the Environment and Territory together with the Coastal Regions carry out the *"Program for the monitoring of marine and coastal environment"*;
- the promotion of long-medium term settlement and socio-economic strategies in order to reduce anthropic pressures on coastal areas through the regulation of urban settlements and productive activities, the delocation of highly hazardous activities and the creation of incentives for those which are compatible with the environment;
- the preservation of wild areas;
- the drafting of sectoral and sustainable development environmental indicators to ensure the compliance and achievement of environmental objectives;
- the development of technologies able to reduce pollution created by urban settlements and industrial activities;
- actions especially devised to replace the exploitation of natural and cultural resources and the depletion of habitats with a fruition oriented towards the preservation of nature;
- the promotion of cultural and recreational activities to avoid seasonal nature of tourist flows.

Indicators must be defined according to the components they refer to (ecological integrity, economic efficiency, social equity and cultural heritage protection) and the ecological or socio-economic processes they are used for. Moreover, the following factors must be taken into due account: bio-geo-chemical cycles, bio-diversity, human pressure, impacts caused by the use of resources. Key indicators have been listed in table 3.

Legal tools. Barcelona's Convention deals with the integrated management of sea environment and coastal areas. The RaMoGe agreement, an Italian, French and Monegasque Treaty, regulates the protection of seawater. Italy signed and ratified the Treaty respectively in 1976 and in 1980 (Act 746); Act 979/82 introduces the concept of sea protection and protection of the coastal areas against pollution but also as the promotion and valorisation of the marine resources; Legislative Decree 112/98 clearly distinguishes between functions and duties of national interest and the responsibilities conferred on regional and local authorities. A central tool is represented by the land use planning scheme: general town planning scheme, major development schemes, sectoral plans, emergency plans. Further useful tools are the economic instruments, the voluntary agreement with the sectors of the economy, technological answers, communication, research and education.

Table 3 Objectives, indicators and targets for the protection and sustainable use of nature, biodiversity, soil and sea

GENERAL OBJECTIVES	SPECIFIC OBJECTIVES
Preservation of biodiversity	Preservation, protection and sustainable use of both biotic and abiotic natural resources; Protection and preservation of the natural and cultural heritage, with particular attention to the Mediterranean area; Development of both traditional and innovative land management techniques towards the preservation of the biodiversity; Promotion of the biosafety; Prevention and reduction or elimination of the impact on ecosystems, habitats and native species against the introduction of non native species.
	The overall understanding of ecosystems and scientific related issues, with particular attention to the pressure exerted on the biosphere (flora and fauna) and on the integrity of territories; Improvement of the efficiency of monitoring, protection and surveillance systems.
	Extension of cultivations, adoption of good agricultural practices, adoption of biological and eco-compatible practices and a sustainable management of forests.
	Recovery of the functionality of agricultural and natural systems in mountain, hill, plain and sea areas; Development of employment within the sustainable use of natural resources sector.
Protection of the territory against hydro-geological, seismic and volcanic risks as well as coastal erosion	The development of a legal framework for the regulation and the safe management of the territory; Increase the safety of high-risk areas; Adjust the existing building heritage; Increase the safety of high-risk plants; Increase the safety of infrastructure facilities in high-risk areas and of strategic buildings; Create supporting tools to decision-making networks; Development of the zoning of dangerousness and risks; Promote research activities.
	Protect coasts from erosion and coastal areas from natural and anthropic subsidence phenomena.
	Recover the full functionality of farm and natural systems; Look after the maintenance of mitigation works; Insurances; Reduce the taxation on territory reclamation activities; Streamline procedures.
	Set up an information database; Development of procedures, tools and guidelines for Local Administration authorities; Adoption of consensus policies towards stabilizing interventions and land management methodologies; Introduction of new regulations for land planning; Improve the quality and the capabilities of interventions of local communities against natural disasters.
Reduction and prevention of the desertification	Updating of the national forest inventory and the proposal of a new Framework Act and a new forest plan; Development of the nursery production; The management of the territory which take into account the peculiarities of the specific soil; Valorisation and co-ordination of Regional services.
	Improve the efficiency of fire-prevention systems.
	Adoption of environmental-friendly farm production systems; Increase of the organic fraction coming from the separated collection of urban solid waste and of agricultural waste for the production of high-quality compost; Monitoring of the pressure exerted on vulnerable areas by tourism activities.
	Hydraulics and forestal arrangement of mountain basins.

INDICATORS	TARGETS
Percentage of endangered species out of total native species; Surface of intensively cultivated lands; Use of the soil: shift from natural to built area; Agro-pastoral surfaces per altitude; Logged surface out of total woodlands; Floodplain areas surface occupied by settlements and infrastructure facilities; Transformation of natural, historical and cultural space; Percentage of protected areas out of the national territory.	Reduction of endangered species to 1% of the total number of species; Having achieved the reduction of 10% by 2000, the same reduction by 2012 is predictable together with a deep analysis of environmental benefits and an open confrontation with stakeholders.
Surface of organic farming and brushwood areas out of total surface; Forester surface certified for the sustainable management.	
Number and surface of protected areas, earth and marine parks; Number of persounel for the management of parks and activities in the protected areas.	
Number of employees involved in the management of parks and activities within protected areas. Number of municipalities for which the state of natural disaster have been declared; Number of people stroken by extreme hydro-geological events; High risks areas with regards to the legislation in force.	Development of efficient prevention policies and of sustainable mitigation interventions (reduction of human, natural, social and economic losses due to natural disasters).
Change of the coastline.	
Total money values and ratio between State investments for emergency interventions and investments for prevention works.	Functional and landscaping recovery of the land and coast; Favour the eco-compatible development of the weakest areas.
Number of municipalities for which the state of natural disaster have been declared.	Acknowledge the importance of local economies; Support the resilience of the territory; Adopt a consensus policy at local level.
Extension of burned areas.	

follow Table 3

GENERAL OBJECTIVES	SPECIFIC OBJECTIVES
Reduction of the pollution on inland waters, marine environment and soils	Reduction and prevention of risks linked to the marine transport of hydrocarbons and other dangerous substances.
	Comply with environmental compatibility criteria for the exploitation of hydrocarbons.
	Reduction of the impact of telluric pollution.
	Reduction of the impact of sea-farming.
	Improvement of the quality of bathing water.
Reduction of the anthropic pressure on natural systems, farm and forest areas, sea and coasts	Reduction of soil consumption, especially close to shorelines and most sensitive areas, due to productive activities, infrastructure facilities and building activities; Recovery of urban and residential buildings; Revitalization of urban waterfronts; Recovery and re-use of historical harbour areas for tourist and recreational purposes and for advanced services; Use of the harbour area fall into disuse; Optimisation of the existing motorway network; Renaturalization on non built urban areas; Reclamation and environmental recovery of polluted sites.
	Reorganization and management of tourism flows which exert extreme impacts on systems and natural resources; Promote good practices on the use of resources and containment of environmental pressures due to holiday resorts.
	Reduction of exploitation activities of resources and fish.
	Reduction of the impact due to port activities and structures.

*ICCAT, stands for International Commission for the Conservation of Atlantic Tuna.

	INDICATORS	TARGETS
		-100% by 31/12/2008.
	Kg of TN and TP per tons of biomass produced each year.	
	Percentage of bathing shoreline.	100% of national shoreline.
	Recovered or renaturalised areas (percentage of Km).	
	Number of sustainable holiday resorts activated or realized; Number of resorts certified with EMAS, ISO 14000 and quality labels.	
	Percentage reduction of fishing fleet; Percentage margin in weight and number of species and fishes by unit of effort; Percentage of young fishes caught and unloaded; KW/h of fishing; Tons by fishing tackle.	-7% by 31/12/2001. 50% more than ICCAT* regulations on minimum size allowed.

Quality of life and environment in urban areas

The quality of life, not only of human beings, relies on the quality of environment, air, water, soil and food. Human health itself cannot merely be explained as "a lack of illness or insanity but it ought to be positively defined as a social, mental and physical welfare"(WHO). The way the environment affects our health is quite complex, therefore many cases are still under investigation to be thoroughly understood. However, people increasingly think of environmental quality as a key welfare factor.

Long-term exposure to pollutants of environmental matrix is likely to induce allergies, respiratory diseases, degenerative and hormonal imbalances, disorders for children, teenagers, elderly and disabled people. Moreover, a substantial number of severe pathologies are due to environmental pollution. Therefore any health protection policy neglecting environmental quality would prove to be inadequate. This will be the aim to be pursued for sanitation reasons complying with preventive and precautionary principles, as well as ensuring acceptable living standards for the population. The exploitation of natural resources itself is more gratifying in every day's life and not only in exotic areas or leisure time.

Human welfare is above all undermined by critical loads on urban environment. For this reason towns have become the best testing ground for general strategies of sustainable development and for participatory initiatives of citizens, namely local Agenda 21, attaining also important ethic and strategic aims.

A large number of environmental key factors affect living standards, especially in man-made areas. Some social behaviours, such as unlawful building and field crimes, bring about linked complex territorial and environmental problems to be tackled with smart innovative solutions.

Urban environment

The conditions of "urban environment" have increasingly worsened so as to rank among the most critical environmental issues. Recently this problem has become a priority for the European and national political agendas. Major investigations on Italian urban environment have pointed out concentrations of coastal settlements (accounting for 14% of the Italian territory where 30% of its population lived in 1991) and the spreading of metropolitan areas, where the main municipality maintains the cultural, productive and administrative key role, while citizens are moving their residence to the outskirts, but are still dependant on the main municipality (in centre). As a result, a crucial point, made of issues related to mobility, noise, atmospheric pollution and traffic jams, the decline in the quality of urban living conditions, is significantly reconfirmed. The use of public transport is substantially declining while urban mobility accounts for an ever increasing share of global mobility and that of motor vehicles (30% of its total).

Therefore, in many urban areas the concentration of nitrogen oxide emissions exceeds the yearly thresholds and often also the general alarm and/or attention values (1.6 million tons in 1985 accounted for 2.1 million tons in 1992). In the last few years, however, the raise of nitrogen oxide emissions has slowed down due to the progressive renewal of vehicles circulating; recently carbon monoxide emissions have reached a stable 9 million tons per year and may further decrease over the medium and long term as a result of more stringent rules on emissions for motor-vehicles.

Eventually, the spread of unleaded petrol and catalytic mufflers has curbed lead concentrations showing a slower pace compared to any other European country. However other atmospheric pollutants are surging such as summer photochemical smog, ozone, benzene and PM_{10} concentrations, as against EU new regulatory limit values.

It must be stressed that the same critical conditions apply to urban noise records, largely exceeding their limit value (many residential areas have even exceeded limit values set for industrial sites).

Urban issues at stake such as waste, water pollution, soil contamination, natural and technological hazards, emissions which induce climate change, shrinkage of natural species and habitats have already been thoroughly discussed. Within this framework, tools for governance and for planning present urban development have proved to be inadequate, due to different points of view and administrative zonings which do not cope with environmental issues and the most recent territorial modifi-

cations (i.e. an extreme administrative fragmentation showing that the 72% out of 8,102 municipalities feature less than 5,000 inhabitants in Italy).

Finally, available analyses on the performance of local policies point out a gap between central-northern regions and southern regions, where town buildings are spreading or undergoing a urban change but their growth lacks the needed environmental policies to keep these activities under control. In 1999, more than one hundred municipalities in central-northern regions managed to recycle over 50% of generated waste, while the share of southern regions accounted for less than 3% of the overall national recycling. Moreover, their waste disposal through an atomised, often-uncontrolled landfill system allows criminal organisations to prosper. Surveys have shown that 70% of the families living in metropolitan areas of the North-East can walk to a green spot from their homes in 15 minutes, against approximately 40% of people living in the South and only 28.5% in Palermo and 33.6% in Naples.

However, the changes in the Italian settlements are quite restrained compared to European and non European countries. Moreover Italian towns have kept in time some of their most peculiar features such as their small-medium size, well-knit communities, outstanding historical and environmental texture, urban culture, management skills of most local authorities. These factors mitigate the ongoing processes while contributing to a potential positive shift. Many urban areas can rely on a valuable strategic resource that is their own huge cultural, historical and monumental heritage which increasingly attracts tourists; as a result, in ten years incomes from museums have tripled.

Recently, some regional and national government bodies have increasingly shown their willingness to draft a strategic plan while local authorities have launched environmental initiatives eventually meeting worrisome requests from lower level (field organisations, citizens) and from the top one (EU). This positive trend witnesses an increasing number of new environmental actors of local administrations coupled with new strategic drafts from governmental and regional levels.

Priorities, objectives and actions

The following overall objectives adapt to Italy the four general priorities set by the European Commission in the "Community Framework for co-operation to promote sustainable urban development "(COM 605/1998):

- *Territorial rebalance*. A balanced urban and country planning to be pursued at a national level taking into account geographical peculiarities, curbing the exploitation of natural areas and soils, promoting the optimal management of physical resources and qualitative standards for urban settlements. This shall solve conflicting relations among different towns, urban areas, rural and natural areas according to polycentric principles, functional integration, environmental sustainability and co-operation;
- *Enhanced urban environment quality*. The protection and improvement of the quality of the environment in which we live (such as its air, noise, waters, green areas, landscape and aesthetic features) reduces the main negative agents by ensuring adequate sanitation standards, while reclaiming, in an environmental and social way, buildings and public areas, restoring buildings, Nature and common parks: this shall imply *"ad Hóc"* interventions and measures supporting the social integration and autonomy of children, teenagers, elderly and disabled;
- *Sustainable use of environmental resources.* Promoting the sustainable use of natural resources (i.e. power, water, raw materials, etc.) by reducing pressures exerted on them also in view of their overall exploitation rebounds, adopting innovative solutions and behaviours, according to the needed adjustment of services and infrastructures;
- *Increase in value of local socio-economic resources and their even distribution.* Promoting urban employment along with a sustainable socio-economic development by strengthening integrated planning, through synergetic growth and co-operation of local economies environmentally-targeted, fair distribution of services and resources, enhanced urban social integration, cohesion, sense of belonging, cohabitation and liveability. In this view typical social crafts must remain located in town boroughs while good practises and environmental commitments of enterprises must be supported;
- *Improve democratic participation and social quality.* It is essential to improve the integrated environmental management skills and the local popular participation to decision-making processes, support the present environmental innovation efforts of some urban areas and promote the implementation in the urban areas showing a greater delay.

Starting from the above-mentioned priorities, the specific goals of the environmental action plan have been singled out referring to the following two basic principles

of local environmental sustainability: the improvement of urban and environmental quality and the reduction of urban metabolism pressures on local and global resources.

Table 4 summarises these specific goals. Moreover, the enlisted indicators have been selected to monitor and improve in time the Strategy for sustainable development. Therefore this list includes every type of indicator.

According to the present distribution of powers, the steering and co-ordination functions are under central state jurisdiction, representing a strategic element which the national policy of sustainability for urban areas shall rely on. Key functions will implement these specific action lines. Every action line is a set of coherent sub-actions better defining the contents and the action field.

First action line: strengthening and promoting sustainability guidelines of Local plans (territorial and sectoral) and their integration into local Agenda 21 processes through:

- integration of sustainability as a criterion/ objective at a planning level for the territorial economic development (sectoral plans and town planning). Over the same territory a series of new instruments, procedures, sectoral and separate planning, overlaps each other bringing about conflicts, inefficiencies and decision-making paralysis. Local authorities are ever increasingly endorsing through local Agenda 21 sustainable development principles, which are not to be regarded as a further planning level but rather as a participative model to integrate environmentally-sustainable targets into local planning.
  The success of this action line is gauged by the geographical spread and number of experiences aimed at integrating sustainability in sectoral plans, such as territorial, transport, waste plans and so on;
- strengthening of environmental sectoral planning and its integration into Local Agenda 21 processes: reintroducing local environmental planning through Plans such as atmospheric and acoustic treatment, urban traffic, power, waste, etc. Promoting an increased co-ordination efficiency and integrated approaches between sectoral and territorial plans. Outlining and updating targets and objectives of local plans, whenever not covered by EU rules, in compliance with regional legislative autonomy. Spreading more advanced planning practices and methodological innovations aiming at integrate sectoral planning and their utilization to support local Agenda 21 processes in order to improve their public-participation and action-oriented feature. Outlining suitable instruments which promote planning while strengthening central monitoring of local plans.

Second action line: strengthening and promoting sustainability guidelines of action Plans aiming at urban and environmental re-qualification through:

- enhancing the sustainable content of European Structural Funds regarding the urban areas in Objective 1 regions. Strengthening central and regional government skills so as to steer financial resources of Structural Funds towards sustainability; preventively evaluating their strategic environmental impact in relation to the objectives set by this Plan for each environmental factor;
- auditing and re-launching the already-established urban upgrading plans of the Ministry for Public Works, monitoring the environmental effectiveness, improving the strategic consistency, social and environmental approach, co-ordinating the plans with other environmental initiatives, refinancing and spreading them;
- re-launching nationally-established reclamation plans: that is their monitoring, new financing, spreading, improvement finalized to the promotion of an integrated approach (land reclamation works, demolition recycling, new urban functions, construction planning of sustainable buildings);
- identifying new and also experimental tools to upgrade urban environment so as to address priority or emerging issues not covered by any specific subsidy yet. Among these:
  - sustainable mobility projects, widening cycle-pedestrian paths, increasing the diversification and the availability of services for collective transports, such as minibus by reservation call, car sharing and carpooling, mobility management, etc;
  - promoting projects for environmental sustainability in tourist, historical and coastal towns;
  - natural reclamation projects and promotion of ecological networks in urban and suburban areas;
  - projects to speed-up and backup actions for acoustic re-mediation;
  - integrated upgrading projects in unauthorised building areas;
  - promotion of eco-compatible construction techniques, of bio-engineering and bio-construction techniques which will result into energy and material savings, appropriate sanitary standards, qualitative improvement of buildings;
- the adoption of measures to allow full independence and to favour social life for children, teenagers, elderly and disables in urban

contexts - by interventions that, according to Act 285 /1997, envisage:
- involvement of weak social classes in the creation of projects (participation planning);
- accomplishment of safe routes;
- adoption of housing solutions fit to physical disability and the removal of architectural barriers in urban contexts as well as in educational and public buildings;
- setting up spaces, meant in particular for children which participate in their designing and planning.

Third action line: use of fiscal levies and economic measures to promote local sustainability by:
- improving present fiscal and loan measures associated with the upgrading of urban buildings, after monitoring their present efficiency;
- enhancing incentive schemes for tariffs, taxes implying the exploitation of environmental resources, the consumption of goods and services such as water, waste, electricity, public transport, private cars, electrical appliances in order to develop a system which encourages or discourages behaviours of citizens and entrepreneurs with respect to the environmental objectives;
- implementing the introduction of eco-efficient practices and alternative energy sources in accommodation facilities, tourist settlements, recreational and sport centres;
- supporting the introduction of innovative management tools, such as Project financing, service contracts, etc.

Fourth action line: promoting a sustainable managerial and administrative innovation within the system of local institutions through:
- outline and promotion of organisational innovations in the local public administration; gradual migration from traditional field and hierarchical competence assignment to a more flexible approach adjusting to evolution and fulfilling specific "targeted functions" identified and agreed upon through sustainable planning processes of development, such as local Agenda 21;
- applying to local policies, procedures of strategic environmental assessment, such as plans, programs, regulations, administrative acts; outlining procedural contexts and types along with general criteria adaptable to different local circumstances to preventively assess the impact of local policies on local and global sustainability goals;
- introducing "conveniences" and reward mechanisms. Setting goals to assess the performance of the local public personnel, along with economic incentives bound to environment and sustainability achievements; priority allocation in national public financing for bodies - such as local Agenda 21- having started an integrated and shared planning;
- supporting the co-operation among metropolitan and municipal authorities and government initiatives through a new approach envisaging tables of equal confrontation among provinces and municipalities, backing provinces or government bodies operating in wide jurisdictions due to the co-ordination role or backup role of authorities for small-medium sized municipalities as far as sustainability is concerned.

Fifth action line: improving the environmental government skills and participation to decision-making processes at a local level through:
- achievement, review and possible re-launch of actions recently promoted by the central State, to ease the endeavours of local authorities with regards to local Agenda 21 and joint integrated planning, and to reduce the difficulties of the most delaying areas. We, refer to initiatives of national authorities, already established and under way, such as Prizes for Sustainable Towns and for Children's Town; support the creation of alliances and networks amongst local authorities; Urban Quality Observatory and the national system of urban indicators; scientific support to local Agenda 21 in small and medium size towns; financing *"ad Hóc"* shared environmental plans; local Agenda 21 guidelines; observatory and data bank of local good practices; targeted training for public administration; targeted information for citizens through the Italian state television and radio channels; Acts on environmental accounting; support and co-ordination of the EU project on local indicators;
- new initiatives to promote innovative tools of integrated environmental management in the Public administration: such as *"ad Hóc"* economic incentives (i.e. tender co-financing) and technical aid (i.e. guidelines, training, pilot projects, etc.) to spread analysis and knowledge filing systems (i.e. sustainability indicators, ecological footprint, environmental accounting, etc.); participation planning experiences such as local Agenda 21; innovative tools to promote dialogue between public administration and citizens; techniques and tools to promote partnerships

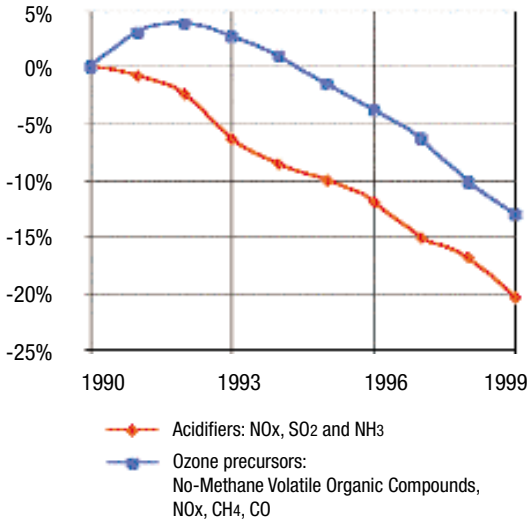
with no-profit sectors and improvement tools for the relationship between public and private; environmental certification and innovation of public administrations for activities under their direct competence such as pilot projects to implement environmentally-oriented purchasing policies among local authorities; EMAS or ISO 14001 procedures applied by the Environmental Action Plan parties under the exclusivity of the Public Administration authority; EMAS and ISO procedures enforced by state companies which offer public services;

— support the active role of local administrations favouring environmental innovation within local enterprises: such as the promotion of EMAS and ISO environmental certification within enterprises of public and/or private services; information campaigns on EMAS and clean technologies; accentuate the environmental role of unique counter, developing benchmarking and a management system of permit/licence targeted to promote positive agreements (lower taxes or local penalties in exchange of high environmental performances).

Figure 7

Pressure factors on air quality in Italy: acidifiers and ozone precursors (EU HL 3 and 4)

1990-based index-numbers



Note: reference year values
NOx, SO_2 and NH_3 = 6.1 Mt eq
NO-METHANE VOLATILE ORGANIC COMPOUNDS, NOx, CH_4, CO= 9.3 Mt TOPF

Source: National Environment Protection Agency, 2001.

Air quality

Atmospheric pollution causes the degradation of air quality and of depositions which damage soils, surface water, vegetation, materials and architectural heritage. Nitrogen and sulphur depositions result into acidification and eutrophication phenomena. Nitrogen oxides and volatile organic components exposed to sun rays generate ozone. This in turn reduces respiratory functions and causes mucous inflammation. High ozone concentrations damage crops by reducing the crop yield, the forests by decreasing their photosynthetic activity, plastics, paints and textile fibres.

Therefore, once discharged, these substances are carried by the wind and scattered by storms and eventually transformed by the presence of water and light or by their mutual interactions. Thus concentrations or depositions in the soil found in a given area, come from near or far-away places, hundreds of kilometres away, giving rise to a trans-boundary pollution. According to estimates in 1997, 75% of sulphur, 70% of nitrogen oxides, 47% of ammonia released in Italy cross national borders. While 58% of sulphur, 30% of nitrogen oxide and 12% of ammonia depositions in Italy come from other countries.

In Italy the EU policies and the conversion of industrial processes have brought to lower lead and sulphur emissions and, in turn, substantial lower lead and sulphurous anhydride concentrations in the atmosphere, while emissions from common sources such as transport and agriculture have been increasingly restrained, with the exception of lead emissions.

The interactions between the economic system and air quality can be understood taking into account:

— energy production mainly relies on fossil fuels;
— Italian industrial system is mainly based on SMEs, whose size and territorial scattering hardly allow the development of technological innovation to reduce the impact on the environment;
— share of transport emissions is predominating and not showing any significant downward swing;
— private transport exceeds public transport in urban areas;
— tourist pressure on valuable sites causes intense emissions due to traffic;
— the Italian artistic and historical heritage is concentrated mainly in towns, so it is significantly exposed to highly-polluting concentrations

and damaging depositions;
- degradation, in terms of quality and healthiness of urban spaces, strongly affects social life;
- the peculiarity of the Mediterranean area aggravates ozone and dust pollution phenomena due to the overall weather and climate conditions.

SO_2 emissions, mainly discharged by power and manufacturing industries, decreased ever since 1980, also as a consequence of the conversion to methane of household heating systems; instead, between 1980 and 1992 emissions of nitrogen oxides constantly increased, showing only later a decreasing trend. Pollution from road transport accounted for a major share of the total quota. Road transport is the main polluting source for Non-Methane Volatile Organic Compounds, generating 46% out of an overall 2,276 kiloton emissions in 1997, followed by solvents accounting for 25%. Benzene, a natural compound of the oil and derivatives, is one of the best known Non-Methane Volatile Organic Compound; it may be generated during oil refining process and it is released during combustion and evaporation processes; it causes cancers, including lymphomas and leukaemia; however 65% of these pollutants come from road transport. Moreover, in 1997 road transport produced 72% of carbon monoxide, CO, 46% of Volatile Organic Compounds, 53% of nitrogen oxides and more than 24% of carbon dioxide emissions.

"Suspended dusts" and "particulate matter" are general terms referring to a wide range of different substances from a physical and chemical point of view, different-sized liquid or solid particles. Approximately, about 70-80% of total suspended particles has a diameter below 10mm. At present no statistical data regarding long-term polluting powder emissions are available in Italy, while some EC *Autooil* 2 outlooks estimate approximately 250,000 tons per year, 20% of which origin from the industrial and transport system.

In 1997, 71% of carbon monoxide, CO, was generated by road transport, while a mere 13% by fixed household and industrial burning sources. In 1991 CO emissions peaked to over 8,000 kt/year.

Over 1988-1997, ammonia/NH_3 emissions kept steady, reaching an overall yearly release slightly below 500 kt/year. In 1997, 92% of the emissions were released by agriculture and breeding while the share of emissions from manufacturing processes decreased by 60% over the last decade. Nitrogen compounds in depositions spread into water as nutrients affecting algae growth and the quality of drinkable water.

Most heavy metals and persistent organic compounds are hardly soluble in water, so they concentrate in bottom sediments and organisms where they perform a toxic activity. Nitrates and sulphates are the main cause of acid depositions, mainly deriving from nitrogen and sulphur oxides generated by the combustion of vehicles, households and industries.

Water acidity, above set levels, intoxicates organisms and worsens the toxicity of other compounds, such as heavy metals.

Priorities, objectives and actions

Framework Directive 62/1996/EC on air quality, prescribes a complex system of laws and methodologies, endorsed by Law Decree 351/1999, together with the international commitments pledged by Italy, favour the outline of strategies to reduce the atmospheric pollution. Energetic, industrial and agricultural sectors can support the use of Best Available Techniques, through incentives and taxations to reduce emissions. Regarding the transport sector, road mobility must be restrained especially in urban areas. General objectives to be pursued are:
- reducing pollutant emissions in the atmosphere;
- no value must exceed critical loads and levels set by international protocols;
- keeping pollutant concentrations within such limits as to exclude severe and chronic pathologies;
- ensuring a constant improvement of air quality over the years so as to prevent damages to the artistic heritage, natural ecosystems and crops.

The set of indicators is made up by hourly concentrations of different pollutants; EU and national regulations establish value limits for each pollutant, which may be exceeded only for a few days within a year. Sectoral indicators are useful to check the quality and quantity of emissions; urban environment indicators are particularly important. The AOT_{40} indicator is used to assess the impact of atmospheric pollution on agricultural and forestry species, by measuring the exposure to tropospheric ozone beyond 40 ppb value limit concentration.

The scientific achievements on atmospheric pollution and consequences affected significantly EU legislation and Convention Protocols on Transboundary Pollution; regulated pollutants increased; the usefulness of models of analysis, simulating the dispersion, has been acknowledged and the interdependency of events, which once was dealt with separately (acidification, eutrophication, tropospheric ozone and climatic change effects) has been understood. Reductions in pollutant emissions are established according to the capacity of

receptive systems to absorb certain depositions. Protocols and Directives are pivoted on a model analysis broken down into the following four mutually integrated modules: emissions, critical value limits or air quality objectives, atmospheric conveyance, dispersion and chemical alteration, abatement costs. This setting up resulted into the identification for each country of emission reduction objectives which may vary according to a cost-effectiveness analysis and the vulnerability of ecosystems, which led to the Göthenburg's Multi-pollutants and Multi-effects Protocol signed the 1st of December 1999.

The scheduled quantitative objectives and actions are enclosed within the Protocols of Geneva's Convention on Transboundary Pollution (NEC- *National Emission Ceilings*), within the directives stemming from EC Framework Directive 62/1996 on each pollutant concentration, within the Directive 72/92/EC concerning tropospheric ozone (see table 5). Obviously every country can adopt more demanding objectives taking into account particular requirements, such as the case of natural and architectural heritage.

Among medium-term priority actions, particular importance is given to the integration of policies as well as to the improvement of the range of tools needed to audit, control and analysis. Actions for improving air quality can be divided into four categories:

- actions finalised to improve the knowledge of phenomena and their origin as well as to monitor changes;
- actions finalised to reduce emissions from electric power generation (alternative sources) and industrial pollutants, resorting to the best available techniques;
- actions setting emission limits or bans to certain pollutants;
- actions aiming at drastically cutting the transportation share, especially urban traffic share, so as to prevent the worsening of air quality through mobility rationalisation, the promotion of lower polluting transport modes, the introduction of zero or low emission vehicles, engines and fuels.

Technological and enforcement tools are ruled by two main approaches:

- an integrated planning for urban and metropolitan development: applying atmospheric impact assessment and Strategic Environmental Assessments to town planning, since every settlement generates and attracts traffic flows. On a large-scale, within local authorities resorting to Geographical Information Systems integrated with forecasting-analysing models;
- application of forecasting and modelling tools: the outline and assessment of strategies to reduce emissions must be based on instruments simulating pollution phenomena and on the analysis of settings and costs, displaying links between sources, air concentrations and soil depositions.

These actions demand tools and resources under governmental competence, such as drafting a legislative provision with relevant guidelines and backup schemes to promote the adoption of new methodologies by local authorities. Moreover, granting funds must rely on the fulfilment of air quality objectives.

Indoor air quality and radon

The exposure to pollutants in confined environments, such as residences and working places, result prevailing compared to the exposure in outdoor environments, since most people live indoor 80% of their time. The World Health Organisation recently estimated that 30% of the buildings in industrialised countries show problems which could cause disorders and/or diseases for the occupants.

Confined environments are affected by chemical, biological and radioactive pollutants, such as radon, a noble gas released by soil, water and building materials. Radon and smoking are regarded as the main risk factors for the induction of lung cancer. Reducing air changes to save energy, utilisation of unsuitable materials and technologies can raise pollutant concentrations.

Directive 89/106/EC, adopted by Presidential Decree 246/1993, introduces the "indoor air, health and sanitation requirement" so as to prevent hazards induced by harmful agents in indoor areas. Directive 96/29/EC, adopted with Law Decree 241/00, dictates the protection from radon for citizens and workers. State and regional laws together with some municipal sanitation and construction regulations deal with energy and environment aspects linked to the building industry. Act 61/98 imposes to earthquake-stricken regions, interventions to meet eco-architecture and energy saving specifications. The recovery plan for degraded boroughs, the so-called "District Contracts" devised by the Ministry of Public Works, urges upgrading for public residential area.

Priorities, objectives and actions

The best remedies are the traditional ones: monitoring sources, plant maintenance and indoor ventilation. Appliances must be regularly checked by skilled personnel. The building design must be based on an indicator list and concentration limits in confined environments according to the specific use. Diagnostic tools and mathematical models must allow the evaluation of the spread of indoor pollutants and the risks of exposure.

The main objectives are the following:
- reducing indoor exposure in high radon release areas;
- striking a balance between health and comfort conditions and power saving requirements;
- converting the building industry through the promotion of Eco-compatible products.

As to radon, the essential measures to be taken are:
- identification of geographical areas with a high radon potential;
- detection of potential sources and relative access of radon in buildings;
- outline of survey methodologies and monitoring techniques (protocols of measure);
- drafting guidelines for interventions of prevention inside new buildings and the improvement of existing buildings.

Concerning the regrading of buildings, two categories of actions are envisaged:
The development of systems for monitored, safe and efficient ventilation in buildings which host service activities:
- control and ventilation of sources to optimise indoor air quality and the use of energy in the buildings;
- development of monitoring systems of air conditioning and air quality.

Technological innovation and introduction of assessment tools for indoor environmental quality in residential buildings:
- singling out indicators for environmental quality state of buildings;
- improving a survey protocol for an efficient characterisation of buildings;
- validating diagnostic tools;
- assessing the damages caused by construction materials and components.

Noise

The noise level in urban areas has increased, exceeding in many cases ordinarily bearable limits. Acoustic pollution has spread in space, affecting outskirts and suburbs, and in time, during the night, holidays and during the time for recreational activities.

In 1984, 130-million people of OECD countries were exposed to unacceptable noise levels. At present, the elements allow us to assume that this figure has substantially increased. This has been due to spreading urbanisation, population density and traffic growth. In OECD countries, vehicles have tripled (cars, trucks, buses and motorcycles) in the last twenty years while air traffic has increased ten times in terms of passengers per kilometre in the same period.

Noise and air pollution reach the highest peaks in metropolitan areas, thus causing damages and disturbances. Road circulation and industrial sites bring about the uttermost noise contamination, while this usually decreases within civil buildings. Noise exposure greatly differs from town to town or within the same town between boroughs according to the habits and lifestyles of the inhabitants.

According to WHO, night noise must undergo at least a 5 dB(A) reduction, although most Italian towns fail to comply with such issue. The "Framework Act on Acoustic Pollution" 447/95 has first introduced in Europe the concept of acoustic limits for the following categories:
- *emission*, intended as a maximum noise level from an acoustic source, according to the acoustic zoning of the territory, determined in its closeness;
- *intake*, related to the acceptable value limits for receptors, released into the environment by several sources, according to the territorial acoustic zoning;
- *differential*, a value to be added to the above stated value limits, which establish a maximum allowed increase from a single source, throughout the day and night, within living environments;
- *attention*, a short-time value limit beyond which local authorities are obliged to take steps and implement remedial plans;
- *quality*, target values for territorial planning and remedial activities.

The framework act has not been fully implemented yet, however all value limits have been established, together with measuring and survey techniques (such as methodologies and equipment), criteria and priorities for

remedial plans and interventions, regulations for the main transport infrastructures, roads (incomplete), rail way networks and airport systems, for recreational resorts and civil housing. Furthermore the role of local and central administrations and of qualified subjects have been defined for monitoring and regulating activities.

Technical acoustic tools for monitoring and measurements have reached a satisfying level of development, in particular for noise spreading modelling and sound-level measurement tools. Technological progress has developed accurate and complex systems which allow measurement methodologies with a high level of precision and completeness of the information. Moreover, the establishment of qualified technicians on noise emissions in the environment, requiring different specialisation levels, precise targets and responsibilities, has significantly stretched the chances of employment.

Priorities, objectives and actions

Overall reduction of emissions and exposures is the first priority, according to different areas and urban functions, complying with national law binding limits. Moreover, the share of population exposed to excessive noise levels needs to be restrained.

Change in consumption patterns and behaviours, such as consciously renouncing to some consumer goods and noisy habits, will prove essential to bring the environmental quality standards to acceptable levels. In fact, the noise problem has often been underestimated, although this might be due to an inevitable adaptation process. However, noise-induced damages can range from a possible increase of audibility limits, to nervous and circulatory pathologies. These risks represent a negative inheritance of the society in which we live, that irremediably jeopardises the quality of life of people and the relationships, creating great difficulties in activities such as learning and communicating.

The problem of urban noise can be hardly tackled due to the complexity and the presence of numerous sources. The acoustic management of the urban enviroment emphasizes the following priorities:

- *acoustic zoning*: a territorial subdivision into homogenous areas of urbanisation and subject to different acoustic limits, both during day and night;
- *acoustic mapping*: an acoustic data collection related to the territory to be compared to the limits of acoustic zoning (see previous point);
- *drafting the "risk maps"*, which allow to assess the actual impact on the health of people exposed;
- *planning upgrading interventions*, in particular for airports, road and railway networks;
- *acoustic impact assessment* for the realisation, modification or improvement of outstanding works, such as airports, roads and railways, or for any other actions which affect the urban acoustic climate.

Territorial planning must outline the areas in the territory with a different dynamic evolution, eventually redeveloping noisy areas by matching social, economic, technical and political competences.

A correct approach is linked to prevention; therefore decision-making processes on territorial actions ought to take into account acoustic issues at all levels (selecting architectural types, the structure of settlements, and road networks). Acoustic remediation and zoning plans demand wide interconnections with any other territorial governance tool, such as town planning, mobility and energy plans (integrated policies).

Any action undertaken must be linked to local Agenda 21 processes: to define environmental targets or for their achievement through the creation of consensus, interest sharing, synergies, new tools, human and financial resources.

Noise generations must be tackled by changing personal behaviours and lifestyles towards a correct fruition of verbal communication and the security of suitable standards of comfort and rest to be achieved through educational campaigns.

It is essential to invest in monitoring the implementation state of legislation at a Local Administration level in order to detect defaulting situations or particularly critical conditions which might lead to a new improved allocation of funds for environmental reclamation.

Electromagnetic pollution

According to the scientific findings of WHO, static electromagnetic fields, due to extremely low frequencies or high intensity radio frequencies and microwaves, may undermine human health due to the warming of tissues, discharges and induced waves. On the other hand consequences on human health from the exposure to low intensity magnetic and electromagnetic fields have not been scientifically proved[6]. Therefore, risk perception on these hazards have prompted the WHO to urge further researches on the exposure to electromagnetic fields in order to assess their potential consequences on human

health, recommending standard research methodologies.

Acute and provisional effects from high intensity exposures are well-known; effects from long lasting low intensity exposures are perceived as highly hazardous thus rousing widespread concerns. Health and environment monitoring is essential to ensure compliance with rules as well as a correct information for citizens and administrators.

Framework Act 36/01 on the protection from exposures to electromagnetic fields, presents as a core issue the precautionary principle:

- envisages exposure limits, attention values[7] and quality targets[8], to protect the health of citizens and workers;
- envisages the creation of a national and a regional inventory on electromagnetic sources as tools for territorial planning and monitoring emissions;
- rules on the institution of remediation for present plants;
- entrusts the network of Regional Environmental Protection Agencies with surveillance and monitoring tasks for plants;
- envisages labelling for commercial products, specifying their exposure value to generated electromagnetic field in order to better protect consumers.

Decrees which implement the Framework Act point at exposure limits to electric fields of 3 to 3,000 MHz of 20V/m (60 V/m for electric fields lower than 3 MHz), setting values of attention and quality at 6 V/m for highly crowded places or with a level of permanence above four hours per day. Moreover, suggested exposure limits as to industrial frequency magnetic fields (50 Hz) account for 100 µT; attention values and quality objectives respectively stand at 10 and 3µT. A widespread scientific literature, in particular the reports of the National Institute of Health, points out a close link between children's leukaemia and magnetic fields.

Priorities, objectives and actions

Health hazards must be tackled through a two way process: by promoting emission reduction and energy saving, by implementing monitoring and knowledge development policies to pursue the following targets:

- exposure reduction when the conditions which are defined as the most critical;
- the reduction of conflicts through a detailed information and the implementation of tools of local concertation;
- the improvement of the efficiency of sources.

The essential actions are**:**

- design of innovative tools; outline of quality control and standard protocols along with cross calibration of measuring tools;
- training of qualified personnel on the entire national territory;
- starting-up redevelopment for unregulated circumstances[9] together with the installation of new UMTS (Universal Mobile Telecommunications System) sources;
- monitoring the emission sources.

In order to achieve the above mentioned objectives, a National Thematic Centre (CNT) on physical agents has been established. It must co-ordinate the achievement of a National Electromagnetic Register, collecting data related to geographic localisation, to national EM radiation sources and their physical characterisation.

Genetically Modified Organisms

The development of new technologies of recombinant DNA allows the production and use of Genetically Modified Organisms (GMO). These organisms are made up by a new combination of genetic materials.

The present two folded debate deals, on one hand, with bio safety and bioethics, obviously entailing economic aspects; on the other hand, with a potential contribution to development and sustainability. The introduction in the environment of new species makes it difficult to forecast long-term ecosystem rebounds. Decisions must be taken after an accurate risk assessment, according to precautionary principles. Bio-diversity protection relies on the evaluation of the introduction of peculiar GMO to previously assess its possible environmental consequences. At a national, international and European Union level, given complex factors and potential interactions at stake, a precautionary approach is prevalent, as a lack

6) "Low intensity" means under those values envisaged by the Council of Europe 1999's Recommendation.
7) "Attention values" not to be exceeded in housing and schooling areas and in prolonged permanence places.
8) "Quality objectives" that is plants' and appliances' emission values to be achieved over the short, medium and long term, through available technologies' and remediation methodologies' resort, taking into account potential long-term consequences.
9) Law 36/01 Executive Decree tends to focus decontamination interventions on the people exposed to above 3µT industrial frequency magnetic fields, allocating 1,500 million euro.

of damage evidence shall not hinder further steps towards human health and environmental protection.

Main concerns on GMO releases in the environment are:
- *health hazards*: food and fodder safety and toxicity, induction of allergies, development of drug resistance, in particular antibiotics, from pathogens;
- *environmental hazards*: transgenic instability and unpredictability of genetic expression, undesirable persistence and transgenic dispersion (genetic pollution hazard) induction of resistance/tolerance in target organisms, susceptibility induction in organisms not targeted, increase in the use of chemical compounds in agriculture;
- *agricultural hazards*: appearance or increase of weed infestations, increase in the use of pesticides, alteration in nutritional value of fodder or foodstuff, bio-diversity loss and the reduction of types of employed cultivations, conflicts in the regulation of typical products;
- *general problems*: costs increase, ethical and legal concerns, difficulties of identification by consumers and of acceptance by the public opinion;
- *patents and intellectual property problems*: patents for vegetable species and related farmers economic dependence, especially in developing countries.

Spreading and marketing of transgenic plants is under discussion within the United Nations Conference on Bio-diversity; in turn the 1999's Cartagena COP5 has worked on this issue to draft a paper agreed upon as Montreal's Protocol on Bio-safety in 2000. Sixty-four countries, among them Italy, have signed this Protocol in May 2000, in Nairobi. This Protocol envisages a participated agreement among countries on GMO transboundary movements implying environmental release and *"ad Hoc"* rules on GMO contained raw materials. For the first time, the Protocol clearly prescribes the precautionary approach and resort to information system that is Bio safety Clearing House as an official tool to exchange bio safety information among involved parties. Other international agencies deal with GMO related issues, such as FAO, through its Commission for Vegetable Genetic Resources, and Codex Alimentarius, FAO and WHO joint board, in particular involved in food security.

The EEC Directive 90/219 - endorsed by Law Decree 91/93, later modified by the EC Directive 98/81, adopted by Law Decree 206/01 - regulates GMO contained use in order to protect workers and the environment during research and manufacturing activities. EC Directive 2001/18, which disciplines GMO deliberate release in the environment, is under adoption and has recently repealed the EEC Directive 90/220. GMOs and their derivative products designed for human feeding are subject to an assessment procedure according to EC Regulation 97/258 that is "novel food and novel food ingredients".

In Europe, since the EC Regulation 97/258 came into force, over 1,600 experimental applications for environmental release have been notified, of which 275 in Italy (up to September 2000), so that Italy ranks second among European countries, after France and before the United Kingdom. Most applications refer to modifications of genetically modified plants increasing their resistance to insects or their tolerance to some herbicides.

Priorities, objectives and actions

Priority objectives are:
- promoting technical and scientific knowledge and supplying correct exhaustive information to the general public;
- adjusting national measures to those commitments endorsed at an international level, in particular applying assessment procedures on GMO hazards before their market introduction;
- monitoring and testing the environmental impact of releases of biotechnological products and safety of foodstuffs on sale.

The following set of measures must be implemented:
- promoting public and private research on bio safety of biotechnological applications in the agro industrial, zoo technical and fish farming sectors;
- developing biotechnological applications removing GMO environmental release, for the environmental safeguard and recovery (such as water and soil depuration and reclamation treatments, water and soil matrixes, deep desulphurization of distillates and crude oils) as well as in the energetic sector (as new fuels);
- drafting a National Bio safety Research Plan to supply exhaustive solutions to the potential impact of GMOs;
- starting up a multi-centred information system especially designed for decision-makers, technicians, information providers, media-jour nalists, educators, consumers and public opinion;
- setting up a National Surveillance System on the environmental impact of food security release and of genetically modified products;
- setting up an *"ad Hoc"* school to train and update monitoring operators;
- urging voluntary agreements among concerned parties on the release of GMO products;

- notifying operations to assess and transfer risks, as envisaged by Cartagena's Protocol on Bio safety;
- outlining tracking procedures for GMO manufacturing processes, that is labelling their processing rather than their final products, just as organic farming;
- drafting an environmental liability bill covering damages induced by GMO.

Food security

Food security should be intended in its wide and strategic meaning as a guaranteed individual and collective food healthiness, closer to the perceptions of consumers. Food security recalls the need for a correct and balanced diet, public information (through schools and media), preventive actions regarding food risks, the right of consumers for aware and motivated choices in such a context where both enterprises and consumers take on their own responsibilities.

Concerning food security, EU positions - stated in the "White Paper on Food Safety" - and guidelines for a global integrated approach ("from fields to the table") which develops along the whole food chain, concerning every party and industry liable for food safety, have been acknowledged by Regulation 178/2002. In this formal context, involved authorities have been entrusted with monitoring tasks as well as with the implementation of national control systems.

Priorities, objectives and actions

The key point for a strategy on food security consists of reliable fodder and food tracking that is *"ad Hoc"* procedures allowing the monitoring of risks and the removal of fodder and food from the market if it shows health hazards. This integrated approach will lead to a more dynamic, effective and consistent food policy, eliminating the inflexibility which restrained so far the timely tackling of food hazards.

Risk analysis must include factors such as evaluations, management (regulations and controls) and public information. Decision-making procedures must also take into account factors such as the precautionary principle, environmental considerations, animal well-being, sustainable agriculture, consumer expectations, suitable information, etc.

However essential requirements for strong safety standards must comply with the safeguard of food peculiarity, as enlisted by the Ministry of Forestry and Agricultural Policies which recently issued the list of 2,171 Italian typical products (Ministerial Decree dated July 18th, 2000). Moreover, food safety measures must not impair competition favouring large size enterprises to the detriment of small size enterprises.

The following steps are needed to achieve the above-stated aims:

- setting up a system to monitor and supervise food security integrating all sources, co-ordinating and harmonising any action taken (by Local Health Agencies, Zoo prophylaxis Institutes, Carabinieri Anti-Adulteration Unit, Fraud Repression Service of the Ministry of Forestry and Agricultural Policies, Regional Environmental Protection Agencies and other local authorities);
- implementing a nation-wide food research program, with regards to advanced technologies, safe production and distribution processes, assessment measures on contamination, chemical risks and exposure, the role of nutrition in health protection, harmonised systems of food analysis. This research plan must also protect food peculiarities and traditional production processes as well as craftsmanship of enterprises, taking into account foods of animal-origin and foods for weaning babies;
- supporting the spread of self-checking corporate procedures (HACCP), as prescribed by EC Directive 93/43, adopted in Italy with Law Decree 155/97, for all food process companies;
- setting-up an independent food authority to act as a national reference in compliance with the European Regulation 178/2002, entrusted with hazard assessments and communication issues on food safety. For this purpose, competences presently assigned to different ministries (respectively to the Ministry of Health, Ministry for Forestry and Agricultural Policies, Ministry of Productive Activities) and bodies (the National Institute of Health, Zoo prophylaxis Institutes, Local Health Agencies, National Research Institute on Food and Nutrition, Frauds Repression Headquarters, Carabinieri for Environmental Protection, etc) must be promoted and co-ordinated;
- setting-up an efficient monitoring system, to be jointly managed throughout the country. Official controls must apply to each party involved in the food production chain, from farming to distribution and final consumption. To this regard, the EC suggests a series of rules concerning operational criteria, approaches, co-operation in developing and managing the monitoring systems, so as to offset failures of the national system;

— setting up an *"ad Hoc"* school to train and update monitoring operators;
— ensuring evenly-efficient systems for health control at the EU boundaries in order to prevent the risk of sanitary and environmental dumping;
— supplying consumers with a correct exhaustive information. To consider consumers as one of the main concerned parties is essential:
- consumer information must include labels and adverts, providing consumers with detailed key information to allow an aware choice;
- risk communication;
- correct information on the nutritional value of food;
- informing the public on the principles for a correct diet and nutrition, especially as far as early childhood is concerned;
- information campaigns to train teachers and for food education in schools.

Restraining the use of pesticides through organic farming, integrated control and the introduction of good agricultural practices.

Legislative aspects raised by the EU White Paper on Food Safety must be implemented through:
— new legal framework for food and fodder safety;
— legislation for the evaluation, authorisation and new food labelling (in particular for those containing GMO);
— animals health and well-being;
— food sanitation;
— residues and contaminants;
— additives, flavourings, conditioning and irradiation;
— products packaging;
— emergency measures and alert systems.

Contaminated sites remediation

The contamination of sites causes an intake of polluting substances into the main environmental matrices, especially soil, body surface water and ground water. Remediation of sites and areas polluted by urban and industrial waste does not only concern Italy, since a great number of environmental emergencies occur in developing countries which do need co-operation and technological support. Up to 1980, Italy lacked an *"ad Hoc"* Legal Framework; therefore uncontrolled dumping, stockpiles of unsuitable waste and raw material, spilling of dangerous substances by industrial plants created thousands contaminated sites to be upgraded. The analysis of Regional Remediation Plans, worked out by regions in the early 90's, points out the following aspects:

— potentially contaminated sites: approximately 9,000;
— first priority sites, short-term interventions: approximately 500;
— second priority sites, medium-term interventions: approximately 1,100;
— estimated cost for short-term interventions: approximately 400 million euro;
— estimated cost for medium-term interventions: approximately 500 million euro.

Costs are quite underestimated, especially for the medium-term interventions.

Interventions to upgrade polluted areas have been first ruled by Act 441/87, urging regions to draft Regional Remediation Plans to get an overall exhaustive picture of polluted sites and areas. Ministerial Decree - dated May 16th 1989 - extended the census to unproductive industrial size overlooking the operational ones. The types of categories are represented mainly by landfillds (72%) and industrial areas (28%), altought most of these are dismissed.

This matter has been regulated by Legislative Decree 22/97, whose basic points concern intervention procedures and sanctions, designed particularly for whoever causes the exceeding of the acceptable limits; acknowledgement that remediation interventions are an actual burden while remediation costs are endowed with a special preferential right over movable and real-estate privileges on polluted sites; setting-up a register office of sites to be reclaimed which shall be drafted by regions according to notices and investigations carried out by their control bodies; the definition of remediation interventions of national interest and the approval procedure of their relevant projects. Ministerial Decree 471/99, in compliance with Legislative Decree 22/97, article 17, and its subsequent amendments and integrations, has clearly regulated the technical, procedural and administrative issues of remediation interventions.

The Ministry for the Environment and Territory, according to the State-Region Conference and after having consulted the competent Parliamentary Commissions, has approved the National Program for environmental remediation and recovery of polluted sites, in compliance with Act 426/98. The same Law has singled out fourteen sites of national interest. Later, Act 388/2000 (2001 Financial Act) added Sesto San Giovanni, Naples Bagnoli - Cordoglio and Pioltello - Rodano, and other sites pointed out by the program.

Funds must be devolved to regions, including yearly shares of commitment limits for the amortization of

loans obtained by local authorities, according to criteria and procedures disciplined by appropriate regulations. Concerning sites contaminated by asbestos, the problem is linked to the dimension (since asbestos and friable concrete asbestos alone account for approximately 30 million tons) as well as to technologies for their recovery or disposal treatment.

Priorities, objectives and actions

Priority objectives are:
- to improve monitoring and knowledge degree of polluted sites, especially by assessing the present risks for health and environment and linked to the expected uses;
- to set the conditions to favour, in time, the execution of projects, especially in urban areas;
- to develop research and experimentation of technologies based on the use of biological processes with a low environmental impact (bioremediation), which do not entail complex infrastructures and can easily be used also in areas having small dimensions.

This priority framework requires the following actions:
- drawing an exhaustive cognitive framework. The data bank of national and local polluted sites, indicated by Regional Remediation Plans, must set the basis for a register office enlisting sites to be recovered and the site already reclaimed. Archives records drafts and enforced projects as well as the technological techniques adopted with regards to typology of pollution;
- promoting experimentation on remediation technologies with a low environmental impact. The need of investments for remediation is extremely high: 1.2 billion euro over the next twenty years for public sites indicated by the Regional Remediation Plans; 8-11 billion euro for private sites; 2 billion euro for sites of national interest. The costs of remediation technologies with a low environmental impact are quite reasonable, therefore some funds could be invested in developing these technologies. The employment rebound is significant. Projects of material recycling must be backed by appropriate legislative tools and support mechanisms;
- standardisation incentives, characterisation processes, industrial monitoring and control schemes through legislative tools to finance enterprises willing to set up applied research networks in the field of environmental monitoring and control;
- accelerate authorisation and administrative applications;
- drafting a clearer and stricter legislation on environmental damage;
- prevention of widespread territorial pollution caused by unsuitable agricultural practices, through a compulsory environmental and sanitary record of potentially polluting fertilisers, among other provisions;
- training highly specialised professionals.

EU provisions on remediation, focused on a small number of targets and priority subjects, can allow Europe to gain a share of world market through the valorisation of initiatives of the Member States while keeping their decision-making independence. Throughout a United Nations initiative, the list of EU enterprises operating in the remediation sector and their specialisation field has been updated[10].

Environmental crime

Italy draws each year an updated statistical framework outlining the environmental crimes and their geographical distribution; among European countries this might be the first initiative. In 1994 the Carabinieri, Legambiente and Eurispes emphasized, for the first time, mafia interferences in two cycles of great environmental impact: waste life-cycle, from collection to disposal, and the cement life-cycle, from pits to bids. Since 1996 this research turned into a yearly Eco-Mafia Report jointly made by Police Units and Social, Economic and Building Research Centre (Cresme).

Monitoring data together with legal orders and acts of the Environmental Protection Unit (NOE) stressed evident links between criminal activities and the seriousness of environmental degradation phenomena in many Italian areas.

This survey pointed out that once the territorial racket grip was limited to the extortion of business and entrepreneurial activities, while since 1990 it has stretched to natural resources.

These potential profit chances have turned into a business, where eco-mafia follows a closed system, from illegal pits to dumping sites: exhausted pits are filled with waste coming from all over the country. The 1999

10) "Compendium of soil clean-up technologies and soil re-mediation companies".

investigation found out the following data:
- Police activities found out 26,508 environmental crimes;
- environmental crimes in traditional mafia regions account for 42.1%, that is Campania, Puglia, Calabria and Sicily;
- Campania is most affected by different illegal environmental phenomena, such as its criminal offences, accounting for 18.3% out of the overall cases discovered by the Italian Police (against 14.6% of 1998) and 6,155 unauthorized houses built in 1999, accounting for 18% out of the total national data;
- 33,571 illegal houses, worth 2 billion euro, have been built in Italy, 56% of them in the above mentioned traditional mafia regions with a territorial consumption of 454 hectares;
- detected criminal clans, operating in the eco-mafia three main fields, that are cement and waste cycles and animal racket, amount to 138.

The potential market of eco-mafia has been estimated at 26 billion euro per year.
Over the period 1994-1999, the data analysis of the joint investigation carried out by the Police pointed out the "hard core" of environmental illegal activities, estimated at about 27,000 crimes per year, an average of 15,000 people prosecuted and over 3,000 seizures. Particularly, over the 1994-1996 period, the territorial surveillance of Police found out 77,850 crimes, prosecuted 53,455 people and executed 7,227 legal attachments. Since 1997, scattered national and regional data have become available so that ascertained overall crimes amounted to 28,457, prosecuted people to 10,826 and executed seizures to 3,491. 44.3% of ascertained crimes concentrates in the four traditional mafia regions Puglia, Calabria, Sicily and Campania.

In 1998, ascertained crimes and executed seizures peaked respectively to 30,957 and 4,443 while prosecuted people dropped to 9,392. However, environmental crimes (42%) did not undergo any change in the four regions which are the most affected by Mafia racket. In 1999, according to recent data, crimes dropped to 26,508 while prosecuted people rose to 17,447; however legal seizures and the share of mafia in the four regions stood unchanged at respectively 4,694 and 42%.

Moreover, animal racket has just recently become another criminal activity, ranging from illegal dog fights to the trade of protected species; several NGOs investigate this racket field, such as WWF, International League for the Protection of Birds and Anti-Vivisection League.
Beyond the quantitative evaluation of these phenomena, the updated analysis are available on the penetration of mafia organizations as well as estimates on the economic turnover of their activities.

The illegal management of cement and waste life-cycles requires the active involvement of legal people, either actual companies or sham ones, contaminating the market before the environment itself, distorting the supply-demand mechanisms, hindering the creation and growth of companies that are lawful, efficient and technologically-reliable. Within this illegal phenomena framework, unlawful companies operate juxtaposing their environmental services to lawful companies. Environmental criminality can be regarded as a factor of serious market distortion, jeopardizing sustainable development chances, strongly opposing to actions which promote archaeological, historical and natural heritage.

Priorities, objectives and actions

An efficient environmental security system must actively commit local and regional administrations along with citizens. The features of the environmental heritage create the need for this joint effort, being public properties defined, spread out and complex. Therefore the improvement of their safety scheme must be supported by campaigns which build a new culture of environmental legality.

Given the novelty and the complexity of these crimes, the prevention of environmental crimes and their repression activities must include security actions together with numerous training and information initiatives.

These initiatives shall make the phenomena of environmental criminal assault and the seriousness of their negative consequences widely known thus raising public awareness. In fact the response ability of local communities relies on danger awareness and on the knowledge of defensive choices. The dangerousness of environmental crimes dooms our lives but this is not yet clearly perceived.

Environmental investigation tools need to be substantially enhanced, as also underlined by the second National Security Plan on "Southern Italy Safety for its Development", worked out by the Italian Ministry of Internal Affairs in compliance with the Community Support Framework, which will be funded by national and EU *"ad Hoc"* resources. This Plan grants to the safeguard of natural and cultural heritage a strategic value. Environmental safety must envisage the streamlining and strengthening of the present punishment scheme along with the following three strategic points:
- the development of advanced surveillance and

monitoring technologies;
- adequate personnel training;
- the updating and the strengthening of data management and communication systems.

With regards to repression activities, the environmental pollution offence envisaged by a government bill submitted in April 1999, aims at introducing offences against the environment in the Penal Code, ranging from the destruction of natural heritage to illegal waste trafficking and environmental fraud.

In order to combat organised crime and illegal activities linked to waste life-cycle, Act 399/2001 has set up an *"ad Hoc"* Parliamentary Investigation Commission endowed with the same judiciary powers and restrictions to check administrative transparency in waste disposal and management utility tenders, detecting present regulation breaches while bringing in legislative measures. This commission must report its implemented actions to the Parliament on an annual basis.

Environmental safety must commit every social and institutional party operating in territorial surveillance and management according to its peculiarities and competences. The ultimate target to be pursued should be the set-up of a regional and provincial network which could be supported by the experiences of Asti, Alessandria and Salerno provinces and Basilicata region: the set up of Environment and Legality Observatories.

Such Observatories aim at gathering every party involved in this field on the knowledge and protection of environmental resources and the management of environmental services, such as waste collection and disposal as well as depuration of waters. Parties playing different social and institutional roles, such as local authorities, Police, judiciary, prefectures, associations, trade-unions, must co-operate within Observatories and set up their executive committees.

The activities of the Observatory are planned each year, according to a precise working schedule; from the collection and review of data coming from a toll-free number, the drafting of questionnaires for local administrations since municipalities run environmental services and carry out municipal surveillance; from collected data processing and detection of critical areas, to projects for the improvement of environmental training for administrators and technicians, and moreover proposals for the improvement of local and regional regulations, if needed. Therefore the regular synergic work of Observatories differs from ordinary tasks of their members.
Eventually, each Observatory should be linked up to the national environmental security scheme so as to receive and communicate useful information and data.

This plan envisages specific activities for each police force, municipal police forces included. However training initiatives must not be limited to repressive apparatus; this would be an actual mistake, emphasized by the fact that today one of the worst failures of the surveillance system is represented by the shortage of administrative trained staff in environmental prevention and monitoring at every level. Nowadays many infringements are administratively punished but the low effectiveness of these repressive measures might nullify surveillance activities altogether.

Actions promoted by the Ministry of Internal Affairs according to the 2000-2006 Community Support Framework can be regarded as an actual turning point for Objective 1 regions, although issues related to the combat against environmental crime must be thoroughly tackled at a national level.

In fact environmental safety relies on territorial surveillance and monitoring. Unfortunately it is affected by the following failures:
- the present surveillance system is almost exclusively pivoted to petitions and exposures, making this activity randomly pursued all over the country;
- a coherent data bank of environmental criminal assaults has not yet been set up;
- the investigation activities, in particular the most complex such as the overall detection of hazardous areas and the analysis of phenomena, usually meet insuperable difficulties, due to the lack of suitable technological tools. An emblematic example is represented by forest fires, arsons in most cases, whereas lacking an updated map of regional and municipal fire-stricken areas, construction bans cannot be enforced.

The Community Support Framework approach will be widened by developing suitable projects and programs supplying the needed information, so as to avoid their redundancy. The complexity and the range of environmental safety parameters demand a great deal of target screening, the analysis of available resources, collected information filing and exploitation. This risk together with the need for the optimization of available resources will require a preliminary grid adoption to steer the development of projects:
- localization of satellite detection systems currently available, with regards to both technical specifications and ownership;

- the outline of available satellite data bank scheme and updating systems;
- the outline of access permissions to data banks and application procedures to retrieve information;
- the integration of satellite, air and land surveying systems, according to a thorough examination scale of investigation activities.

This preliminary screening action starts with the priority objective of monitoring and controlling activities. The four main environmental criminal assault phenomena are:

- illegal solid and liquid waste land or water fill disposal, especially waste "grave-burial" phenomena;
- unauthorized building;
- pits/quarries and other mining activities;
- pollution of coastal areas and rivers.

Once the basic information on the above mentioned phenomena of stricken areas has been gathered, their diachronic reading, through already available data bank of satellite images, can prove extremely useful. This will also allow the evaluation of their average progress as well as a closer investigation of suspected illegal phenomena up to actual territorial inspections to be carried out in the detected areas.

Law Draft 3960, submitted by the government in April 1999, clearly distinguishes between mere breaks of reg-

Table 4 Urban living and environment quality indicators and objectives

GENERAL OBJECTIVES	SPECIFIC OBJECTIVES
Urban and territorial rebalance	Integration of Field Plan with local Agenda 21 processes; Polycentric rebalance of territorial functions (so as to cut mobility demand).
	Curbing and redressing building pressure and other causes deteriorating and worsening urban, historical, cultural and building estate quality.
	Urban area reuse and environmental restoration interventions extent.
	Historical, cultural and environmental estate wider accessibility and redressing; Enhancing the qualitv of urban texture.
Urban environment quality enhancement	Reduce inhabitants exposure to pollution (air, water, acoustic and soil) and its gradual elimination.
	Reduce the hydro geological/technological hazard.
	Containment of environmentally high-impact mobility; Metropolitan traffic control and boost alternatives to private mobility; Development of mobility-replacing telematic services; Development of an urban infrastructure easening the mobility of cycles and pedestrians.
Sustainable use of natural resources	"Environmental cost" minimisation and quantity reduction of waste and exploited resources (energy, water, materials).
	Exploited resources recycling and recovery increase.
	Spreading "environmental-friendly" consumption and behaviours.
Social-economical resources promotion and their fair distribution	Boosting employment, enterprises and activities oriented to sustainability.
Improving a social and democratic involvement	Improvement of resources, services and fair-distribution; Strengthening social integration, cohesion, liveability, cohabitation and sense of belonging in urban areas.
	Renewal and enhancement of integrated environment management skills and of community participation to decision-making processes; Promote managerial innovation and sustainability-oriented administration within local authorities; Improve the participation to the decision-making processes and environmental-governance skills within local authorities.

** EU LC xx indicates a correspondence with the ten indicators envisaged by the European Project "Towards a local sustainability framework", the so called the European*

ulations in force and actual crimes. Generally speaking, environmental crime covers those illegal behaviors affecting the environment to a limited extent, that is widespread bad habits such as fly tipping; in such cases the needed punishments are not as effective as educational media and information campaigns.

Those regulation breaches, classified as environmental crimes, encompass mere illicit deeds since they bring about severe air, water, soil, flora and fauna degradation or other such consequences or risky/dangerous circumstances. Then if the event takes place, this increases the punishment to three-ten years of imprisonment in case of environmental disaster.

At an international level, the G8 has established a narrower co-operation between police forces and the judiciary, through the so-called Law Enforcement Project on Environmental Crime, which is a permanent working group. At EU level, Eurojust, a new legal co-operation body has been set up, assigning several action fields and among them, environmental crime.
Eventually, in 2000 National Anti-Mafia Public Prosecutor's Office together with the Council of Europe have sponsored the first Pan-European Symposium - held in Caserta - summoning prosecutors pledged in organized-crime fight; in their final motion they have underlined environmental crimes seriousness and urged a hard-tackling strategy.

INDICATORS*
Motor vehicle incidence in local passenger mobility (EU LC 3).
Urban natural areas (in urban contexts) protected against urban expansion (EU LC 9).
Urban contaminated or degraded areas (in urban contexts) currently recovered and reused (EU LC 9).
Available access to services, historical - cultural goods and green areas (EU LC 4).
Good air quality days (EU LC 5); Local plans and reports air improvement and emission cut; Population exposure to acoustic pollution (EU LC 8); Zoning and Plans of acoustic redevelopment; Underground and surface water pollution; Depuration capacity (see Water Resources).
People exposed to hydro geological hazards; People exposed to industrial and technological hazards.
Motor vehicle incidence in local passenger mobility (EU LC 3).
CO_2 emissions local share (EU LC 2); Energy consumption per capita and per worker; Renewable Actions and plan to efficiency; Water consumption (and collection) per capita and per worker (see water resources).
Urban waste generated, per capita; Share of separately collected fractions.
Public transport use; Sustainable products spread (EU LC 10).
Environment-oriented companies and employees; Environmentally certified, EMAS/ISO 14000, public and private companies (EU LC 7).
Citizens satisfaction (EU LC 1); Social equity and economic welfare indicators; Health and social security indicators.
Number of joint activities promoted towards sustainability and its spreading; Projects progress; Amount of public funding to projects.

Common Indicators – DG Environment, Expert Group on Urban Environment, February 2000.

Table 5 Living quality, environmental safety & quality objectives, indicators & targets

GENERAL OBJECTIVES	SPECIFIC OBJECTIVES
Atmospheric polluting emissions cut and pollutants threshold maintenance in order to avoid damages to human health, ecosystems and cultural heritage	Compliance to Standard of International Protocols and to EU Directives thresholds.
	SO_2 emissions cut.
	NO_x emissions cut.
	Non-Methane Volatile Organic Compounds emissions cut.
	NH_3 emissions cut.
	CO_2 emissions cut.
	Benzene emissions cut.
	PM_{10} emissions cut.
	Tropospheric ozone concentration cut.
	Cut and prevention of radon exposure and indoor pollution.
Reduction of acoustic pollution and exposed citizens	Complying with limits imposed by national laws.
	Decrease the percentage of citizens exposed to excessive noise level.
	Change in consumption models and behaviours; New transport technologies and low acoustic emissions motorizations; New technologies for active and passive noise monitoring.
Reduction of exposure to electromagnetic fields where human health and environment are treated	Increase the public awareness on exposure induced health risks; National collection of electromagnetic exposure levels; Equipments and plants emissions cut.

* *NEC stands for National Emissions Ceilings*

INDICATORS	TARGETS
Atmospheric concentrations of: SO_2, NO_2, O_3, benzene, PM10, lead and BaP; Emissions of: SO_2, lead, NH_3, NO_x, Non-Methane Volatile Organic Compounds, heavy metals and POP; Deposition (soil and water) of sulphates and nitrates.	Reduction of polluting emissions according to levels and timeframes set by Protocols Bringing concentrations below EU Directives levels.
Emissions of SO_2 from the industrial and energetic sector; SO_2 emissions of mobile sources; Air concentrations: hourly and daily averages, yearly average and 98th percentile, winter average; pH of surface water; Critical loads of acid and eutrophying nitrogen.	Emission: 1330 kt /year since 2000 (NEC* Directive); 1042 kt /year (Oslo Protocol); 475 kt /year by 2010 (NEC* Directive) and 500 kt /year by 2010 (Gothenburg's Protocol); Concentrations: limits and reference values (Presidential Decree 203/1988); Limits set by the Directive 199/30/EC.
NO_x emissions from transport; NO_x emissions from stationary sources; Air concentrations: hourly and daily averages, yearly average and 98th percentile, winter average; Critical loads of acid and eutrophying nitrogen.	Emissions: 1Mt /year by 2010; 990 kt /year by 2010 (NEC* Directive); Concentrations: limits and reference values (Presidential Decree 203/1988); Limits set by the Directive 199/30/EC.
Emissions of NMVOC from the industry (solvents) and mobile sources.	Emissions: 1159 kt /year by 2010, (Gothenburg's Protocol and NEC* Directive); Targets set by 99/13/CE Directive on organic solvent use.
Agricultural NH_3 emissions.	Emissions: 419 kt /year by 2010 (Gothenburg's Protocol and NEC* Directive).
Transport CO_2 emissions.	Concentrations: limits and reference values (Presidential Decree 203/1988); 10 mg/m^3 average maximum concentration on 8 hours by 2005, (2000/69/CE directive).
Fuels benzene percentage; Urban areas benzene percentage.	10 µg/m^3 present quality target; 5 µg/m^3 as yearly average(2000/69/CE Directive).
Manufacturing and mobile sources of fine dust release; PM_{10} concentrations in industrial and urban areas and in road infrastructure.	40 µg/m^3 present quality objective; 20 µg/m^3 by 2010 in compliance with 1999/30/CE Directive.
VOC, NO_x and PM emissions; Metropolitan town-leeward and rural areas O_3 concentrations; Vegetation damage and agricultural yield drop evidence; Critical loads.	Concentrations: limit values and levels under the PMD 28/3/83 and Ministerial Decree 16/5/96; Long term objectives and target values for 2010 (02/3/CE Directive): AOT_{40} at 6 mg/m^3 per hour for crops.
Indoor pollutants concentration; Radon concentration.	
Population exposure levels to daily noise; Population exposure levels to night noise.	Within 15 years: complete implementation of redevelopment plans for transport services and related infrastructures (under MD 29th November 2000, article 2, letters a.3 and b.3); Within 5 years: thorough implementation of redevelopment plans for transport services and related infrastructures not included in the previous paragraph (under MD 29th November 2000, article 2, letters a.3 and b.3), in compliance with limit values set by enforcement regulations under the article 11 of act 447/95.
Low-frequency magnetic fields intensity in highest exposure areas;	Exposure limits: 5 kV/m e 0.1mT; Attention values: 10µT; Quality target: 3µT.
Radio frequency electric fields intensity in highest exposure areas; Attention values for permanence in buildings of at least four hour at 6 V/m.	Exposure limits: 60 V/m (0.1-3 MHz); 20 V/m (up to 3GHz) e 40 V/m over 3 GHz; Living quality improvement target in highly-crowded outdoor areas: 6 V/m, 16 mA/m and 0.1 W/mq.

follow Table 5

GENERAL OBJECTIVES	SPECIFIC OBJECTIVES
Sustainable use of GMO Spreading knowledge and awareness on GMO and biotechnologies	Strengthening and enforcement of environmental crimes legislation.
	Ecosystem and health protection and prevention against GMO and biotechnological products hazards.
	International Trade bio safety.
Food security and quality	Development of research in food security.
	Reduction in pesticides use by promoting organic farming and integrated control; Setting-up effective monitoring systems on food security.
	Consumer correct information on food security.
	Safeguard of Italian food industry craftsmanship and product peculiarity.
	Set-up of independent food authority.
	Set-up of effective monitoring system.
Reclamation of polluted sites and areas	Achievement of zoning and monitoring reclaimable sites; Experimentation on remediation technologies of low environmental impact.
	National interest interventions achievement.

Table 6 Combatting environmental crimes: objectives and indicators

GENERAL OBJECTIVES	SPECIFIC OBJECTIVES
Strengthening of environmental crimes legislation and its relevant enforcement	Enhanced effectiveness of local and regional regulations.
	Set-up of an effective environmental security systems.
	Strengthening instrumentation detecting environmental crimes.
Promotion of democratic participation and awareness to environmental security scheme	Promotion of environmental legality culture.
	Growth of aware seriousness on environmental criminal assault phenomena and relevant negative rebounds.
	Updating and strengthening of data management and communication systems on environmental criminal assault phenomena .

INDICATORS	TARGETS

INDICATORS	TARGETS
Detected and prosecuted environmental crimes; Executed legal seizures.	

Exploitation of natural resources and waste generation

In developed countries that represent a reference for developing ones, the production and consumption activities exploit environmental resources - such as air, water, ores, fuels, land, etc.- in an inefficient and un-sustainable way, while increasing sewage discharges.

The analysis of production and consumption patterns of developed countries emphasizes a low-efficiency in the use of natural resources, resulting into the environmental scattering of the most used resources. The degree of efficiency in the use of natural resources, along the entire lifetime of products, that is their tapping, processing, consumption and disposal/recovery stages, can be substantially increased and both the final consumer and the efficiency of enterprises will benefit from this.

In order to support growth, the global economic system focused on the minimisation of costs of the primary resources thus encouraging enterprises to exploit them in an inefficient way. Therefore, the excessive abstraction of natural resources has brought about deep changes of the typical material flow in the metabolism of ecosystems, thus reducing the renewal of resources while negatively affecting both human health and the economy as a result of the following effects:

- loss of value induced by environmental degradation;
- the need for remediation;
- a reduced availability of renewable and non-renewable resources;
- an increasing need for health protection of the population.

Environmental and economic reasons urge a substantial reduction in the use of resources, as well as in the flow of materials and pollutants discharged into the environment by human activities. A more efficient use of natural resources in the industrial sector and a shift towards a service efficiency satisfaction in the consumer's consumption pattern must fulfil the above-mentioned aims and maintain the final consumption at a high qualitative standard.

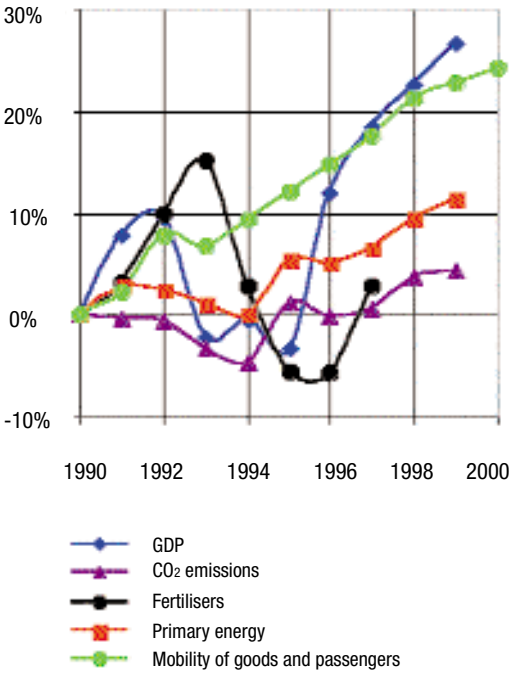
From a social point of view, the inefficient and excessive use of natural resources violate the principle of equity as well as the right to access for both developing countries and future generations.

Use of natural resources

Italy, as other developed countries, has reached and maintains such levels of consumption higher enough to alter any ecological balance. The excessive and improper use of resources concerns both non-renewable and renewable resources such as inert materials, fossil fuels, other ores such as water, land and timber.

In many cases the use of renewable resources exceeds their regeneration capacity; this applies to water, timber and energy bio-masses. Most non renewable resources exploited in Italy (about 90% of energy materials and minerals) are imported. Therefore their reduction or replacement with renewable ones would largely benefit our economic system. Moreover, 20% of the world population exploits 80% of the overall natural resources.

Figure 8
Italian consumption indexes



Sources: Italian National Agency for New Technologies, Energy and the Environment; National Institute of Statistics; National Environmental Protection Agency, 2001.

It was estimated that the world economic system exploits twice as much natural resources as sustainable use of the earth ecosystem allows. Moreover, 20% of the world population exploits 80% of the overall natural resources. Therefore, the equity access principle can be tackled only by ensuring a more efficient use of natural resources and an equal-footing access.

Developed countries should increase the efficiency of both production and consumption sectors appealing to their wider research and development skills so as to export sustainable-growth technologies into developing countries rather than low-efficient environmentally-dangerous processes.

At EU level, a gradual Eco-efficiency schedule has been suggested through a reduction of the exploitation of natural resources by 25% within 2010, by 75% *(factor 4)* within 2030 and by 90% *(factor 10)* within 2050. These strategies aim at restraining the entry of materials exploited by the world socio-economic system, on a national, regional, industrial, urban and household basis while safeguarding and maintaining the actual living qualitative standards. Moreover this goal can be better achieved by changing the improper excessive present consumption of material goods and aimlessly wasteful lifestyles thus improving in this respect also the quality of our life. These strategies anticipate a widespread technological modernisation and innovation of the industrial system therefore they demand to every involved party a thorough support and persuasion.

Research and technological development on production processes will largely support the implementation of this strategy as follows:

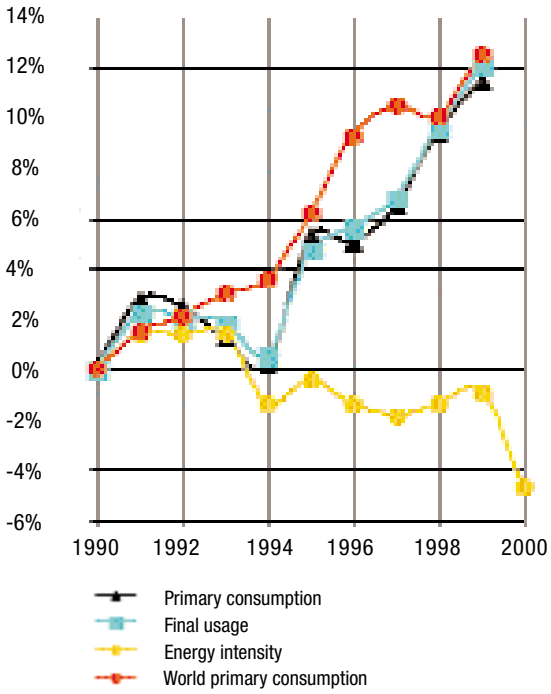
- reducing the consumption of raw materials and resources, especially non-renewable ones;
- stretching the lifetime of products;
- gradually replacing commodities with Eco-efficient services;
- emphasizing the recycling and the reuse of no-longer usable products and all their composing materials by supporting a real growth of the recycled materials market.

Along this path and through oriented steering actions of the demand, sustainable development policies will be focused on clear, accurate and understandable quantitative targets, thus de-coupling development from the economic growth and dematerialising the economic system.

The *factor 10* pattern covering the next fifty years envisages for the productivity of resources an increase of 4.5% per year. This model requires a clear-cut technological development resumption and a new *self-sufficiency* culture, that is a higher quality of life based on less material goods and more adequate services in countries, like Italy, featuring nowadays unsustainable middle-term lifestyles.

Figure 9
The development of energy resources in Italy (EU HL 10)

1990-based index numbers



Note: reference year values.
Primary consumption: 152 Mtoe
Final usage: 118 Mtoe
Power intensity: 0.195 ktoe/euro
World primary consumption: 8,623 Mtoe

Source: Italian National Agency for new Technologies, Energy and the Environment, 2001.

Present manufacturing pattern makes economic dematerialization extremely difficult, since it relies on the sale of high quantities of products and goods which are short lasting and continuosly replaced.
Present trends show a resource-consumption decrease in the production of goods and services and a fair de-coupling between economic growth and resources - see field resource-consumption indexes, in figure 9 - although these advantages are overrun by the increase of global consumption. An absolute de-coupling involves a clear-cut swing in the use of resources while a relative de-coupling entails an use of resources lower than the growth rate.

Dematerialization requires a shift from short life term product sale to the sale of services, through the use of long life term material products. This is an example of a double benefit/dividend, that improves both the quality of life for consumers and the advantages for enterprises, by decreasing the share of materials and the environmental burdens and by increasing employment rates.

This transformation demands a public opinion information and guidance campaigns, so that people will not perceive the provision of alternative lifestyle as a threat to their personal freedom, preventing them from a useless negative perception of changes.

The European Environmental Agency[11] has adopted indicators, worked out by some European countries, concerning the extent use of environmental resources (Total Material Requirement, TMR) and a given product or service material intensity (Material Input per Unit Service, MIPS). Estimated TMR refers to the whole of Europe and its interior exchange flows which offset each other. These indicators include the share of materials exploited from environment which will not be conveyed into final products. The application of indicators allows to monitor the performance of the economic system, in comparison with the use of resources, as well as the calculation of material input per yielded wealth unit.

Some Italian consumption profiles, and some data regarding the intensity of resources have been stated respectively in figure 8 and in table 7. An estimate has been made on the overall material flow both in 1995 and in the previous decade, and a survey in 1998 on Direct Material Input index, building materials excluded, states that is about 420 Mt/year, i.e. about 8 t/year per capita (EUROSTAT).

Over the same decade, GDP increased by 4% while the demand of productive system resources decreased by 13%. This trend must be carefully assessed since it has been substantially backed by the gradual replacement of oil products with natural gas for direct energy use and electricity generation and by the progressive de-localisation in other countries of the primary industry sector,

Table 7
The input of materials and the relevant GDP ratio per economic activities (kg of resource input per GDP million in 1988)

Section I: national materials					Section II : imported materials				
National Materials	Non-Energetic Ores	Bio-Masses	Endogenetic Steam	Energetic Ores	Imported Materials	Non-Energetic Ores	Biomasses	Unimportant	Energetic Ores
Agriculture, zootechnology, forests, hunting and fishing	34	1,721	19	0	Agriculture, zootechnology, forests, hunting and fishing	10	66	11	20
Ores, energy, iron metallurgy, cement	2,541	3	283	217	Ores, energy, iron metallurgy, cement	156	8	4	323
Chemicals, rubber, etc.	397	21	37	17	Chemicals, rubber, etc.	153	43	59	76
Metals, machinery, transport means	185	4	26	9	Metals, machinery, transport means	149	10	6	31
Food and drink industries	127	613	29	12	Food and drink industries	35	186	6	28
Textiles, timber and paper	92	20	28	9	Textiles, timber and paper	19	103	14	22
Buildings	1,478	3	16	9	Buildings	179	13	5	24
Trade and shops	54	47	17	10	Trade and shops	9	19	1	9
Conveyance and communications	56	7	13	35	Conveyance and communications	20	8	2	78
Other saleable services	62	3	11	4	Other saleable services	10	3	2	8
Non saleable services and Public Administration ones	76	11	13	7	Non saleable services and Public Administration ones	16	8	2	15

11) European Environmental Agency (EEA): "Environmental Signals 2001".

an industry featuring a high input of raw materials, towards the replacement of manufactured with already refined or semi-processed products.

The National Institute of Statistics (ISTAT) has taken the first steps to establish a national material accounting, while some companies, within innovation and process certification projects, are adopting accounting systems for some resources, mainly for water and power, along with the initiatives to decrease the use of resources linked with the need of waste reduction.

A restraint in resource consumption of the Italian economic system, which processes resources in order to manufacture goods and services, allows the reduction of purchasing costs for imported raw materials, a national budget's liability, thus stirring up the research and development of new high-efficient processes and products improving therefore their competitiveness.

Promoting the use of services, rather than the acquisition of products, increases the share of skilled manpower in the service industry sector and in foreign products related services and reduces the import of consumer goods thus creating social advantages and a positive trade balance.

Factor 4 and *factor 10* projects set dematerialization targets, (see table 8).

Water resources

The amount of available water supply accounts, given its present governing capacity, for 52 billion m^3 of which approximately 40 billion m^3 are actually being exploited. Italy, such as any other Mediterranean country, shows a significant irrigation usage, that is 20 billion m^3, even if over the last decade irrigated areas and unit consumptions have emphasized either a stabilisation or a reduction trend, especially in northern Italy. Projections show an expected decrease in the demand of water from the Po basin by 2011 of approximately 10-40%.

No data are available on the consumption of water for industrial purposes, but the gradual reduction trend set in the 1970s still seems to be operating: between 1972 and 1986, paper, rubber and synthetic fibre industries and sugar mills underwent substantial cuts of respectively 4%, 80% and 56%. Between 1994 and 1997, the chemical industry recorded a 5% cut against a 10% production increase.

The latest available statistics regarding consumption of water for civil use go back to 1987, which clearly outline both an increase of water exploitation, as compared to the consumption of the previous decade, and a decreased efficiency in the distribution. However, recent findings of the Water Research Institute (IRSA) records a stabilisation of water exploitation. Between 1970 and 1980, the quality of surface water showed a fair improvement as a result of the reduction of industrial burden and the activation of purification systems; this is particularly true in the industrial sector, even though a national scale shows a medium low quality level. Although in the past twenty years many purification plants have been built, there is no evidence of a strong and relevant improvement in the quality of the ecosystems and metabolism of the Italian water as shown in other European countries. There are no regular data regarding the quality of ground water to allow projections, however a medium long term worsening is expected due to the present severe soil contamination levels: therefore this is a very serious problem to be tackled.

Purification plants have substantially increased: 4,875 operational secondary or tertiary treatment plants in 1993 as against 3,823 in 1987, recording a 20% upswing, even though non operational plants are increasing too. The share of equivalent population connected to the sewage system is 77%, while 63% is serviced by operational plants.

Priorities, objectives and actions

Generally speaking, there is no shortage in the Italian water resources, however the traditional water demand, for household, irrigation, industries, energy, navigation, have increasingly been coupled with the demand for environmental use such as water quality protection, landscape safeguard and promotion, ecosystem and bio-diversity protection, amusements (tourist resorts, fishing and canoeing) (see figure 10).

For this reason, it is a priority to restore or preserve water regimens compatible with the protection of ecosystems, the recreational uses and land asset. In many Italian districts this will imply less exploitation of natural water flow (see figure 11), especially of good and high quality sources. Therefore, less demand is a priority goal, that is the amount of resources needed to meet the dissipative usage; for this purpose saving, re-using and recycling interventions must be implemented.

Framework Directive 2000/60/EC on waters, for some aspects anticipated by Legislative Decree 152/99, sets up a framework for EU action on waters. This Directive

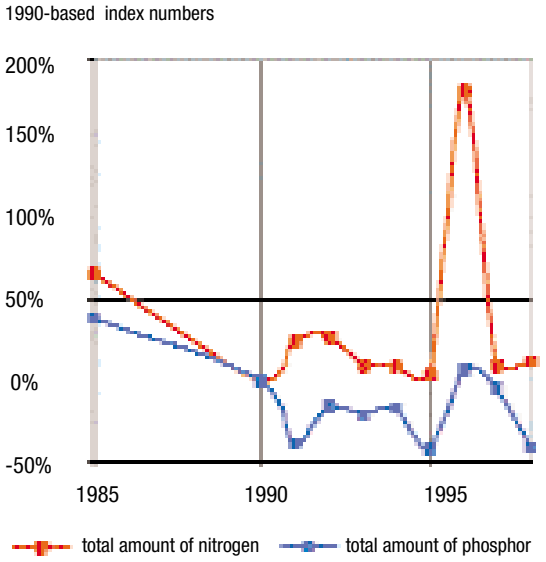
establishes ad Hoc environmental targets for surface and underground water resources, extending the concept of protection so as to include all the ecosystems connected with water habitats. These targets must be pursued and achieved according to precise deadlines and in compliance with the technical annex. The good qualitative standard of the overall water resources must be achieved within fifteen years from the date that Directive came into effect. The Regional Safeguard Plan, under the Legislative Decree 152/99, will plan protective measures restoring the sustainable balance of water and reducing worst polluting loads on surface and ground waters.

Infrastructures will allow any potential water resource exploitation through considerable investments and the raise of systemic fixed costs, that is invested capital renewal and maintenance. These costs, also if perceived as a burden, will be inevitably borne by future generations. That is why a financial and economical sustainability should be achieved, so that invested capital funding, management and renewal costs are fully borne by generations benefiting from their relevant advantages. This ideal target can be approached striking a balance between the fulfilment of the above-mentioned environmental goals and below-stated ethical ones, that is, on one hand aligning rates to such a level as to initially cover at least management and amortisation fees, while on the other hand restraining the growth rate of the capital assets as far as water services are concerned. The more the rates get closer to marginal costs, externalities included, the more efficient will be the allocation of resources.

Social and ethical sustainability: this definition implies a series of concepts explained as follows. Water demand corresponding to fixed rate must be fully met. However, as to water civil usage, water is to be regarded as a necessity, so each fundamental need ought to be met at affordable economic conditions, avoiding the concept of water as a luxury good. The above-stated principle, that makes recipients bearing relevant service fees, might penalise some areas because of their higher rates; therefore the principle of infra-generation equity must be satisfied involving a fair national solidarity bond among individuals, water supply services and geographical areas. Therefore, a balance must be drawn between financial independence requirements and the fulfilment of demands, discouraging dissipative settling and manufacturing patterns.

Operational targets are broken down as follows:
Reducing leakages in conveyance, storage and distribution systems. This objective requires the following steps:

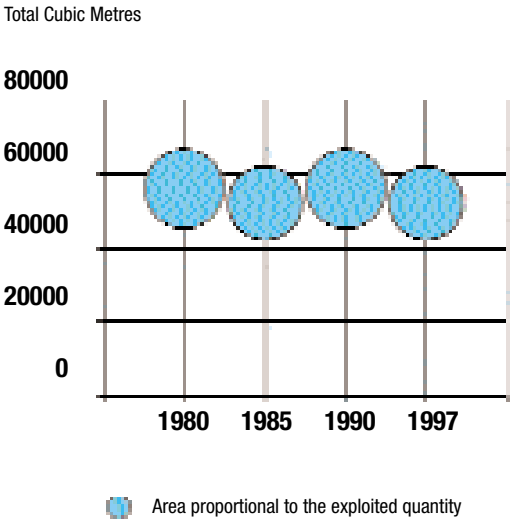
Figure 10
The water quality of large rivers (EU HL6): Nitrogen and phosphor concentrations



Note: reference year average values:
Total amount of nitrogen = 6.8 mg/l
Total amount of phosphor = 0.21 mg/l

Source: Ambiente Italia Research Institute, 2001.

Figure 11
The use of surface and underground water in taly (EU HL 10)



Source: National Environmental Protection Agency, 2001.

- the census of existing supplying sites and related abstraction measurement;
- the provision of more efficient control and monitoring systems (that is video-surveillance);
- a rationalisation and optimisation of water systems management, notably total-use tanks, through computing model tools;
- ordinary maintenance of the existing networks;
- the partially wide reconstruction of water distribution systems, particularly in the civil sector.

This objective is prescribed by several laws, Act 36/94 and Legislative Decree 152/99, but none of them can impose sanctions on governing authorities. However, an economic disincentive is needed, since present water duct leakages represent a stronger priority than that one of water waste.

Reduction of final consumptions. It is a priority in the agricultural sector, the most water-demanding, and this goal calls for the following measures:

- an input for the re-naturalisation of soil interventions, taking into account the territorial characteristics;
- changing to lower water demanding crops;
- the improvement of the irrigation techniques;
- the application of detection, monitoring, forecasting and management systems computing model in order to ensure an optimised use of resources, that is the right quantity at the right time;
- new data on the real use of water resources;
- the modernisation of irrigation networks;
- the imposition, at an agricultural policy level, of restrictions and disincentives, or, vice-versa, the provision of economical, financial and organisational incentives, such as access to markets, information, etc.;
- the need to impose a pattern of rates based on the amount of water actually used.

Both civil and industrial sectors need incentives to promote the installation of low consumption equipments and to influence the behaviours of individuals, families and enterprises, also through informative and promotional campaigns. A useful tool would be a meter installation in each residential unit to record the consumtions. Industrial sector needs the promotion of interior recycling manufacturing processes. To this end, Act 36/94 and Law Decree 36/99 supply the needed provisions. Moreover, the cost of rates play a key role so their revision would be an effective disincentive tool. Furthermore, a more rational water resource exploitation must be promoted by backing the introduction and spreading of Best Available Techniques; incentives to recycle water in all the stages of manufacturing processes; the reuse of valley conveyed waters and the return of sewage waters featuring same qualitative characteristics as the exploited waters.

Legislative Decree 152/99 envisages the revision of concessions based on the integrated comparative assessment of different options; “integrated” means that different aspects, technical-engineering, economic, environmental, cultural and socio-economic, must be jointly taken into account. Contracting-out specifications are to be enforced and carefully monitored, providing potentially affected citizens with legal binding warranties.

Sewage water reuse. It is fundamental for agricultural use, since it returns natural resources to the environment or to other potential use, restraining also tertiary disinfecting treatments, thus avoiding nitrate and phosphor purification treatments, with a strong reduction of economic relevant costs, energy and /or territory saving, in terms of impregnated areas. Sewage waters, used for irrigation purposes, can feature high concentrations of nutrients preventing the use of synthesized fertilisers so as to restore bio-geo-chemical cycles. Moreover, industrial reuse can be increased according to Legislative Decree 152/99. Its provisions promote the reuse through revisions of concessions, that is “not to use river and strata water, but to recycle the available sewage waters”. To this end, the maximum length of irrigation diversion concessions must be revised, being the most numerous ones, drinking use included, so as to allow a better planning of irrigation. A public financial commitment is needed to bear the costs of purified sewage water distribution facilities; however in some cases, notably in water-demanding industrial districts, voluntary agreements have proved to be most useful and beneficial.

Reducing the polluting pressure. This objective implies infrastructure actions, new purification systems, with the improvement and replacement of the existing ones and ,in particular, of the managerial actions, that is the improvement of the functionality of industrial plants. Infrastructure actions must aim at the following targets: equipping the largest municipalities with purification plants; updating the inadequate treatments of the small villages or equipping them with suitable ones if needed; reduce the excessive urban suburbs sewage-collection costs; endowing tourist resorts with purification/treatment systems. Most of these cases will require low-cost high-Eco-compatibility treatments such as phyto-purification. The major problems for the industrial sector affect southern Italy, notably food industries. Managerial actions must envisage the selection of qualified governing authorities, increased surveillance and vocational training.

Act 36/94 and the Legislative Decree 152/99 will represent the need for regulatory instruments. Notably the Protection Plan, envisaged by Legislative Decree 152/99, must emphasise those water resources who fail to comply with the set quality objectives, pointing out the needed interventions. Discharging top limits can be more restrictive according to their potential impact. This Plan must affect the whole basin, reducing polluting loads, setting diversions for minimum vital down flows, exploiting land buffer abilities such as changes in the use of soils, hedges, tree rows, grass belts spreading, as well as the self-purification capability of streams such as the re-naturalisation, the introduction of protected river-bed and surrounding areas, resorting to major works, but also to prescriptions and incentives.

The use of modelling instruments is needed to quantify the underlying cause-effect links; for this purpose the collection of quality and quantity data shall be rearranged. The Safeguard Plan shall link up any concerned party such as Optimal Territorial Domain Authorities and the corporate that manages civil loads, but also those who control the industrial and agricultural loads: enterprises, field associations, development corporations, remediation and irrigation consortia, regional offices, etc. As to purification mud, their high disposal costs have already restrained them. However, their solution to reduce production is still unknown and their market has not been yet sufficiently developed.

The extension of many civil and industrial purification plants could be carried out through valley-based phyto-purification mud-free refining systems. The separation of waste-water collection systems, by preventing the flow of first rain waters and featuring high concentrations of heavy metals, will allow the creation and development of better-quality mud for agricultural reuse.

Improvement of both the network and the management of meteoric waters in the urban areas. Legislative Decree 152/99 envisages that Regions must impose new settlements for separate collection networks; therefore Regional Management Plans and building regulations must implement this directive by promoting the gradual replacement of existing hybrid systems with separate ones and the wide use of storage and treatment facilities for first-rain waters, with the function of re-naturalising urban water ducts. In view of high replacement costs, there is a need for incentive mechanisms and public subsidies.

The coverage of total costs. Galli Act has started with a process of rate adjustment to long-term costs, which at present is still under way, especially concerning sewage and purification. The achievement of the transformation of the present management system - reducing the present 13,000 governance bodies to about 80-100 as expected by the Optimal Territorial Domains - is a prerequisite to contain the rate increases in the most-disadvantaged areas. However, the reform implementation delays have also postponed a rate-to-cost adjustment. At the same time, rate regulations are forced to fluctuate between a short-term policy and restrained incentive potentials (Inter-Ministerial Committee for Economic Planning) and a long-term "standardised rate method", strongly criticised for its weak incentive mechanisms. However, the completion of the Optimal Territorial Domain Authority must no-longer delay this strategy or the rapid implementation of a rate-to-cost adjustment - covering also investments - as well as of a consistent and effective economical-financial regulation system increasing the sector's efficiency.

However, basic ethical and social sustainability target needs an outspoken transparent rate adjustment, apparently following two paths conflicting each others. On one side the 1998's LLPP guidelines aiming at reducing the national differences of Optimal Management Areas through cross-territorial area equalizing mechanisms such as those envisaged in France for *"les Agences de l'eau"*, that is rate environmental additional levies to fund ad Hoc projects for most-disadvantaged areas, especially intended for southern Italy featuring a chronic infrastructure delay; on the other side allowing the rate differentiation within the same Optimal Territorial Domain too so as to promote even and smaller rate-zones.

From a microeconomic point of view, a two-fold solution is to be chosen, that is setting a fixed share, so as to cover concession rights, and a variable one, more than proportional to consumption.

Accessibility. Present social rate bracket privileges the first consumption units regardless of the user conditions thus subsidising the poor and the well-off consumers. Therefore more selective equalising measures ought to be adopted.

Artificiality reduction. Galli Act and almost every regional implementation Act allocate the needed new financing to local authorities through the Domain Plan; governing authorities, entrusted with the selected plan execution, will charge this cost and relevant financial fees on their rates. This mechanism promotes the realisation of new plans, since their costs do not affect the operator, discouraging investments to improve the use of resources on the existing facilities, since these fees would be paid by the management body itself. Howev-

er, governing authorities should partially bear the costs of new investments, rather than automatically charging them on rates, and be entrusted on the periodical reports of investment programmes and relevant financial and rate schedules, since Optimal Territorial Domain Authorities Plan is to be regarded as a long-term strategic plan. The implementation of these principles, acknowledged by 2002's Finance Act on utility tenders (Article 35, 1st paragraph), will call for modifications to Act 36/94 and to the Ministerial Decree dated November 22nd, 2001.

Fulfilment of demand and reliability of services. The monitoring of contracts and service cards, entrusted to an ad Hoc authority (replacing the present Surveillance Committee that was lacking both in autonomy and power), must be associated with a benchmark of efficacy and efficiency standard of services. As far as non-civil use is concerned, the fulfilment of demand must be managed according to their compatibility with the existing resources and the sector policies.

Legislative harmonisation. Numerous sometimes uneven rules, often worked out in different incoherent contexts, have so far disciplined water resources; moreover their implementation provisions did not match the expectations. The unstable reference framework and the deregulation of public services demand further technical and entrepreneurial contributions. The tool of consolidation acts can play an effective role in legislative harmonisation and updating.

Pro-active attitudes. The involvement of the competent parties needs a system of sanctions that can clearly and efficiently detect transgressors of dumping rules, thus avoiding a useless deterrence.

Production-consumption cycles

OECD has recently focused its attention on the integration of environmental costs in the final cost of products, along their whole lifetime (LCC, Life Cycle Cost). Therefore, it is required that product and management costs are to be taken into account, such as energy consumption, spare parts, needed quantity per single operation, along with disposal expenses. Moreover, OECD has also started an ad Hoc "Sustainable Consumption and Production" programme, setting a priority target, that is the purchasing and use of low environmental impact goods and services by the public administration (Green Procurement or Green Public Purchasing). Therefore, every country has to come to terms with two conflicting requirements: complying with newly-introduced product purchasing criteria without violating international market rules, with specific regards to the free trade of goods. Several countries have already or are in the process of integrating environmental requirements among their Public Administration product selection criteria; purchase managers are being equipped with a comprehensive lists of reference and performance parameters for each single product as well as peculiar environmental data assigning additional points to ad Hoc environmentally-certified products, featuring Ecolabel, EMAS and/or ISO 14000 qualifications.

Recently, the International Standardisation Organisation has set up an ad Hoc working group on an environmental aware design of products (Design for Environment, DFE) issuing guidelines on this matter. From its outset, the DFE procedure might be regarded as *a product management system*.

As to fiscal levy use, OECD data highlight that environmental taxation ranges from 3.8% to 11.2%, while its average value stands at 7% out of overall fiscal levies. The remaining share is made up by 35% direct taxes, 32% excise revenue duties and 25% social security contributions. OECD country's environmental taxes account for 1%-4.5% of their GDP. However, the following general considerations arise from this overall picture:

- lack of information on energy and material flows as well as on the impact of both products and services;
- qualitative and quantitative information gap on public administration consumption and the purchasing procedures of different authorities, especially at local level;
- insufficient information on the environmental patrimony of consumers and service consumption habits.

Generaly speaking, the consumption of Italian families show a gradual shift from goods to advanced services, paying much attention to the ratio between costs and benefits. As to Public Administration consumption, the available data estimate the GDP public expenses share at about 18%; while it can be assumed that, according to experiences in other EU countries, public administration running costs account for a 50% of the overall expenses, that is PA energy consumption and operating services such as cleaning and maintenance. However, the implementation of the environmental policy for the public administration starts with the purchase and a correct use of products and services featuring a low environmental impact.

The Sixth EU Environmental Action Programme defines as a priority the approach to an integrated product policy based on the analysis of the lifecycles. This approach proves to be basic to meet targets such as a sustainable use of resources and cuts on the waste generation. The Sixth Plan is supported by a series of Directives concerning specific product categories such as motor-vehicles and trucks, petrol and fuels, packaging, batteries, detergents, building materials and crops.

In 1999, the EU Ministries of the Environment entrusted the Commission with the task of drafting a Green Paper on the development of an integrated product policy, approved in February 2001. The Green Paper emphasizes the need to support an Integrated Product Policy with the following three basic steps:

- issuing correct prices including environmental externalities;
- stimulating the demand of green products;
- strengthening the most eco-compatible productions.

Every above-mentioned general objective entails a range of possible actions and tools. After having consulted each competent party in 2001, the European Union is planning to publish its IPP White Paper in late 2002.

Among the Italian political initiatives promoting products featuring a low environmental impact, great importance must be attached to the legislative implementation of EU directives on fuels for unleaded motor-vehicles, due to the introduction of a differentiated taxation.

Moreover, also the following initiatives are worth mentioning: the promotion of motor-vehicles that respect the given emission levels; National Packaging Consortium (CONAI), production line consortia and co-operatives; the introduction of the Carbon Tax; the set up of a National Waste Observatory and Register; plan agreements with some industrial groups and trade associations (such as FIAT, Montedison, Pirelli and Transport Federation, Farmers Federation, Italian Agricultural Confederation and Italian Craft Confederation) in order to introduce or develop Ecolabel products, services or practices.

In Italy Ecolabel became operational only in 1997. Analysis on this delay have pointed out the inertia of the productive system, scepticism regarding the label's commercial value, difficulties in co-ordinating production, commerce, consumption and institutions. Therefore an officially-designated subject must be found, beyond the interests of the concerned parties, catalysing Ecolabel promotion and diffusion actions.

SMEs showed much interest in Ecolabel because, unlike corporates that can afford the mass-media promotion of their products, they could significantly benefit from the introduction of Ecolabel, since this tool can help them to reach potential consumers.

Priorities, objectives and actions

A basic sustainable product policy task requires the internalisation of the environmental impacts in the cost of products in compliance with different methodologies, presently being worked out, ranging from Swedish *EPS* to EU *ExternE*, this latter concerning energy costs. However this implies an in-depth knowledge of the product's lifecycle environmental impact so as to evaluate its related material flow and at the same time their harmful environmental effects. The most common internalisation method implies a fiscal charge shift for enterprises– since this is usually charged on the final costs of products - including manpower, energy and raw material expenses.

Furthermore, consumer-target campaigns can affect habits and improve environmental knowledge so as to steer choices towards lower polluting products. Economic sectors such as tourism and hotel industries bear peculiar responsibilities so that they may much contribute to the introduction of new behaviours, to be later followed by families themselves.

Some other product policy implementation tools are Eco-labelling, a market promotion for products with a lower environmental impact, public administration commitment in enlisting environmental requirements among required characteristics of selected products and services (Green Public Purchasing) within EU-set rules.

Aims and targets to be achieved in five years are:

- within the public administration (GPP) at least 30% of the purchased goods must meet the ecological requirements;
- taking into account replacements and resorting to scrapping mechanisms, between 30% - 40% of durable goods must be low energy consumption items;
- enterprises must apply environmental accounting to products. Along this line ISO 14000 is developing type three Ecolabels.

The framework of policies and measures for the consumption and production along with the adoption of global quality principles are extremely complex and can be broken down into the following steps:

Outlining a background knowledge through:
- a data bank on the energy and the material flows of the main national products;
- a detailed analysis of the public administration consumption and purchasing procedures, reporting differences between central and local authorities;
- periodic studies on consumer habits, and on the consumer attitudes regarding environmental legislation comprehension and evaluation attitudes.

The promotion of supply. The "Consumer Public Administration" must be regarded as the most important purchaser and user of low-impact goods (GPP). This entails the modification of the public administration service and item purchasing specifications, by enlisting environmental requirements, obeying to the EU rules; the best way would envisage a marking system by assigning a specific value to the environmental performances of products, but not automatically excluding environmentally-uncertified items.

Designing fiscal actions and incentives for enterprises that alter the retail prices of products, favouring products with a lower impact.

Working out technical instruments to be supplied to enterprises, especially SMEs, in order to ease their LCA and DFE widespread introduction through streamlined methodologies, while setting up sector data banks gathering information on the environmental performance of processes and products, without excluding those who do not possess these qualifications.

Promotion of demand through consumer-targeted information and training actions by means of awareness campaigns, involving the active participation of distribution systems and consumer associations, - i.e. purchase and use guidance booklets. Moreover, long-term training initiatives should be envisaged for schools.

Waste

Waste represents the final stage of the economic process. The material balance of 1998, as an example, showed that the material input in the national production-consumption system amounts to 863 Mt (Wuppertal Institut). The output of carbon in GHG emissions amounted to 150 Mt; 20 Mt further materials contributed to gas emissions. The solid and liquid material output, that is waste, amounted to about 100 Mt, of which urban waste accounted for 27 Mt and special waste for 68 Mt. 150 Mt are exploited by the socio-economic system, in addition to building materials. Our economy's overall material processing yield, with the exclusion of recycling and reuse processes, amounts to 68%, but excluding building materials, it lowers to 37%.

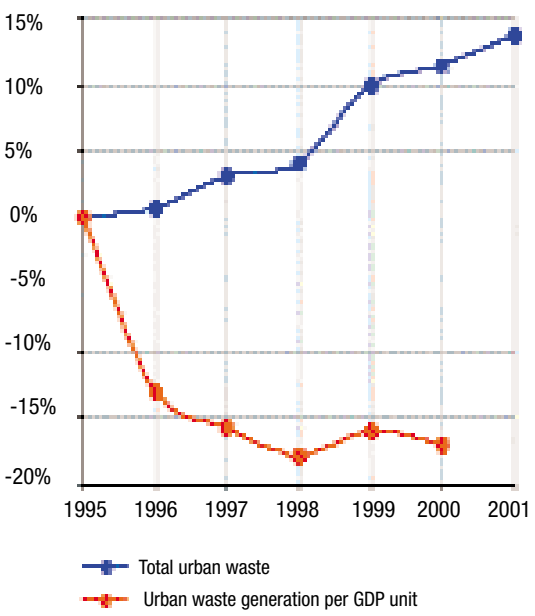
Urban waste. The estimates of the National Waste Observatory for 2001 have foreseen an overall urban waste production amounting to above 29 Mt with 508 kg per capita, showing a 14% increase as compared to 1995. The separate collection stood at 16.9%, that is 27% in the North, 14% in the Centre and less than 5% in the South, showing a 20% yearly average increase. Over 7% of the urban waste is being exploited for energy production. About 71% of the urban waste has been disposed through landfills. The 1999 data show a material recycling share amounting to 18.4% (National Environmental Protection Agency and National Waste Observatory). The 1999 survey has pointed out 41 licensed operational incinerators, 28 of which placed in the North, 10 in the Centre and 3 in the South, ensuring a global potential of 3 Mt, of which 79% in the North, 13% in the Centre and 8% in the South. The same survey had singled out 786 operational landfills, greatly differing from one geographical area to the other, that is 571 plants in the South, establishing a negative record, followed by 137 plants in the North and 78 in the Centre.

Special waste. The regular collection of data on the special waste from industrial and service activities started in 1997 but it still requires further administrative and regulatory initiatives to consolidate its procedure. Special waste generation records go back to 1998, when they accounted for about 68 Mt, including almost 4 Mt of dangerous waste. Therefore, overall waste generation raised by 11% as compared to 1997 data, while special hazardous waste only increased by less than 5%. However, 65% special waste generation concentrates in the North, where most Italian industries operate. In 1998, special waste recovery share stood at 42%.

Urban waste is increasing at a lower pace than GDP rate; at present special and overall waste data are insufficient to compile a comprehensive statistics. The drop of the intensity index, that is urban waste generation per GDP unit, shows a de-coupling, although a slight one, between economic growth and waste generation over the 1995-2001 period. This phenomenon can be carefully evaluated as a positive trend (see figure 12).

Waste management shows inconsistent features in different Italian areas. Critical circumstances can be detected in the following issues: the lack of training for administrators and garbage collectors; ecological downstream framing delays, especially in the South; the insufficiency and inconsistency of plants for energy recovery;

Figure 12
Italian urban waste intensity and generation (EU HL 8)



Note: reference year values.
Total urban waste: 25 Mt
Urban waste generation per GDP unit= 0.03 kg/euro

Sources: National Environmental Protection Agency and National Waste Observatory, 2001.

management fragmentation; delays in the achievement of the Optimal Territorial Domains; the introduction of a short-term and low-cost system of urban sanitation tenders; a slow application of the rate pattern; the insufficiency of monitoring and control activities; administrative and procedural complications; inadequate informative and awareness campaigns; weak application of the instruments for a democratic participation. Moreover, another phenomenon to be restrained is represented by organised criminality's illegal waste carriage and disposal, especially affecting the South and the islands. Four southern regions are still under emergency state, in spite of important operational processes, the management-support administrative scheme still needs further improvements.

The extreme fragmentation of the waste system is delaying in its consistent industrialisation process. In this scenario, private funds do not find the needed profits, so the integration of waste cycle into the economic system proves to be insufficient. A contribution for the management of the industrial sector might be brought about by a reform currently under parliamentary scrutiny of local public services. A further contribution can result from the introduction of a streamlined licensing system, administrative and bureaucratic management, reference regulation and revision process.

Priorities, objectives and actions

The overall waste quantity needs to be restrained also through incentives for suitable prevention initiatives; waste generation must be de-coupled from economic growth, applying sustainable production and consumption patterns and increasing the efficiency in the use of resources. Waste management must comply with every concerned party's shared liability principles. However, it is necessary to intervene in the designing and manufacturing stages of goods to reduce their hazards for man and the environment along with their whole lifecycle.

The EU 2000-2010 Sixth Environmental Action Plan sets, as a waste sector priority, a sensible reduction of its quantity and dangerousness. For this purpose, adequate actions have been envisaged to affect the manufacturing process of goods. As to waste management, EU Directives 91/156, 91/689 and 94/62 place waste disposal in a secondary position, while stressing the priority for recycling activities, material and energy recoveries.

The Italian government has implemented EU guidelines with the Legislative Decree 22/97. Thereafter, waste management is defined as the overall waste collection, carriage, recovery and disposal, the monitoring activities, the surveillance of landfills and shut-down disposal plants. Legislative Decree prescribes the achievement of minimum separate collection targets in the Optimal Management Areas, mainly corresponding to provincial territories. Moreover, from an organisational point of view, in each optimal territorial domain's municipality, keeping urban waste monopoly, suitable co-operation and co-ordination procedures must be ensured in order to rationalise waste management. Legislative Decree 22/97 introduces urban waste rate so as to ease this process. Regions are entrusted with the need to promulgate the drafting management plan. However regional and local administrations were given few strategic objectives concerning waste cycle management and rationalisation, the redressing of territorial imbalances, the technological innovation of the industrial system, bureaucratic streamlining and the reduction of the impact of the criminal activities.

Recycling and recovery activities are ruled by the ad Hoc streamlining of licensing administrative procedures. The increasing use of voluntary agreements can greatly contribute to the strengthening of recycling and recovery

activities, through suitable incentives especially devised to spread the application of such tool. Packagings are separately ruled; such ad Hoc regulation restates EU recycling and recovery targets for waste packaging, expressly setting a National Consortium for Packaging to run these activities. The 1998 Italian Act, implementing the EEC Directive 157/91, introduced a Compulsory Consortium of Lead Waste and Exhausted Lead Batteries ensuring the collection, carriage and recycling of exhausted batteries through syndicated plants.

Reduction of waste quantity and hazardousness. Specific targets pointed out by the Strategy for Redressing the Industrial Sector, later transcribed into Regional Operational Plans and DOCUP worked out by regions in order to exploit EU Structural Funds over the 2000-2006 planning period, can be still considered a viable drafting that allows a wide application of prevention principles finalised to check and improve the environmental standards of products as far as waste generation is concerned through the following steps:

- introducing environmental management schemes within industrial processes and services (environmental certification);
- modifying process technologies to reduce waste generation;
- issuing regulatory, administrative and financial instruments finalised to reduce waste generation;
- reforming product environmental performance, alongside process one, enhancing the recycling and recovery potentials of waste materials or their components.

The waste generation reduction objectives, whose quantitative targets are quite difficult to define as a result of rapid field transformation, imply a halt to waste increase at least, through the following tools:

- the application and circulation within enterprises of regulatory tools and environmental standard certifications, supporting and encouraging a network of small and medium sized enterprises (IPPC, EMAS and ISO 14000);
- a gradual introduction of urban waste rates, proportional to generated waste, in order to meet a two-fold target: affecting the behaviour of citizens and business users while ensuring transparency of costs of the management service referred to each single task;
- packaging makers and users lifelong product liability/accountability.

The reduction of risks is essentially based on the replacement of hazardous products and compounds, through the introduction in the industrial process of the best available techniques.

Material recovery. Recovery strategies make use of the optimisation of urban waste collection systems. These prove to be effective from a technical, economical, environmental and waste recovery and recycling and market development point of view. In order to develop it properly, the following stages must be improved: collection and industrial recovery systems, a market for recovered waste materials and products, through actions as follows:

- specifying separate collection minimum targets up to 35% by 2003;
- streamlining procedures oriented towards material recovery;
- internalising recycling and disposal costs into the price of products;
- exploiting fiscal levies to discourage the use of landfills and adjust the unit cost to the treatment one;
- achieving waste packaging targets as stated by Directive 62/94 and its subsequent revisions, that is 50%-65% weight to be recovered as material or energy within the first stage, 25%-45% weight to be recycled and 15% weight to be recycled for every packaging material;
- using innovative treatment technologies to make qualitative materials at competitive prices;
- supporting markets of recycled materials;
- defining suitable standards to ensure qualitative compost production.

Energy recovery. The fulfilment of this aim must be encouraged through streamlined procedures such as the use of Waste-Derived Fuel and green certifications. This managerial procedure can substantially restrain the overall impact of this sector. Therefore its promotion must be backed so as to ensure first a technological development curtailing environmental impact at most while increasing power recovery efficiency too, and secondly supply an administrative and economic support to the creation of new modern plants for the energetic recovery of waste.

Landfill disposals. It is ruled by Directive 31/99 reforming its mechanisms to reduce and prevent negative environment and human health rebounds during the operational and post-operational management activity of landfills. This Directive, whose national legal implementation is under way, prescribes for member states a urban biodegradable waste landfill disposal cut in compliance with the following targets: by 2006 up to 75% weight as compared to 1995; by 2009 up to 50% and by 2016 up to 35%.

Table 8 Objectives, indicators, targets and actions for the sustainable use of natural resources

OVERALL OBJECTIVES	SPECIFIC OBJECTIVES
Reduction of resources exploitation without affecting the quality of life	Improvement of the efficiency of the production/consumption model (eco efficiency); Reform of the fiscal policy, in terms of ecology, towards resources exploitation; Introduction of external costs (environmental and not) within the overall price of raw materials, products of the main production/consumption systems and construction projects; Progressive shifting from the sale of consumption goods to equivalent services; Application of indicators for material flows and material inputs for the evaluation of economic policies.
	Steering citizens consumption and PA purchasing models towards goods and services with minimum use of materials.
	A new legal framework for town planning and building towards the maintenance and the re-use of the territory and building heritage.
Preservation and restoration of water resources	Reduction of loss in the agricultural and civil sector.
	Reduction of consumption.
	Reuse, substitution of spring water quota with agricultural and industrial waste water; A better real time management of withdrawals, accumulation, adduction and distribution; Promotion of recovery interventions in wet areas, river banks, hedges and tree rows.
Improvement of the quality of water resources	Reduction of the civil and industrial load to natural water.
	Improvement of the purification skills in the civil and industrial sector.
	Improvement of the reliability of the depuration in the civil and industrial sector.
	Improvement of the network of dump collection in the civil and industrial sector.
	Reduction of mud delivered to waste disposal sites in the civil and industrial sector.
	Reduction of fertilizers and control agents in the agricultural sector.
	Improvement of self depuration skills of the territory; Improvement of the sewage system management; Reuse of sewage sludge.
Sustainable management of water resources production/consumption system	Protection, improvement and restoration of all water resources.
	Protection, improvement and restoration of all underground water basins ensuring a balance between the extraction and the induced recharge of aquifer.
	Reduction of the accumulation of closed-end fund.
	Covering costs; Establishment of smoothing methodologies also independent to OTD (Optimal Territorial Domain) dimensions; Promotion of water saving, recycling and reuse.
	Adoption of a tariff based on the marginal cost in the civil, industrial and agricultural sector.
	Demand satisfaction.
	Accessibility of a proper equipment for a fair price in the civil sector.
	Reliability of supplies in the civil sector.
	Equity (reduction of the tariff difference between disadvantaged areas and not).
	Fiscal federalism.
	Transparency of equal distribution mechanisms in the civil and industrial sector.

INDICATORS	TARGETS
Total Material Requirement (TMR) eventually linked to GDP as a general indicator for the dematerialization of the economy; Environmental space (as a pro capita resource); Ecological footprint; Material Input Per Unit Service (MIPS).	Material Flows: -25% by 2010; -75% by 2030 (*factor 4*); -90% by 2050 (*factor 10*); Within PAs, at least the 30% of purchases shall match ecological requirements; 30-40% of durable goods with reduced energy consumption.
Percentage difference between withdrawal and use.	
Consumption per GDP unit; Consumption pro capita.	
Percentage of covered demands with waste water.	
Effective BOD/Acceptable BOD within the Protection Plan.	
Percentage of civil and industrial population covered.	
Percentage of control activities which reveal the exceeding of threshold established by the Protection Plan.	
Percentage of separated networks.	
Sludge per served inhabitant; Sludge per industrial GDP unit.	
Annual consumption (per hectare and total) per toxicity level.	
Extension of the territory able to manage the loads.	
Percentage of those surface water basins classified with “good” and “very good” state (according with the notice of the Attachment V of the Directive 00/60/EC).	Achievement of a good state of surface water for all water basins by 2015.
Closed-end fund per unit of sold water.	
Percentage of coverings induced by the tariff (as distributed in OTD), by the extra OTD compensation, by transfers from State to Regions.	
(marginal cost - tariff) / tariff x100.	
Water supplied/need; Deficit of the soil humidity with respect to the optimal level.	
Percentage of the family income spent to cover the costs of essential needs.	
Days off services.	
Difference between the maximum and the minimum tariff at national level.	
Percentage of the cost of the service covered by the tariff or by transfers of the Region.	
Classification of equal distribution methodologies	

Indicators. Legislative Decree 22/97 entrusts waste monitoring to the National Waste Observatory, co-operating with the National Environmental Protection Agency, to check generated waste flows, recycling and recovery up to their end disposal. The National Waste Observatory and the National Environmental Protection Agency publish reports on urban waste, packaging, waste packaging and special waste. Waste cycle assessment and analysis indicators are mainly economical as follows: waste system management and investment costs, power recovery and material recycling economic returns/profits, waste category recycling and power recovery economical efficiency, industrial sector waste generation per worker.

Administrative action, ensuring waste management system efficiency and efficacy, must be pivoted to outline managerial and organisational models and executions both at a regional and a local level, such as the Regional Waste Management Plan, the delimitation of Optimal Management Areas, the issuance of local administration joint co-operation regulatory provisions, etc. Improving the operational capacity of Public administrations is necessary, so much in its integrated cycle management and planning stages as in its surveillance and monitoring stages, so as to overcome some existing regulation limits by promoting voluntary agreements and increased awareness of the operators. The participation to the decision-making processes and valuable target-sharing tools such as local Agenda 21 can experiment patterns

Table 9 Objectives, indicators, targets and actions for a sustainable management of waste

GENERAL OBJECTIVES	SPECIFIC OBJECTIVES
Reduction of production, recovery of materials and energy from waste	Reduction of urban waste production.
	Reduction of special waste production.
	Reduction of dangerous waste.
	Recovery of materials and recycling of urban waste.
	Recovery of materials and recycling of special waste dangerous and not.
	Recovery of energy from waste.
	The environmental and sanitary safety of waste disposal sites and the reduction of the amount of waste disposed.

of involvement of citizens and operators in the sustainable waste management through the integrated management of the waste cycle. Although the share of households waste is not the highest, the aware participation of citizens has proved to be basic in steering consumption and this in turn has brought about a choice of lower-waste manufacturing patterns. In many cases eco-efficient material use and waste management culture spreads throughout schools and families.

INDICATORS	TARGETS
Total production; Pro capita production; Production/GDP unit.	
Total production; Pro capita production; Production/GDP unit.	
Total production; Dangerous waste/total waste.	Reduction of dangerous waste with regards to 2000 data: -20% by 2010; -50% by 2020.
Separately collected fractions (SCF); SCF pro capita; Amount of each single fractions from SCF; Mass concentration of SCF versus the whole production; Amount of total material recovered; Amount of material recovered per each single fraction; Mass concentration of waste sent to recovery.	SCF objectives: a new directive on packaging is under discussion; Objectives related to packaging materials for 2003: Recovery 45-65%; Recycling 25-45%; 15% recycled of each single material.
Total amount of material recovered; Mass concentration of waste sent to recovery versus the whole production; Amount of recovered material/production sector.	Increase by 50% the amount of fractions recovered.
Electric energy produced from waste; Thermic energy produced from waste (CDR); Amount of incinerated waste and contained calories; Production and use of CDR.	Doubling of the amount sent out for energy recovering by 2006.
Amount of disposed waste in sites/total amount of waste.	Reduction of the biodegradable materials stored with regards to 1995 data: -25% by 2006; -50% by 2009; -65% by 2016. Waste appointed to the final disposal with regards to 2000 data: -20% by 2010; -50% by 2050.

Monitoring the environmental action for sustainable development

The early effectiveness of this Strategy will depend on the efficiency of the ordinary and extraordinary monitoring procedures. In order to modify and to adapt the Strategy objectives, a strong participation and a concertation institutional framework is required among all interested bodies and authorities. Nowadays, there are many complex and relevant balancing phenomena between environment and development. As a result, monitoring actions towards sustainable development are conducted by means of a certain number of indicators, both general and specific. The Strategy itself contains the whole list of thematic indicators that describe all environmental processes relevant for sustainable development.

Sustainable development implies the integration of environmental strategies with social and economic ones. Göthenburg's European Council (2001) has worked out the institutional aspects of such integration, setting convergence modalities of processes related to three subject areas of sustainability, started with the new Sixth Environmental Action Plan (Helsinki, 1999), with the promotion of processes of sectoral integration (Cardiff, 1998) and with the Structural Plan of Social and Economic Development (Lisbon, 2000). The European strategy is pivoted to the principle that social, economic and environmental effects of each policy must be analysed in a coordinated way and considered in decision-making processes so that the three dimensions of sustainable development are equally measured and appropriately reflected.

The European Council of Göthenburg asked the European Commission to evaluate each year the implementation state of the overall strategy for sustainable development. This assessment procedure has first been undertaken through EC briefing report to the Barcelona Council in Spring 2002. For evaluation purposes, the Council considered essential to resort to socio-economic structural indicators associated with key environmental indicators. The key environmental indicators of the European Council, stated in table 10, represent the uttermost environmental action criticalities and priorities of each country, developed according to the four main sustainable development action categories: climate change, transport, health and use of resources.

According to the decisions agreed at the Council of Barcelona 2002, the list of main environmental indicators must be further enlarged. In December 2001, the Council of European Ministers of the Environment has invited Member States to develop further indicators, within the list of indicators to be worked out and adopted by the Council, related to the health sector, with a particular emphasis on chemical products, to the sustainable management of natural resources particularly concerning water, to both water and land biodiversity and to the sustainable use of resources (see table 11).

The key environmental indicators of the shortlist (see table 10) and the core set (see table 11) must provide a brief, clear-cut overall picture of the European sustainability state on environmental issues and allow benchmarking. Although the first selected key indicators will undergo regular revisions and completions, also according to new available data, the Italian strategy must be monitored in a homogenous and coherent way by using the same indicators. Moreover, this choice will ease the yearly Italian reporting of the domestic sustainability state to the European Commission. Therefore, the indicators of the European Council are included among the list of indicators of the Italian Strategy.

Furthermore, the Italian Strategy associates to each environmental quality indicator targets and timing, whenever feasible. The same indicators must address in the future impact evaluations on sustainability implied by strategic and programmatic proposals. However, special attention and further developments will regard health and more general standard indicators, concerning the quality of life and employment issues.

The driving element for sustainability and for the definition of targets is essentially a decoupling trend between economic growth and pressure on natural resources and on the environment, especially in agriculture, energy and transport sectors. The specific indexes on the pressure of economic activities, in terms of material, soil, energy, water, resources, waste production per units of economic wealth, of added value or per capita, must reduce their growth rate (partial decoupling) and finally stabilize or decrease (absolute decoupling). These trends can be monitored through their comparison with the historical series of indicators, set according to the objectives and the timing.

Adequate technical and financial resources must be allocated to activities and studies to monitor and check sustainability, thus implementing European Council guidelines for member states. These resources will ensure the development of common assessment tools, models and methods and their continuous and long lasting revision, paying great attention to the quality of observation methods of the required data, to territorial and regional differentials and to the analytic methods for the elaboration of indicators.

A particularly important role will be assigned to communication and information in order to guarantee transparency and ensure a wide aware participation to the decision-making processes.

A leading role must be played by the new technologies which allow to manage information on-line.

Table 10 List of sustainable development key environmental indicators set by Barcelona's European Council (2002)

COMBATING CLIMATE CHANGE
1 Aggregated emissions of green-house gases (6 gases) in terms of CO_2 equivalents, as compared to Kyoto target
2 Energy intensity of the economy (per GDP unit)
ASSURING A SUSTAINABLE TRANSPORT SYSTEM
3 Volume of freight transport relative to GDP (passengers/km together with goods' ton conveyance) in terms of intensity per GDP unit
4. Transport modal breakdown (passengers/km and tons/km)
TACKLING THREATS TO PUBLIC HEALTH
5. Air quality: exposure of urban population to atmospheric pollution
IMPROVING RESPONSIBLE MANAGEMENT OF NATURAL RESOURCES
6. Collected, landfill-disposed and incinerated urban waste in terms of kg/inhabitant
7. Gross production quota of renewable energy

Table 11 Open list of key environmental indicators set by Barcelona's European Council (2002)*

TO COMBAT CLIMATE CHANGE
GHG emissions (six different gases); sectoral breakdown as compared to GDP (the economy's carbon intensity)
ASSURING A SUSTAINABLE TRANSPORT SYSTEM
Transport volume to GDP ratio (vehicles/km)
Transport modal breakdown (vehicles/km)
Exposure of population to transport-induced high noise
Journeys' average length and distance per person, per mode and per purpose
Transport infrastructure investments per mode (passengers and goods)
Internalisation of external costs
Consumptions of transport fuels
TACKLING THREATS TO PUBLIC HEALTH
Exposure of urban and rural population to atmospheric pollution
Emissions of ozone precursors, particles and SOx
Exposure to toxic chemicals, including pesticides
Consumption of toxic chemicals, pesticides included
IMPROVING RESPONSIBLE MANAGEMENT OF NATURAL RESOURCES
Collected and landfill-disposed urban waste as against GDP
Collected, incinerated, landfill-disposed urban waste (highlighting energy recovery)
Waste prevention
Recycling rate of selected materials (that is glass and paper/cardboard)

* Indicators that the European Council is working on fot improvement.

follow Table 11

Recycling rate of selected materials (including other materials)
Valorisation rate of selected materials
Generated hazardous waste
Fishing sustainability of selected sea species
Concentrations of N and P in rivers
Discharges of polluting agents (fertilizers, organic substances, chemicals) into water courses (pressure indicator)
Drinkable water quality
Water sectoral use
Indicators of resources' productivity or material resources' intensity (GDP as against material resources' overall requirements - according to type of resource)
Use intensity of material resources (as to overall economy)
Biodiversity index
Protected areas (as to biodiversity)
Consumption of pesticides
Organic farming
Nitrogen balance
Evolution in the destination of soils according to main categories, evolution of built areas
Contaminated and eroded areas