SUSTAINABLE DEVELOPMENT AND ENVIRONMENTAL MANAGEMENT

Sustainable Development and Environmental Management

Experiences and Case Studies

Edited by

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PREFACE

This book stems from a four-year experience of a Training Programme addressing members of several Chinese governmental Institutions which, given the moment of extremely intense and fast development of their country, consider the issues of environment and sustainable growth among the foremost priorities.

In particular, they expressed the need and will to develop policy and management tools that could lead to a strategy of sustainable growth from an economic, social and environmental point of view.

The Programme turned out to be a success (it involved, up to June 2007, more than 2000 trainees from almost all the Provinces of China) precisely because the forces that answered those needs are extremely diverse as to include the academia, national and local governments, public institutions, private companies and international agencies. Following this feature, the book's contributors have been selected among more than 300 professors, researchers, policy makers, and entrepreneurs involved in the Training activities, thus offering different approaches to the key questions of environmental management.

The Programme was made possible thanks to the support and commitment of the Italian Ministry for the Environment, Land and Sea, which had started a broad bilateral cooperation programme in China some years ago; the Venice International University, whose peculiar character of international and interdisciplinary association allowed the involvement of experts from a variety of Institutions and countries, and hosted the Chinese trainees in a beautiful location in the Venice lagoon; and the University of Turin, that through its Center of Competence Agroinnova provided its expertise in the agro-environmental field.

The Programme's aim of building capacity in sustainable development and environmental management for the Chinese trainees is contained in this book as it addresses the key aspects of environmental sustainability from the point of view of its policies, economic instruments and social implications, by providing theory and case studies from the authors' different experiences and backgrounds. Water Management, including resources, monitoring and waste water treatment; Air Quality, in terms of monitoring and pollution control; Waste Management, from the point of view of technology and economics; Energy, conceived as efficiency and promotion of renewables; Sustainable Industrial Development, in terms of tools offered by the Industrial Ecology framework; Sustainable Urban Development, based on new perspectives of planning; Agriculture and Natural Resource Management, including ecological, economic and social aspects, with examples of the successful cooperation in China; these are all the aspects that shape the book.

The variety of issues covered and the wide approach used make this book a useful tool for readers with different backgrounds and levels of knowledge on environmental and sustainability sciences.

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We also would like to thank: the Project Management Offices of the Italian Ministry for the Environment, Land and Sea in Beijing and Shanghai; the Chinese Academy of Social Sciences; the State Environmental Protection Administration of China; the Chinese Ministry of Science and Technology; the Environmental Protection Bureaus of the Municipalities of Beijing and Shanghai; Tsinghua University, Beijing; Tongji University, Shanghai and all Chinese trainees.

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M.L. G.

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THE EUROPEAN WAY TO SUSTAINABLE DEVELOPMENT

The integration of the environmental dimension within development strategies, the positive and necessary role of the business community and enterprises in combining economic growth and environmental protection are by now universally known; so much so to hope that we are closer to ending the theory and practice of conflict between environment and development once and for all.

The European Union is consolidating this vision, primarily through new environmental policies, based on "positive actions" rather than on constraints and prohibitions. Such actions enhance the conservation of resources and the protection of the environment considered as a "development engine" and as an "opportunity".

However, to concretize this perspective it is necessary to modify the "culture" and the instruments of traditional environmental policies. The improvement of the economy's environmental performances, technological innovation and the diffusion of new knowledge and skills cannot be obtained as a result of constraints and prohibitions, but as a shared process between public authorities, enterprises, business community and consumers' associations.

To this end, the identification and development of a regulatory framework and market mechanisms, including fiscal ones is highly important. These, in turn, encourage the expansion of best practices and clean technologies for the benefit of businesses and consumers, who choose the environmental sustainability of processes and products as reference criteria.

The European strategy for sustainable development must be reinforced through a determined cross-integration of the environmental dimension in sector policies. The integration between environmental protection and the preservation of natural resources together with Europe's energy security and the sustainable mobility of passengers and freight are particularly important.

However, the European way to policy integration is still long and controversial since national protectionisms withdraw resources from investments for technological innovation which are necessary both to win environmental challenges and to support European economic competitiveness.

At a national level, an innovative process must be started urgently to modify the objectives and instruments of environmental policies. This type of process should be particularly orientated towards supporting – within the European regulatory framework – stimulating measures for the development of best practices and clean technologies for the benefit of public administrations, businesses and consumers who choose environmental sustainability and as reference criteria for the management of resources and for processes and products.

Such characteristics and challenges of the European experience are contained in this book, which has also been prepared for the Chinese public.

China is facing the challenge of an environmental policy oriented towards sustainable development with great decision, in harmony with the forces of business and innovation and without contradiction.

In the year 2000, on the basis of such consideration, the Italian Ministry for the Environment, Land and Sea started a Cooperation Programme involving different Chinese institutions and Universities. Within this Programme several projects were developed. They aimed at monitoring and managing the environment, protecting and preserving natural resources, managing water resources, promoting energy production from waste, developing renewable sources and energy efficiency, contributing to sustainable urban planning, protecting the environment in poor areas, developing low emission technologies and transport systems, investigating and developing sustainable agriculture, biodiversity protection and forest management.

In particular, projects concerning energy efficiency, renewable energy, energy production from waste and forest management targeted to produce emission credits according to the Clean Development Mechanism (CDM) of the Kyoto Protocol were organized.

In this framework, a training program for the participants of the various Chinese institutions involved was developed. The contributions deriving from this program are included in this volume.

I. SUSTAINABLE DEVELOPMENT POLICIES

I. MUSU

INTEGRATED ENVIRONMENTAL POLICY IN THE EUROPEAN UNION

Abstract. The chapter is divided into two parts. The first will present the main principles, instruments and institutions of the European Union environmental policy. The second part will analyze how to adjust the European Union approach to environmental policy in order to comply with a perspective of sustainable development. A change is needed along two lines both requiring more integration. First, the environmental objectives should be integrated into the early phases of the different sector policy processes, such as transport, energy, industry, agriculture, infrastructures and land-use policy. Second, the European regulatory system to environmental management has to integrate the command and control approach with two others approaches which, although in different forms, give more role to the initiative of individuals and social groups. These are the economic and participatory approach. The economic approach, based upon compatible incentives, aims at achieving eco-efficiency of products and production methods. It is based on tools such as environmental taxes and emission permits. The participatory approach aims at creating the necessary awareness to change consumers' preferences so that they can send firms credible signals in order to induce them to more environment friendly products and processes.

1. PRINCIPLES, INSTRUMENTS AND INSTITUTIONS OF THE EUROPEAN UNION ENVIRONMENTAL POLICY

The role of the European Union has been crucial in pushing individual European countries to adopt a coherent national environmental policy. In some countries, without a European framework, environmental policies would still be at a very preliminary stage. The European Union was, and still is, in general more advanced than many of its individual member States in terms of environmental objectives and policies. This will also be the case with Central and Eastern Europe new member countries, whose environmental objectives will be much increased by their joining the European Union.

The European environmental policy is inspired by a few fundamental principles (Kraemer, 2003). The first is the *subsidiarity* principle, which inspires not only environmental policy but all types of intervention of the European Union with respect to individual member States. Basically, the subsidiarity principle states that a decision should not be taken at a higher level (Union) when it is more efficient and appropriate to take it at a lower level (member States). It is clear that the implementation of the subsidiarity principle has a lot to do with the environmental policy; we will discuss this point later on when analyzing the relation between the power of the European Union to establish environmental limit values at a European level and the autonomy of environmental legislations in individual countries.

A second principle is the *integration* principle. This principle has two applications. The first application concerns the integration of different approaches to environmental policy: legal, administrative, economic and participatory. The idea

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here is to always compare different possible instruments so as to use them in the most efficient way. The second application concerns integration of different sector policies: from this point of view, environmental considerations should be taken into account in the elaboration of other policies such as industry, agriculture, energy, transport, infrastructures. The idea is to achieve a permanent, continuous "greening" of all the European sector policies.

A third principle is the *precautionary* principle which has been inserted in the European Community Treaty (art. 174.2). There is much concern when such a principle is mentioned, the fear being that it can be improperly used to prevent any innovation effort and hence to block the possibility of pursuing economic growth. This principle was explicitly mentioned in the Rio de Janeiro Declaration in 1992; however the way it was mentioned does not aim at blocking economic activities, but rather at stimulating appropriate environmental measures. The Declaration states that in the case of threats of serious or irreversible damages, the simple lack of full scientific certainty cannot be used to delay measures to prevent those damages.

From some European directives, one can argue that the application of a precautionary approach in the European Union is seen in a positive perspective: where the relevant scientific evidence is insufficient, measures should be provisionally adopted on the basis of available pertinent information, after a scientifically serious risk assessment, and reviewing the measures themselves within a reasonable period of time.

A fourth principle is the *preventive* principle. Sometimes this principle is linked to the precautionary principle, but it is a different one. The preventive principle implies that the basic objective of an environmental policy should not be merely that of proposing and implementing measures aimed at repairing environmental damages produced, but should primarily attempt to prevent new damages to be determined.

An application of the preventive principle is the polluter pays principle (PPP); as we will see later on, this principle, by making the person or firm who caused the pollution responsible for bearing the social costs of the pollution produced, aims at creating an incentive for avoiding polluting activities and behaviors in the future.

The European environmental policy uses many instruments. First of all we have *regulations*, which are uniform provisions binding to all member States. They are aimed at setting up specific administrative structures (such as procedures for attributing an eco-label, or eco-audit schemes), or at transposing obligations of international environmental conventions into European law (i.e. regulations on ozone-depleting substances, on shipment of wastes, on trade of chemical products, etc.).

The most frequently used instruments in European environmental policy are *Directives*. Directives address member States and normally oblige them to act in a certain way. Member States have to transpose the provisions of a Directive into their own national environmental law. Directives tend to be of a general nature when applied to environmental fields (i.e. water, air, wastes, habitats and so on) or to concepts relevant to environmental actions (such as the Directive on Environmental Liability).

A very important instrument aimed at providing a framework for future European environmental policy is the *Environmental Action Program*. An

Environmental Action Program does not contain legally binding or enforceable provisions; its meaning is essentially political, to obtain a large consensus among member States on objectives and priorities of the European environmental policy. Guidelines exposed in an Environmental Action Plan often influence environmental policies within an individual member State.

There is another instrument that performs a "moral suasion" role similar to that of an Action Plan, although more limited: *recommendations* on specific fields such as coastal zone management, waste recycling, protection of animals and so on; recommendations are aimed at creating an environmental awareness and sometimes they are the first step to prepare the field to more binding measures to be proposed if enough consensus emerges on the issue touched in the recommendation.

The main actor of the European environmental policy is the *European Commission*. The European Commission formulates opinions and recommendations (white or green papers, communications to the European Parliament), makes proposals for new European environmental legislation (directives, regulations), acts to implement the European environmental policy in the member States and monitors the state of application.

In its work the European Commission is assisted by a number of informal bodies the most important of which is the European Environmental Agency that has the task of collecting, processing and distributing information about the European environment with a report published on a regular basis. There has been much debate over whether the European Environmental Agency should also have the function of enforcing the application of the European environmental law; the issue was not decided and was delayed at a later stage.

The *European Parliament* debates the proposals from the European Commission and approves directives, regulations and action plans; action plans are adopted by a joint decision of the Council and the European Parliament. The Parliament's influence on the development of the European environmental legislation has been constantly increasing over the years.

The *European Council*, made up by national governments heads or representatives, often meets under specific headings, among which environmental issues; at these meetings, issues of environmental strategy and policy are discussed although no decision is being made. The Council frequently discusses proposals from the Commission before the European Parliament.

A very important role is performed by the *European Court of Justice* which has the delicate and difficult task of ensuring that the European law is applied by the different member States and of resolving conflicts between different levels of policy decisions.

2. SUSTAINABLE DEVELOPMENT AS THE LEADING OBJECTIVE: IMPLICATIONS FOR THE EUROPEAN ENVIRONMENTAL POLICY

The European strategic framework for environmental policy is well summarized in the Sixth Environmental Action Plan. The action program outlines priority objectives for the European initiative, specifies the adjustments and modifications that the Union's environmental policy should undertake in the next years, and

indicates the measure that the Commission should propose, to be implemented in the member States.

According to the European Action Plan, sustainable development is the leading objective of the European environmental policy. This follows from the Amsterdam Treaty of the European Union that declares that one of the objectives of the European Union is to promote economic and social progress and to achieve balanced and sustainable development.

The decision to adopt a framework of sustainable development clearly emerges also from the Lisbon declaration in 2000, where the European Council set for the Union the strategic ambitious goal of becoming the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion.

The way this strategic goal is defined reveals a wide concept of sustainable development, including not only environmental preservation but also social progress and cohesion. Both are considered necessary conditions for economic growth persisting over time, not only in the sense that economic growth could come to an end without a basis of natural resources and social cohesion, but also in the wider sense that a preserved environment and an fair social network are required to leave open to future generations fair opportunities to choose how to continue their development pattern. This perspective was strongly underlined by the Brundtland Commission in 1987 when the first definition of sustainable development was given (WCED, 1987).

Focusing on the *environmental* aspect of sustainable development, the crucial condition appears to be that of "decoupling" environmental degradation and resource consumption from economic development.

Continuous economic growth can lead, and in fact has led, to an excessive demand for environmental and natural resources. If we accept as inevitable that continuous economic growth implies environmental degradation, there is no alternative than to accept environmental degradation or to give up economic growth, choosing a stationary state. This perspective is refused by the European Union approach. The basic idea in this approach is that protecting the environment does not necessarily implies to restrict economic growth.

Environmental protection can be made compatible with economic growth through continuous improvement in the eco-efficiency of the economic system (Brock and Scott Taylor, 2004). The fundamental force promoting economic growth is now recognized to be not physical capital accumulation, which is important, but accumulation of new knowledge leading to continuous technical progress. Human capital accumulation and the acquisition of immaterial capital such as new ideas become increasingly relevant. Technological progress promoting economic growth assumes the form of continuously improving productivity of labor and physical capital. We need to extend the idea of technological progress to a type promoting the improvement of the use of limited and not reproducible natural and environmental resources.

Technological progress in the environmental sector is what is required to assure continuous improvement in the environmental efficiency (eco-efficiency) of products and production processes in the economic system. Technological progress

in the environmental sector produces a continuously decreasing pressure of environment and resource use per unit of output.

It may happen that technological progress in production, improving productivity of labor and physical capital also implies lower pressure of environment and resource use per unit of output (improvement of environmental productivity); but this is not always the case; it is not automatic.

Given the nature of public good of the environmental preservation and the various externalities implied by natural resource exploitation, it is well known that the market system must be helped in order to get the introduction and diffusion of this required type of environment friendly technological progress; a major support of public policies is required to obtain the re-orientation of investment towards environment friendly technologies.

If this strategy turns out to be successful, it may well happen that protecting the environment does not necessarily have to be translated into restricting growth or consumption, but can become an engine for a stream of innovations able to create new markets and business opportunities.

In order to comply with a strategy of sustainable economic growth, the European environmental policy is now changing, according to two directions, both oriented to increasing integration. The first direction starts from the consideration that policies under the control of the environmental authorities can only be partly successful in meeting sustainable development objectives. Environmental objectives should not only be assigned to environmental policies but they should become objectives of other policies such as transport, energy, industry, agriculture, infrastructures and land-use policy. In other words environmental objectives should be integrated into the early phases of the different sector policy processes, according to a comprehensive cross-sectoral approach (McCormick, 2001).

The second direction starts from the consideration that European environmental policy has been essentially based until very recently upon a legislative and administrative approach, what in the international literature is called a "*command and control* approach" (Tietenberg, 2006). This approach relies on rules and standards rather than on incentives using the market system and on voluntary participation of the different groups and members of the society. It has become increasingly evident that the "command and control" approach is only partially valid in dealing with the complexity of the issues involved in an environmental policy aimed at achieving sustainable development.

The European regulatory system to environmental management needs integration of the command and control approach with two other approaches which, although in different forms, take more account of, and give more importance to the response and initiative of individuals and social groups. These are the *economic* and the *participatory* approach. The first gives a lager role to incentives; the second to the direct voluntary involvement of consumers and firms.

The two directions of integration of the environmental policy are interdependent. Integration of different tools such as legislative, economic and participatory, favors the horizontal integration of sector policies making them reciprocally more consistent with the general target of promoting sustainable development.

3. THE ECONOMIC APPROACH TO ENVIRONMENTAL POLICY

The command and control approach widely used in the European environmental regulation has economic implications. Directives and laws, based upon quantitative standards and pollution limits, impose constraints to economic activity of firms and consumers; hence implicitly they impose costs and prices when economic agents overuse the environment. However these implicit costs are very indirect signals; moreover they not always are the most efficient and cost effective type of signals. This is why the European Union now encourages the use of direct price signals which are able to embody the environmental costs of the different economic activities.

The economic approach to environmental policy recognizes the difficulties of the market system to reveal the value of the environmental damages or the value of an environmental improvement. The main reason is the difficulty of clearly defining property rights on environmental resources which have the nature of public goods. A *public good* has the property that once it is produced, it can be used in a non exclusive and non rival way (Krugman and Wells, 2005). This means that the good can be used simultaneously by many people and that the use by one person does not reduce the amount available to be used by another person. This also means that a person can enjoy the public good once produced even if she does not contribute to its production. Clearly this implies that market production of public goods is likely to be insufficient because of a lack of clear signals that individuals are willing to pay to contribute in producing the public good.

An environmental improvement is a typical example of a public good; similarly, environmental degradation in the form of pollution is a typical example of a public bad. This means that the environmental costs of the typical economic activities carried out through the market (production and consumption) are not revealed as market costs. They are social costs, in the sense that they affect negatively persons or groups of persons, but they are not private costs revealed by the market. They are negative *externalities* (Krugman and Wells, 2005).

These observations have led to the recognition that a public intervention is necessary to obtain environmental improvements and to reduce environmental damages. This need can be fulfilled by using a typical command and control policy approach, which imposes implicit costs to those who are damaging the environment. This acts as an incentive to reduce activities and behaviors that damage the environment.

However, the economic approach to environmental policy goes beyond the command and control approach because it does not use a quantity based incentive as the command and control approach, but the same incentive used by the market mechanism, i.e. the price incentive.

The most well known market-based instrument is a tax on polluting products and production processes, the so-called *environmental tax* (Tietenberg, 2006). If a firm knows that it has to pay a tax on every unit of polluting emission, it will try to avoid paying this tax if the costs of abating pollution are lower than the costs of the tax. The firm will also have an incentive to use resources to introduce new technologies that reduce the polluting emissions per unit of output; this will send a clear market

message to devote efforts towards a technological progress able to reduce the emissions per unit of output, exactly the type of technological progress that we have considered above necessary to obtain a sustainable path of economic growth. Hence an environmental tax eventually aims to change the price signals in the market in favor of more environment friendly products, processes and services.

It is clear that the higher is the environmental tax, the higher is the incentive in this direction. But this works only in the long run. In the short run the effect may be of reducing output. This is why there are so many concerns about the introduction of environmental taxes. In the European Union, member States are encouraged to introduce systems of environmental taxation, but the difficulty is recognized to tune these instruments in a way that does not discourage economic activity and employment in the short run. Although there may be some shifting of economic activity and employment from polluting industries towards industries engaged in producing pollution abatement devices, this is not enough to cancel the concerns about the potential short run negative effects of environmental taxation.

This means that environmental taxes must be introduced within a long run perspective of promoting an environmental friendly technological progress aimed at reducing the polluting emission and in general the environmental pressure per unit of output. A good idea is to "earmark" the environmental taxes (O'Riordan, 1997); this means that at least a share of the tax revenue is used by the government to support innovations and R&D in environment friendly technologies. This idea is also useful in promoting the necessary consensus for accepting the introduction of environmental taxes. In other words, environmental taxes could be used to support the right type of subsidies to economic activities.

An important issue is indeed that of changing the structure of *subsidies* to economic activities in order to correct their past negative environmental effects. In the European Union subsidies have been used in a perverse way from the point of view of a correct environmental policy aimed at a sustainable development. Dirty type of energy consumption and polluting agricultural techniques have been heavily subsidized: subsidies have encouraged polluting economic activities, such as the use of coal or the use of chemical pesticides and fertilizers in agriculture.

In the near future, it is expected that these types of subsidies will be reduced, entailing a parallel change in the energy and agricultural policy according to the criterion of sectoral policy integration. The need of a more appropriate approach to subsidies in the perspective of sustainable development is urgent in the European Union, and it must be recognized that some steps have been done, although more efforts are required.

A way of combining taxes and subsidies are *deposit-refund* systems (Callan and Thomas, 1996). They are suggested to encourage the use of an appropriate method for recycling wastes. A deposit is left in the hands of the regulatory agency when a product is sold. If the producer or the buyer show that they have been able to recycle it according to the rules, the deposit or part of it is given back; otherwise it remains in the hands of the regulator. The system can be refined by inserting the idea of an *environmental bond* (Common and Stagl, 2005). The deposit is considered as posting a bond, which can then be sold to some institution able to recycle the waste at a lower cost so that it can get a net benefit when the bond is paid back.

An argument used to obtain consensus on the introduction of environmental taxes is that they are more efficient than any other existing taxes they could replace with a net benefit for the society as a whole. Typical examples of inefficient existing taxes are the ones on labor which discourage employment and on capital, which discourage savings and investment. Environmental taxes are efficient because they internalize social costs, such as environmental costs, that are not revealed in market transactions. Efficient environmental taxes could at least in part replace inefficient taxes on labor and capital. This process has been labeled *Environmental Fiscal Reforms*. Indeed some member States have started to proceed along the path of an Environmental Fiscal Reform, by combining new or increased environmental taxes with reductions in the taxation of labor in order to increase employment.

This is a typical form of integration of environmental policy with other types of policies, in this case with macroeconomic and employment policies. However, the employment effect of environmental fiscal reforms is sometimes objected to on the basis of the consideration that environmental taxes increase the price of final goods. This not only increases inflation, but leads to substituting relatively less costly leisure for relatively more costly consumption, in this way reducing labor supply and employment. This interaction effect may contrast the positive effect of recycling the labor tax revenue with the environmental tax revenue (Goulder, 1998).

Another objection to environmental taxes is that they are inherently *regressive*; as people pay them on the basis of how much they use the environment, independently of their wealth; so it may well happen that poorer people pay relative high environmental taxes. Compensatory redistributive measures are in this case required for equity reasons.

A very delicate point on environmental taxes concerns the appropriate level at which to establish them. The aim of an environmental tax is to "internalize" an environmental social external cost. Knowing the amount of such a cost is very difficult for the environmental regulator who has to set the tax. The market does not provide it; and any method to calculate it in an artificial way leads to an ambiguous outcome (Kolstad, 2000).

The economic theory tells us something about when to use quantity or price incentives (i.e. when it is better to use a quantitative limit to pollution and when it is better to use a tax on pollution), in the case the environmental regulator does not have full information on the value of the environmental damage and abatement cost. Basically, the regulator should use a tax when the value of marginal environmental damage does not change with the level of pollution. On the contrary, when there is clear evidence of threshold effects on environmental damage, then aggregate standards should be used (for example in certain urban area for air pollution which can be very damaging for human health, or in a river basin for water pollution which again can be very damaging for human health).

The conclusion of this type of argument seems that – in the case of threshold effects – we are in practice coming back to a command and control approach. But this is not true. Even in this case, the distribution of the aggregate standard among the different polluting sources can be achieved in a more cost effective way by using price instruments. *Tradable pollution permits* have been suggested in this case (Common *et al.*, 2003). The directive on Emission Trading encourages the formation

of emission permit markets in Europe.

The idea is basically that a source with higher pollution abatement cost would prefer to buy pollution permits from a source that is more efficient in reducing pollution: by buying the permits, the former saves the high abatement costs; the latter gets a net benefit in selling the permits. Hence the aggregate pollution reduction required by the aggregate standard will be obtained at a lower social cost: using a system of tradable pollution permits is a way of achieving the aggregate standard in a cost-effective way. Polluting sources with lower pollution abatement costs should abate more and sell permits to the polluting sources with higher abatement costs which should abate fewer pollutants.

While in the case of environmental taxes the difficulties of the regulator lie in collecting the information required, especially on the methods and costs of abating pollution, in the case of pollution permits markets, the difficulties lie in the transaction costs of organizing the market, that must be competitive and transparent in order to avoid creating problems imperfect market power and incompleteness of information (Tietenberg, 2006).

This type of difficulty emerges in the international applications of the permit system, i.e. for greenhouse gases (GHG) emissions. For a number of reasons, it is less costly to abate GHG in developing countries than in mature developed countries; this suggests that to achieve a world cap in GHG emissions, an international system of tradable GHG emission permits should be introduced: more permits should initially be assigned to developing countries than to developed countries; developing countries could sell these permits to advanced countries. Advanced countries would save heavy abatement costs; developing countries could use money to develop projects with sustainable technologies embodying reduction of GHG emissions. The difficulty of organizing such a system lies in the enormous transaction costs, increased by the international dimension and by the lack of a supranational regulation board.

4. ENVIRONMENTAL FISCAL FEDERALISM IN EUROPE

In the European Union, directives establish environmental standards considered valid in every country. A frequently raised question is whether this is compatible with the principle of subsidiarity. Shouldn't this principle imply that different countries are left free to choose their own level of environmental protection, that they consider appropriate? This conclusion can be accepted only when polluting emissions and wastes do not have spillover effects on the jurisdictions of other countries. In this case, the application of the subsidiarity principle means that each country should set its own environmental objectives and choose its own environmental policy.

In this case there will be in general different levels of environmental quality across different countries. In each country the environmental regulation will depend on the perception of the environmental damages, on the costs of the technology to abate pollution, on the assimilative capacity of the environment. Hence the environmental policy will be strict when the perception of the environmental

damages is high, the costs to abate pollution are low, and the assimilative capacity of the environment is high. On the other hand, the environmental policy will be more tolerant when the perception of the environmental damages is low, the costs to abate pollution are high, and the assimilative capacity of the environment is low. In a country where the environmental regulation is strict, the price polluters will pay is higher than in a country where environmental regulation is more tolerant. Also, environmental standards will be stricter in the first area than in the second one.

This is a typical framework of environmental fiscal federalism (Siebert, 1998). In this framework homogeneous environmental regulations across countries can be achieved through resource mobility and institutional competition. Capital and entrepreneurial resources of polluting firms will move from the first area, where the environmental regulation is strict, to the second area where it is lax. There is an incentive to relax the environmental regulation in the first area and to make it stricter in the second area: a tendency to the homogenization of environmental regulation will emerge.

The risk is that institutional competition will produce a "race to bottom". The rate of economic growth may slow down in the area loosing resources, while it may increase in the area in which firms and capital move. National authorities, in their eagerness to attract new investments and to create new entrepreneurial opportunities may opt for using and maintaining excessively tolerant environmental policies. National authorities behave strategically trying to take advantage in terms of economic growth with respect to their neighbours.

This perverse type of "race to bottom" outcome is used to claim that centralization of environmental policy at the European level is preferable even when pollution in one jurisdiction does not have external effects on other jurisdictions. Or at least a minimum level of common environmental policy criteria should be adopted at the European level in order to avoid the degeneration of the "race to bottom" outcome.

On the other hand when there are spill-over effects of pollution in other countries, or when these effects are reciprocal, and affect many countries (as it is the case with GHG emissions) at least the different countries' environmental policies should be coordinated. In this case the existence of the European Union can greatly help to achieve a cooperative approach.

5. A NEW APPROACH TO ENVIRONMENTAL LAW

Environmental legislation will continue to play the most important role in framing European environmental policy. However more integration between environmental law and an economic approach is required in the sense that European environmental law should be more concerned with the consequences of the legal rules. More attention should be given to the implication of the environmental legal rules to social efficiency which increases when the net social benefits of the application of such rules increase (Segerson, 2000a).

More attention should be given to the incentive effects of environmental laws. A good example is liability in environmental issues addressed in the Directive just

approved. It is well known that the rule of *strict liability*, which imposes on the party that causes injury the whole cost of the damage, has the effect of both increasing the injurer's level of preventive care and discouraging the negative injurer's activity. It is expected that the use of the strict liability rule and the related penalties imposed by the courts for environmental damages will have a strong effect in preventing such damages.

However, sometimes strict liability is not the most appropriate legal rule in order to reduce the likelihood of environmental negative consequences. When for example the preventive care of the potential victims of pollution is important in reducing the damage (as it may happens with some behavioral rules in collecting wastes), the strict liability rule is not the most efficient legal rule; a *negligence* rule may be better, imposing liability only if due preventive care is not applied.

One of the problems with the implementation of a strict liability regulation lies in the fact that firms incurred in heavy environmental liability, especially if they are small or medium sized, may turn out to be unable to repay their debt. One way of dealing with this problem is to make the financial sector more involved in the environmental liability of the firm supported by its lending. If the regulation would impose some kind of participation of the financial institution in the environmental liability of the financed project, it is expected that the financial institution will be more concerned with assessing the environmental risk of the supported project. This rule would be expected to produce consistent steps towards a greening of financial practices.

6. PROMOTING VOLUNTARY PARTICIPATION TO ENVIRONMENTAL IMPROVEMENT

Integration between the legal and the economic approaches to environmental policy is important; however the European Union has declared its intention to promote further integration with a third element which is going to play an essential role in promoting sustainable development; this third pillar is *voluntary participation*. The EU has developed programs and initiatives aimed at encouraging voluntary action by firms, consumers and citizens to improve their environmental performance.

Starting with firms, the basic reference framework is the Integrated Product Policy Approach (IPP), aimed at improving the environmental performance of products throughout their life cycle. The approach is extensively illustrated in a Green Paper produced by the European Commission in 2001. A number of instruments are suggested to implement this IPP approach. The first is the European Eco-Management and Audit System (EMAS) which encourages firms to set up site or company-wide environmental management and audit systems and to publish periodic environmental performance reports that are independently verified by accredited auditors.

Whilst the uptake of EMAS by companies has been encouraging, additional measures need to be considered that will help significantly to increase the proportion of companies that publish rigorous and audited environmental or broader sustainable development reports. Another instrument to promote firms' voluntary participation

is the whole set of compliance assistance programs, to help in particular small and medium sized enterprises to better understand European environmental regulations and to better comply with environmental legislation, and to get information about best practice clean technologies in different business sectors.

A recently suggested method to strengthen partnership between environmental regulators and business communities which is especially relevant for large firms is the *voluntary environmental agreements* (Segerson, 2000b). They are considered as a way to respond to the high costs of command and control type of environmental regulation: under a voluntary agreement, polluters voluntarily undertake pollution control measures rather than undertaking them because of the existence of regulatory requirements.

Voluntary agreements can take the form of unilateral initiatives by firms or industries, without the government being actively involved: similar initiatives are strongly related to the application of corporate social responsibility to the environmental field. Or they can take the form of bilateral agreements between a regulatory agency and a group of firms, emerging from the recognition of the importance of reaching such an agreement rather than rely on environmental regulation. Or they can be designed by the regulatory agency to induce participation by individual firm; in this case the designing agency should make explicit the obligations of the participating firms and their rewards with respect to the use of mandatory environmental regulation

These voluntary programs can indeed be effective, but their success is not automatically guaranteed. Success is most likely where firms have a strong inducement to participate in the agreement. Reasons to participate are the perception that consumers are increasingly aware of the importance of environmental effects of products and productive processes, the possibility of getting strategic benefits by avoiding the costs of a more stringent environmental regulation, the possibility of receiving government financial support.

Hence, governments can induce participation of firms through “carrots” such as financial subsidies or through “sticks” i.e. the threat of a stricter regulation. Subsidies must however be used with great care, both because of their implications on the public budget and their potentially distorting effects; they should be oriented to support R&D and innovation activities included in the voluntary agreement.

The mere signing of voluntary environmental agreements does not automatically mean that they will be enforced and that they are going to produce a significant environmental improvement. Monitoring the way the agreement is carried on is important; and the threat of implementing a mandatory regulation in the case the agreement has not produced the expected results remains crucial. For this reason voluntary agreements should not be considered as substitute for environmental regulation: voluntary and regulatory approaches should be considered as complementary tools in an integrated environmental policy.

Very important in promoting participation to environmental improvement is the role of consumers. Consumers can make the market mechanism work directly in improving the quality of the environment. Consumers’ preferences may change so as to determine a higher willingness to pay for environment friendly products and processes, and to reduce the willingness to pay for polluting products and processes.

Firms will be ready to take the market messages deriving by these more environment friendly consumers' preferences.

Consumers' appropriate information is essential to this task. An important instrument in this direction is the eco-label scheme that has been developed at the European and State level with the aim of affecting consumers' choices. These eco-label schemes are also part of the IPP approach. The financial sector could play an important role offering Green Investment Funds to those investors who want to be reassured about production in an environmentally and socially responsible manner.

A fundamental role is played by environmental education, which is probably best provided at local, regional and national level and by a range of organizations, such as NGOs, commanding the required respect and trust.

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THE ROLE OF LEGAL PRINCIPLES FOR ENVIRONMENTAL MANAGEMENT

Abstract. The present contribution begins by defining the category of the legal principles as a specific source of international law, highlighting the differences between them and the other two main sources of international law namely treaties and customary law provisions.
Then, the most relevant environmental legal principles are presented, with reference to the major developments which marked the evolution of international environmental law in the last thirty years. Principles such as principle 21, the precautionary principle and the principle of co-operation are examined in this context. A specific focus is then put on the most important contemporary environmental principle, namely the principle of sustainable development, whose origins and main constitutive elements are presented, followed by an analysis of the most notable international treaties as well as decisions of international courts and tribunals in which such a principle has been taken into account.
The contribution ends with an examination of the various functions environmental legal principles may play in international environmental law, which is conducted in order to determine their effective actual and potential contribution to environmental management.

1. THE LEGAL PRINCIPLES AS A SOURCE OF INTERNATIONAL LAW

The general principles of law are recognized among the three main sources of law to which the International Court of Justice (ICJ) may refer to when rendering their decisions on the basis of article 38 of the ICJ Statute, beside treaty and customary law provisions. The category of the "general principles of law", or more precisely of the "general principles of law recognized by civilized nations", was inserted in the ICJ Statute by those jurists who contributed to its legal drafting in order to make sure that the Court, in case there were no applicable rules of treaty or customary law to solve a controversy pending before its jurisdiction, was not obliged to close the case with a "non-liquet", that is with a declaration that no rules existed which were applicable to solve the case at stake, but could rather make recourse to the basic principles which are contained in the legal order of the various well-evolved legal systems around the world. Legal scholars have then clarified that the reference to "legal principles recognized by the civilized nations" is not meant to exclude *a priori* the contribution which may come in this context from the legal tradition of developing states, but rather to include all legal orders around the world, which have a minimum of stability, coherence and predictability.[1]

Before presenting a specific analysis of the most relevant environmental legal principles and consequently trying to assess which is their actual and potential function for environmental management, it is first necessary to define the exact boundaries among the concepts of (treaty and customary) rules on the one side and legal principles on the other side.

C. Clini et al. (eds.), Sustainable Development and Environmental Management: Experiences and Case Studies, 17-31.

The issue of the distinction between legal principles and the other two main sources of international law, and in particular the one between customary rules and legal principles, has been addressed by several legal writers, but it is in particular the work of Cheng which may be of a major help for the sake of our analysis. According to him, in particular,

> while conventions can be easily distinguished from the two other sources of international law, the line of demarcation between custom and general principles of law recognized by civilized nations is often not very clear, since international custom or customary law, understood in a broad sense, may include all that is unwritten in international law. In Article 38, however, custom is used in a strict sense, being confined to what is a general practice among States accepted by them as law. General practice among nations, as well as the recognition of its legal character, is therefore required. It should be observed that the emphasis in the definition of what constitutes a custom lies not in the rule involved in the general practice, but rather in its being part of objective law as a whole. In the definition of the third source of international law, there is also the element of recognition on the part of civilized peoples but the requirement of a general practice is absent. The object of recognition is, therefore, no longer the legal character of the rule implied in an international usage, but the existence of certain principles intrinsically legal in nature. This part of international law consists in the general principles of that social phenomenon common to all civilized societies which is called law. (Cheng, 1953)

In more general terms, the difference among legal principles and legal rules is a "logical distinction", according to the legal philosopher Dworkin. In his opinion, in fact,

> the difference between legal principles and legal rules is a logical distinction. Both sets of standards point to particular decisions about legal obligation in particular circumstances, but they differ in the character of the direction they give. Rules are applicable in all-or-nothing fashion. If the facts a rule stipulates are given, then either the rule is valid, in which case the answer it supplies must be accepted, or it is not, in which case it contributes nothing to the decision. (Dworkin, 1977)

From the reasoning of Dworkin, it emerges that the flexibility which characterizes legal principles may be an advantage in all those circumstances in which the application of the very rigid instrument of legal rules may run the risk of not rendering effective justice in the concrete case at stake. This may be further clarified by the following excerpt from Cheng:

> Since principles express general truth, general principles of law express general juridical truth. They form the theoretical bases of positive rules of law. The latter are the practical formulation of the principles and, for reasons of expediency, may vary and depart, to a greater or lesser extent, from the principle from which they spring. The application of the principle to the infinitely varying circumstances of practical life aims at bringing about substantive justice in every case; the application of the rules, however, results only in justice according to law, with the inescapable risk that in individual cases there may be a departure from subjective justice. (Cheng, 1953)

A similar line of reasoning, to the ones expressed by Cheng and Dworkin, was already made in very clear terms, a long time ago, in the decision rendered by the Arbitral Tribunal in the *Gentini Case*, back in 1903. In such a circumstance, in fact, the Umpire had held that:

> A rule... "is essentially practical and, moreover, binding...; there are rules of art as there are rules of government", while "a principle expresses a general truth, which guides our action, serves as a theoretical basis for the various acts of our life, and the application of which to reality produces a given consequence". (Gentini Case, 1903)

What said above makes clear that the fundamental and essential difference among legal principles and legal rules is an ontological distinction, insofar legal principles constitute general and abstract provisions, which express general and always valid truths and represent the theoretical basis for the definition of legal rules, whereas legal rules, which express the practical formulation of the legal principles from which they originate, have an essentially practical nature and normally entail binding consequences for their addressees.

In conclusion, therefore, we can affirm that despite the fact that legal principles constitute general and abstract provisions, which often do not possess the sufficiently precise character which characterizes legal rules, this does not by any means prevent such principles from having an important role as sources of international law, beside treaty and customary rules, as the third main source of law to which the International Court of Justice (ICJ) may refer when rendering their decision based on article 38 of the ICJ Statute (Cheng, 1953).

This is particularly true in the field of international environmental law, characterized by a great flexibility and variability of situations which is often not very well served by the rigidity of legal rules, but rather tends to receive a greater benefit in terms of effectiveness from the flexibility of legal principles.

2. THE ENVIRONMENTAL LEGAL PRINCIPLES

It is only in the last few decades that humanity has begun to become more and more aware of the consequences for the environment that invasive and unsustainable patterns of human development, which for a long time were subject to very little control, are posing for the global environment and ultimately for the very survival of our planet. An institutional and legal response to tackle the issue of the "environmental challenge" has been devised by the international community of States around the world, starting from the 1970s, based on the belief, aptly explained by the International Court of Justice, that

> the environment is not an abstraction, but represents the living space, the quality of life and the very health of human beings, including generations unborn. (International Court of Justice, 1996)

Actually, the record of the international practice also shows some early cases with "environmental" features which were decided well before humanity has become aware of the "environmental challenge" which we are presently facing. For instance, the 1941 *Trail Smelter Case*, which dealt with an issue of trans-boundary air pollution, is often cited as an example of an early "environmental" case, which involved two States at international level, although it concretely resulted in the application to the relationship between two sovereign States of the traditional rules of "good neighbourliness" and "nuisance" between private persons, which exist in most national legal orders (Trail Smelter Case, 1941).

Apart from this one, and a very few other cases, however, it is not until the beginning of the 1970s that the international community started to approach the "environmental challenge", by devising a proper legal framework, including a specific set of environmental legal principles[2]. The starting date of what has been then called international environmental law is commonly reported back to 1972, when the first world conference for the protection of the environment was held in Stockholm, under the auspices of the United Nations. The 1972 Stockholm Conference, officially named *UN Conference on the Human Environment*, had among its merits to start discussing the main environmental issues at stake in a well framed way and promoting the adoption of instruments and the establishment of institutions to effectively tackle those issues. To this effect, the States gathered in Stockholm adopted a well-known Declaration which crystallizes some of the most important

> common principles [which ought] to inspire the peoples of the world in the preservation and enhancement of the human conditions (UN, 1972).

The Principles listed in the Stockholm Declaration represent the first example of the concrete effort of the international community to establish some guidelines which can be applied in order to try and find an adequate and successful balance between the need to foster economic and social development and the opposite necessity to promote and improve the environment, to maintain or restore a quality of the environment at a level which permits a life of dignity and well-being for the human beings, with regard to both present and future generations.

In particular, among the twenty-six Principles listed in the Stockholm Declaration, it is Principle 21 which represents a landmark. In fact, such a Principle, which has been commonly considered since its first formulation one of the cornerstones upon which international environmental law is based, provides that States have the sovereign right to exploit their own natural resources according to their national policies and the correspondent responsibility to ensure that activities carried out within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

Principle 21 of the Stockholm Declaration probably represents the first attempt of the international community to try and find instruments and patterns to achieve a balance between the right to economic development and the protection of the environment. In this case, the right to development is enshrined in the right for each State to exploit its own natural resources according to its own needs and policies, which States have a sovereign right to pursue, while at the same time they must ensure that economic development does not damage the environment, particularly the environment beyond the borders of the State within whose jurisdiction the potentially damaging activities are performed. In fact, in Principle 21, the attempt to strike a balance between the right to development and the duty to protect the environment is still framed in the very traditional terms of limiting trans-boundary pollution which may give rise to international controversies among sovereign States. However, it cannot be denied that in concrete terms the establishment of Principle 21 probably paved the way for the appearance on the international scene of the

concept of sustainable development, which was firstly launched in the 1980s and now represents the basis upon which most of international environmental laws stand.

The genesis of the concept of sustainable development is commonly reported to the 1987 *Brundtland Report*, which contains the well-known definition of "sustainable development" as

> development that meets the needs of the present without compromising the ability of future generations to meet their own needs (UN, 1987).

The characteristics of the principle of sustainable development will be analyzed in greater detail in the next paragraph of the present contribution. For now it is sufficient to recall that the principle of sustainable development, since its first formulation in the Brundtland Report, has immediately become the common keyword for the promotion of all national and international efforts aimed at promoting patterns of development wishing to pay a closer attention to the needs related to the protection of the environment.

It is certainly not a coincidence that the 1992 Rio Conference promoted by the UN General Assembly to assess the state of the art regarding such a world-wide effort towards a sustainable and environmentally sound development and to start developing common strategies and adopting specific measures to halt and reverse the adverse effects of humanly-induced environmental degradation on the planet, was named *UN Conference on Environment and Development*. The name chosen for the 1992 Rio Conference stressed in fact the importance of the overarching objective of the balance between the right to pursue economic development for all peoples on earth with the competing common interest of mankind to promote sustainable patterns of development and abandon practices and behaviours which are deemed to be too risky for the environment.

The *Rio Declaration* adopted at the 1992 Rio Conference contains twenty-seven Principles, which although are *per se* generally non binding, certainly represent the main framework upon which most of the global efforts to affirm, both at international and national levels, an increased recourse to the principle of sustainable development are based since then. In the Rio Declaration, a particular stress is placed on the need that States co-operate in good faith in order to fulfil their right to development without endangering the environment and to further promote the establishment of a full body of international law in the field of sustainable development.

Several Principles listed in the Rio Declaration deserve a special attention: first of all, one may recall Principle 2 of the Rio Declaration, which substantially reproduces Principle 21 of the Stockholm Declaration, with a small, but quite significant modification. In fact, while the text of Principle 21 states that "States have the sovereign right to exploit their own resources pursuant to their own environmental policies" (UN, 1972), twenty years later, probably under the influence of the principle of sustainable development, the text of Principle 2 affirms that States have the right to exploit their own resources pursuant not only to their environmental policies, but also to their "developmental policies" (UN, 1992).

As one can see, this slight, but not irrelevant modification probably reflects a significant change in the perspective towards the protection of the environment

which took place during the 1990s. The new perspective is dominated by the concept of sustainable development, which aims at reconciling the interest of economic development with the one of environmental protection, on a case by case basis, without trying to give an *a priori* primacy to one of those interests over the other.

Beside Principle 2, there are at least two more principles in the Rio Declaration which deserve a special mention. The first one is Principle 15, embodying the precautionary principle, which calls for an anticipatory approach to environmental problems, also in those circumstances where there is no scientific certainty on the possible negative consequences which may derive from an incumbent situation of risk for the environment. According to the definition contained in the Rio Declaration,

> where there are risks of serious and irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. (UN, 1992)

In brief, since its incorporation in the Rio Declaration the precautionary principle has received a broad support by most States of the international community and nowadays represents one of the most striking features of international environmental law, despite the remaining uncertainties over the precise consequences which may derive from its widespread application that could be assessed only on a case by case basis.

The other remaining principle contained in the Rio Declaration that deserves a special consideration in the present context is Principle 27, which refers to the co-operation principle. The definition of such a principle, which is largely based on the former Principle 24 of the Stockholm Declaration, reads as follows:

> States and peoples shall co-operate in good faith and in a spirit of partnership in the fulfilment of the principles embodied in this Declaration and in the further development of international law in the field of sustainable development. (UN, 1992)

The relevance of the co-operation principle is two-fold. On the one side, it may provide the relevant legal underpinning to the activities of States directed to the adoption and implementation of international legal obligations for environmental protection. In addition to that, on the other side, it may further provide the legal basis for drafting more precise legal rules, instruments and techniques aiming at rendering more effective the general duties of information and participation in the environmental field.

After the 1992 Rio Conference, international developments regarding the evolution and further classification and advancement of the environmental legal principles have become more rare and less relevant and incisive. A reference, however, ought to be made to the third global environmental legal conference, which followed those of Stockholm and Rio, and which greatly influenced the further elaboration, interpretation and application of the principle of sustainable development. It is the Johannesburg Conference, which was convened by the United Nations in 2002 in order to assess the progresses made by the international community in the process for the development of an international law in the field of