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DIVERSITY PROJECT

BETWEEN BIOLOGICAL DIVERSITY AND CULTURAL DIVERSITY: A PROPOSAL FOR SUSTAINABLE DEVELOPMENTS

First meeting of the Conference of the Parties to the Convention on Biological Diversity.

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I - PREMISES

The project is based upon observation, guidelines, and objectives resulting from international activities which handle negotiations and agreements concerning the treatment and protection of the ecobiosphere. Among these are the Conventions on Biological Diversity, on Climate Changes, on the Ozone, Forests and Deserts as well as programs of cooperation for development, Agenda 21 and Commission on Sustainable Development or other multilateral scientific group such as IPCC, the European Science Foundation and others.

The objective of this project is to create opportunities for interdisciplinary and intercultural research, and interaction in order to influence this type of international activity by introducing considerations both on the scientific and cultural levels and the legislative level, as well as the modalities of cooperation with special emphasis on that which regards relations between developed and developing areas.

With regards to cooperation on development, joint implementation, transfer of technologies among current programs and modalities, a trend towards technological and economic uniformity is evident. The fundamental idea remains that of helping those countries defined as "developing", while questioning which sort of development is appropriate. If the question remains unanswered unilateral relations among peoples, unidirectional fluxes of resources, technologies and cultures, lack of use and depression of local cultural, scientific, technological resources will continue as they always have to exist. In the light of serius gaps within the model to be exported this process has conspicuously proved to be senseless and often have been justified only as operations for penetrating new markets.

The question of biodiversity may also be faced in hierarchical and sectorial terms and in fact is generally considered to be of interest only to specialists. The prime concern seems to be to create inventories and to enumerate diversities. These classifications may surely have a certain but limited function. The current concept of biodiversity is also limiting because it excludes man who becomes its supreme observer and director. Man, however, is immersed in biodiversity, he is part of it, must be recognised as one of countless agents of infinite environmental manipulations which the planet endures. This explains the necessity to reinterpret in non hierarchical terms the position of mankind in the ecosystem and to rediscover the bond which exists between biodiversity and cultural diversity.

The risk of reduction is not limited to biodiversity. This is the tip of the iceberg formed by more general process which can be identified as a decline in ecological differences induced by manmade activities which introduce massive one dimentional fluxes of material and energy into ecosystems.

This causes a trend towards the levelling of thermodynamic differences (the greenhouse effect, the raising of the temperature of oceans and other macro and micro phenomena. The possible

consequence is the simplification of the ecosystems which undergo a progressive reduction of their own capacities to produce useful work in as much as the initial energetic state continuously resembles the final states. the number of components of the system tends to reduce because the request for specialised functions diminishes and with this capacities of exchange and, in final analysis, of regenerations disappear.

In reference to these premises one must note that the international programs work is carried out prevalently around expressions and concepts which have been coined or which have recently become part of the normal lexicon, such as sustainable development, biodiversity, climatic changes, complexities, global environment, etc.

The definition of these terms is not immediately understood but is rather ambiguous and leaves itself to many interpretations. One must also note that these expressions whether directly or indirectly are referred to or contain the idea of diversity which represents the basic if not structural concept which is apparently difficult to interpret in qualitative and quantitative terms. In fact the diversity while being at the base of thermodynamic and biogeochemical processes that governs life and existence, also represents a "philosophical" line of research, formation and organisation alien to the model of development which has prevailed ever since Industrial Revolution.

Science, which was formalized on the deterministic conception, while aiming at the solution to specific problems and reaching even ambitious objectives, has sectored scientific research, disciplines, and technologies making and sharing of knowledge incommunicable and not integrable. Science has also be found unprepared to interpret and to intervene in a natural environment that has proven to be highly specialised, complex and unpredictable and whith a very high degree of interrelations due to its extreme diversification.

In this process the scientific value of the cultural diversities of peoples and ancient comunities as expressions of different knowledge and techniques of existence has been disregarded. The fundamental bond which exists between cultural and biological diversity has therefore been underestimated. This bond which also climatic or physic appears to be sounder and conditional for survival wherever the ecological dynamic proves to be more extreme and specialised. And if the complexity of a system is identifiable with its own capacity for self sufficiency, then this really seems to be the most important characteristic of indigenous peoples. These peoples appear deeply immersed in a complicated weaving of relations and influences between their human, technical and productive organisations and that of the local or specific environment. They are so highly involved in partecipating in and penetrating the ecosystem that they have no evident propensity for expansion and quantitative development.

Scientific international debate has brought to our attention the ongoing presence of a process of great transformation of the man-environment system classified by many as "Global Change". There are therefore some questions which scientific research must address in order to be able to program new and necessary courses.

Is the process of Global Change moving towards an increase in complexity, or is it tending towards the simplification and "homologation" of phenomena in general, and relations, and systems?

Is human handling and management or manipulation by man of various activities, from industrial production to the conservation of so-called natural environments, with the consequent phenomena of restriction of diversity (i.e. diminuition of forests, desertification, reduction of biological species, increase of global population and decrease in individual nations, and cultural distinctions, increase of urbanization reduction of diversity in science, technology, etc.), responsable for the loss of complexity, and if so, to what extent?

Is there a possibility of environmental manipulation which fabricates diversities or transforms the echosystem maintaining neverthess the "degree of diversity" which have already been obtained by natural means?

What are the proper methods of observing and measuring current processes related to "global change"?

Does the possibility of an environmental management which builds what we call "Diversity", or which is able to transform echosystems while maintaining the "degree of Diversity" already reached by natural means, exist?

Have the level and quality of prescience, that is, the capacity to forecast changes, been diminished?

What is practical and gnoseological application whith particular reference to the environment as a whole (including humankind), of the concept of evolution, and, correspondingly, the concept of primitism?

Is formalized science alone able to answer these and other questions? Does it possess those cognitive elements needed to observe, recognise, appreciate the value of "Diversity"?

The answer has been already given by UNCED. In the "Convention on Biodiversity", the signatory countries declared themselves to be "aware of the general lack of information and knowledge regarding biological diversity, and of the urgent need to develop scientific technical and institutional capacities to provide the basic understanding upon which to plan and implement appropriate measures".

In the "Convention on Climate Change" the same signatories say "Noting that there are many uncertainties in prediction of climate change, particulary with regard to the timing, magnitude and regional patterns there of".

On the basis of the foregoing, our proposals is that: in order to resolve the confusion, and overcome those limitations named, it is

indispensable to utilize all existing intellectual resources, and examine all ways and means by which we exist and manage the environment.

We must realize that the state of nature is extremely diversified, and follow its "technological philosophy" of interchange among numberless variables, acknowledging that the management and planning of and into the environment, is and must be diversified. As the environment is so complex and interrelated, it is not possible for the methodology of a single science to encompass it, which, restricted in its knowledge, isolates and often ignores the relationship among its components, including mankind.

It is necessary to introduce into the current model, same perspectives about diversification in order to be able to broaden the scope of the many possible relationships between living beings and their environment. To recognize the fundamental ecological value of Diversity means to reject or modify the structure of culture and science. To emphasise: diversification of the courses of culture, science and technology offers many viable alternatives. It is reasonable to ignore their potential?

In the panorama of scientific research and current technologies, opportunities today exist for surmounting the compartmentalising of science. We are referring to the contribution of new studies about chaos, complex systems, atmospheric chemistry and physics, biodiversity, irreversible processes, etc. We also refer however to the perhaps unspected contribution of new technologies such as computer science and electronics, which of impetus and possibilities either to the integration of disciplines e.g.: biotechnology, biosensoristic, monitoring systems, etc, or to the movement of work towards diversified and flexible systems,and products. Furthermore, the very same computer technologies seem able to evaluate communication and information systems, which remarcably approach the techniques of oral tradition which themselves alone seem able to pass on precious environmental knowledge.

II - THE RESEARCH TOPICS

It needs pointing out that while there is a great deal of talk about "environmental emergency" and the rupture of ecological balances, the discussion tends to stick to generalities and is often dictated by the need to find stopgap solutions to situations that are already on the verge of collapse.

The most obvious result of this is that the debate oscillates endlessly between warnings of environmental catastrophe and overconfident proclamations of technological capacity to solve the problems involved. The conflict between these two perceptions is, however, purely apparent for, while they start from different assumptions, both take it for granted that man and nature have a conflictual relationship, that there can be no harmony between their interests and that one of the two is destined to succumb to the other. Seen in this light, the environmental debate is a blind alley, since man is perceived exclusively as either the potential polluter or the potential dominator of nature.

Nevertheless we all now recognise the central importance of biodiversity which has been defined as "the variety of life forms, their ecological roles and the genetic diversity they enschrine". Diversity, in other words, is identified as a fundamental ecological mechanism that is the basis of life itself and nature's way of ensuring the complexity of the environment surrounding us by supplying life on earth with an infinite variety of experiments, options and interactions.

Now, does that variety of life forms include the human species or not? If, as seems obvious, it does, despite all attempts at sublimation, why should the cultural diversity of peoples not be examined from an ecological stand-point? If the life of man manifests itself through culture, we need to consider whether cultural diversity is not merely a function of time but also, and primarily, a result of the different

latitutes and different ecosystems in which culture develops. This would mean that the relationship between man and biodiversity induces, or tends to induce a diversification in knowledge and the techniques of life itself.

Thus, while human action can reduce biodiversity, there is clear evidence that human action can also increase it. Indeed we know that the activities of many indigenous populations and communities play a decisive role in both increasing and managing biological diversity and that numerous species have been lost in areas where such activity has come to a halt. This raises doubts about the very concept of the 'natural' i.e. the 'uncontaminated' or 'virgin' environment since we know that many so-called 'wilderness' areas on our planet were, at some time in our history, influenced and transformed by human activity.

Interesting examples can even be traced in the industrialized nations themselves. In certain areas of particular environmental value human action has, over time, lead to substantial changes by optimizing local resources, introducing new plant species or urbanizing the environment to the point where a landscape created by man as part of a specific historial process, appears to be the product of 'natural' evolution.

'By abandoning the static concept of conservation we can therefore develop environmental programmes and strategies that are aimed at integrating human activities into the local ecological organization. This approach is, in fact, already emboded in the culture of every society however much the current trend towards homogenisation is threatening the survival not just of many species, but also, and above all, of the many technical and cultural options the mankind requires in order to guarantee its survival.

The following topics were identified as key aspects of the "Diversity Project" to be examined in depth on the basis of an interdisciplinary, intercultural confrontation between formalized and non-formalized science.

1. Cultural diversity and biological diversity

There is a two-way link between biological (or environmental) diversity and cultural diversity. To break it, or to act without taking it into account, is to further the reduction in the number of living species and cultural options , in other words, homologation. Homologation is the real problem that we must address and fight. Pollution, waste, loss of biodiversity are aspects of the process of homologation.

Understanding the relationship between cultural diversity and biological diversity means bringing the social dimension back into the environmental question. In this new light, the limitations of the conservationist strategy that has prevailed up to now become clear. In aspiring to safeguard the integrity of nature, people tend, as a matter of concept and fact, to exclude the human presence from targeted ecosystems. Hence the environmental question often takes on absolute or utopian tones that alternate between predictions of global catastrophes and declarations of unconditional faith in the problem-solving capacity of technology, but offer no real way out. Both visions, by severing humans from their environment, tend to foster homologation.

Combining biological and cultural diversity implies acknowledging that there is not just one nature and one science, but many kinds of science and nature, each resulting from the relationship between a given society and its environment. This means that every environment is controlled and manipulated by the rules of the society that inhabits it; in other words, local biological diversity and cultural diversity evolve in the same dynamic context.

Cultural diversity bears witness to the existence of a scientific relationship between a society and its environment. Coexistence between nature and culture is as valid and vital as it is ancient. In this sense a culture may be considered functional vis-à-vis the environment in which it operates if the ensemble of thought, technologies and practices that define it tend to limit the decline in the quality of its resources and increase its biodiversity. We could say that such a culture tends to limit what appears to be the unhaltable entropy of such a closed and limited system as our planet appears to be.

Seen in this light, our current development model based on cultural and technical indicators which lead us to believe that technology can be infinitely replaced by resources is unable to maintain ecosystems. While historically our current development model is based on a specific and limited cultural and natural environment the survival of the environment has depended on refining methods for the exploitation of all resources, wherever these could be found. The result is a tendency to erode resources i.e. differences in some cases to the point of draining them completely. This process, which we call "homologation" has reduced the number of and relationships between species, that is biological and cultural diversity.

It should be pointed out however, that cultural diversity does not derive automatically from environmental diversity, always and everywhere. If cultural diversity is the conscious manifestation of environmental diversity, then the former contains the latter, not vice versa. Human culture may, in fact, choose to reduce or to fuel environmental diversity. It may, in other words, choose to regard it as a resource or as a waste product. There can, however, be no doubt that whatever we choose to do, diversity remains a resource and that there are peoples who use it as such.

Assuming that environmental diversity is a sub-system of cultural diversity, we may also claim that environmental homologation is a sub-system of cultural homologation. This means that cultural

diversity, where manifested and practiced, guarantees environmental diversity by playing an active role in its maintenance and development.

Assimilation, civilization, evangelization and westernization are all processes of homologation that destroy cultural diversity and directly threaten environmental diversity. Conversely, if we think of diversity as a resource, we open a whole new spectrum of options in the relationship between humans and nature, enlarging the possibilities of awareness, of lifestyles, and of environmental management.

2. Formalism in science

There is a need to see whether the basic formal structures that underlie mathematics and physics are appropriate for addressing problems and phenomena that involve vital relationships such as the ones that affect diversity. If not (as we believe), we need to marshall all our intellectual abilities and review the techniques and sciences used to manipulate the environment.

We do not propose to give up formalism, but to recognize its social and cognitive limitations. With formalism as our only guiding principle, we are unlikely to become aware of the diversity and development of a science of relations whose predominance has contributed decisively to the present sectoralization of disciplines.

It is a well-known fact that to describe a phenomenon by mathematical formalities, we necessarily proceed by averaging. Fine details are overridden, and we are left with a relatively rough description of average appearances in a standardized space, applicable almost everywhere. Although formal theories always stem from a concrete need to study a given problem or class of problems, they may result in the construction of models that simplify rather than explain reality.

Models conceived to solve a given problem can be taken to the global level through formalization, but only at the cost of disjoining them from time and space. Conversely, bringing a theory conceived as a theory of remote action (for instance, global change) down to the local scale does not increase awareness and can be dangerous for the effects it may produce as it misleadingly circulates as knowledge.

The formalization of reality does have the advantage of enabling us to address a problem without being distracted by its specific features. To the extent that one can work on a formal theory without knowing its possible applications and ends, the process of formalization contributes to the division of scientific work as well as to the separation of knowledge.

Today the formal approach to biodiversity tends to call for specialized studies of a numerical and hierarchal type, rather than qualitative. This leads on the one hand to inventories, and on the other hand to attempts to measure diversity by the techniques of calculus. Once again, the results ignore relationships among species (including mankind) and the biotic and abiotic environment.

3. Dialogue between different sciences

The same scientific dignity ascribed to formal science should also be recognized in the knowledge and experience accumulated by the indigenous peoples, local communities, ancient cultures and nomadic peoples living in both the industrialized countries and the developing world. Appropriate methodologies need to be devised for dialogue among different kinds of science, ensuring that scientists specialized in the study of diversity and the peoples and communities that are keepers and bearers of diversity have the same freedom of expression.

Indigenous peoples and similar groups that have been able to maintain their cultural identity and control their traditional resources offer concrete examples of high technology linked to a profound awareness of ecological dynamics. Outside observers have noted that the integrated systems these peoples have developed for the management of plants and animals work as a way of broadening local gene pools. Accordingly, they constitute a valid alternative to the current costly and destructive monocultural system of environmental management. Indigenous knowledge not only represents a substantial resource, but can also provide methods of discovery based on indigenous ability to experiment and invent.

It is vitally important to ensure that the indigenous and nomadic peoples and the local communities which practice diversity participate in the construction of a new kind of science. If this is to occur, we shall have to abandon the method that has been used up to now and which involves the appropriation, sometimes by violent means, of the know-how, technologies and products generated by those societies. In recognizing the need for reciprocity, we need to work together on the construction of new communication methods for setting up and maintaining dialogue, scientific and cultural relations and new legal regulations.

The creation of interdisciplinary and intercultural groups may be the right vehicle for know-how and technology transfers between different people and is of vital importance, considering that scientific principles are established not only on the basis of evidence brought to bear on a given problem, but also as the result of relations among scientists.

To foster dialogue among different types of science, it is necessary to influence the processes involved in learning and imparting knowledge, and to create social and educational venues that can encourage the emergence of new modes of communication between

bearers of indigenous and formal knowledge. Moreover, this is a way to avoid the imposition of socalled modern solutions, which in reality are unilateral prescriptions that lack an understanding of diversity and cannot solve local problems such as the care of key animal species.

4. Global change

The idea that global change poses a common problem to all mankind is misleading. No one lives globally; everyone lives and learns locally. Attention should be focussed on the solution of local problems as a way to solve global problems. This can be achieved through policies that recognize local action to prevent change as a wiser and more effective approach than unlikely and unknown global remedies.

The "homogenized" world of global culture should be transformed in order to reintroduced cultural diversification and those that concern life style, the knowledge and respect for diversity in accordance that the statement that "diversity is life". All the necessary endeavours should be considered for this to happen above all in urban and metropolitan places, places where today the most powerful process of homologation happens inside as well as in the surrounding territories. A necessary step is to convince the "western world" that diversity is an element that cannot be uprooted in their own existence.

5. International cooperation

We need to replace the current process of unilateral technology transfer with one based on the concept of mutual consent and reciprocity. The world of international cooperation needs to switch from the policy of "aid" to "exchange," based on the idea that to overcome present environmental problems, it is essential to build a world in which different technologies, economies, cultures and sciences can coexist. Cooperation should become a mechanism of

reciprocal influence and sharing, instead of homologation and the reduction of peoples and territories to that single model of development/no development which continues to be used to classify what is in reality a much more complex and diversified human environment.

A large part of the world's population lives in minimum-survival areas. We need to give a new sense to economic development, reconsidering our concept of wealth and poverty. A greater quantity of things does not mean a better quality of life. To rediscover the sense of an economic logic at the service of living things and human existence, we must reflect deeply on the relationship between economics and living things.

6. Traditional Resources Rigths

Know-how relating to the sustainable management of biodiversity, biotechnologies, agricultural and food products, medicines etc., as well as the traditional environmental management techniques developed by indigenous peoples and traditional communities should be considered fullyfledged inventions and the fruit of scientific processes. These are the intellectual property of the communities that produced them. Hence they should be legally protected and constitute a major source of benefits and revenue for their creators.

This type of problem has become a central concern of many sectors and international treaties dealing with human rights, labour laws and intellectual property. In the Convention on Biological Diversity, in Agenda 21, in ILO Convention 169, in the Declaration of the Rights of Indigenous Peoples passed by the United Nations and in other international fora, this is a highly topical question, not merely because of its many implications, but also because it provides new food for thought and proposals that seek a more adequate approach to the issues.

The greatest difficulty arises when, in drafting juridical machinery for its protection, we are faced with the collective nature of traditional knowledge and with the impossibility of identifying the owner of certain know-how or the creator of specific inventions. This brings us into outright conflict with the western legal approach which is based on the individual and does not formally recognise indigenous knowledge, practice or spirituality as a genuine science capable of producing innovation.

We might overcome this impasse by changing the terms in which the question is posed. In order to grant full rights to traditional knowledge, we need to start from the definitions, rules and models adopted by the indigenous peoples themselves for the recognition and protection of intellectual property. Our aim is to define intellectual property rights as an entirely new concept in order to establish a new 'sui generis' system of laws and non-legal support structures required if we are to support, defend and strengthen the indigenous communities and their science. This process will need to be implemented with the full participation of the indigenous peoples and local traditional communities who should be allowed to make their own direct contribution to the creation and testing of the instruments that best suit them.

The new law, which we have called 'Traditional Resources Rights' should be introduced into all international agencies and negotiations concerned with the environment and in particular into the conventions on biodiversity and climatic changes, into the Commission on Sustainable Development and into the treaties concerned with the Ozone layer, Deserts, Forests etc. It should be viewed as a fundamental instrument for linking cultural and biological diversity to the extent that the existence of the former guarantees the existence of the latter. Furthermore, aside from the full de facto and de jure recognition of indigenous science, it has been proven that up to now the transfer of traditional knowledge and practices has actually taken the form of

unilateral appropriations that have tended to degrade, pervert or even destroy their sources.

Seen from this angle, the fact that even today only governments participate in negotiations on the environment constitutes a serious drawback. Since the participation of indigenous peoples is deprived of official status there is still no place in the negotiations for their science which nevertheless possesses what the industrialized world is seeking, namely the know-how and techniques required for any sustainable use of resources and for the conservation of biodiversity.

7. Research approach

The Earth's ecosystem can be considered as a whole composed of subsystems univocally characterized by the relationship between environmental diversity (biological, climatic, geographic) and cultural diversity. By dividing it into biocultural areas, diversity can be studied in interdisciplinary and intercultural terms, and planning can rely on local experience. The basic idea is that the pursuit of sustainable development on a global scale is a false problem; it is more correct to say that the world has seen myriad cases of sustainable development, and it ought to be possible to establish a correlation between sustainability and diversity. Each bioculturally defined area can give rise to a model of sustainable resource use.

This plan allows us to consider two aspects:

No scientific method, whether formal or not, analytical or experimental, can study the whole of a process or reality. Processes and realities are seamless, but one can mark off a part one intends to study with temporal and geographical boundaries drawn at will. Biodiversity is both a reality and a dynamic process. In order to understand it, we have to break it down according to the criteria we judge most

convenient, then we can recompose it by studying cross-boundary flows and exchanges.

The link between environmental diversity and cultural diversity is a local relationship. This assumption is consistent with the fact that no one lives globally, and environmental specialization parallels cultural specialization. Cultural diversity may be said to be the conscious manifestation of environmental diversity. One may also observe that the more extreme the environmental conditions of human existence, the sharper and more determined the cultural diversity. The human communities that have evolved in extreme environments (deserts, rainforests, snowfast or alpine regions, islands, and so forth) developed highly specialized sciences that joined nature and culture in millenary coexistence. Such regions are considered "wilderness." It makes no sense to call them virgin or uncontaminated environments, because they have been influenced or transformed by human activity. This goes to show that most of the planet's biodiversity is not found in nature reserves or national parks, but in the populated areas of devoloping countries, on the far edge of the globalized economy.

In urban and economically developed areas, one can see how the relationship between cultural and environmental diversity influences rural land use and the relationships between cities, old towns and rural areas.

III - SCIENTIFIC COMMITTEE "DIVERSITY PROJECT"

The "Diversity Project" was launched by the interdisciplinary seminar entitled "Beyond global change: Diversity as a resource" held in Paris in May 1994, which was organized by COBASE and sponsored by the Commission of European Communities DGXII.

The seminar received scientific back-up from:

- Musèum National d'Histoire Naturelle de Paris
- International Union of Biological Science
- Ben Gurion University of Negev
- Institute of Geography, Russian Academy of Science
- Centro Vito Volterra, La Sapienza University of Rome
- Oxford Centre for the Environment, Ethics and Society
- International Association of Botanic Gardens
- Nordic Saami Council
- Natural Management Resources Institute, Stockholm University.

The Seminar aimed to raise the problem of cultural and environmental diversity and human knowledge, to open the discussion of issues relating to indigenous peoples and to start a dialogue between formalised and non-formalised science. On this occasion a Scientific Committee was set up to promote the "Diversity Project" and publish its contents.

The Committee brings together western scientists as well as representatives of indigenous peoples and traditional communities. It is also open to contributions from anyone else interested in working on the topic in question.

The following are the members of the Scientific Committee "Diversity Project":

Working Group

- Massimo Pieri, COBASE, Italy (President)
- Anna Borioni, COBASE, Italy (Secretary)
- Sheik Ibrahim Abu-Rekaik, Beduin Community, Israel
- Darrel Posey, Oxford University, UK
- Paul Richards, Wageningen Agricultural University, Netherlands
- Elina Helander, Nordic Saami Institute, Finland
- Claudine Friedberg, Musèum National d'Histoire Naturelle, France
- Vladimir Kotliakov, Institute of Geography, Russian Academy of Science
- Reuven Yagil, Ben Gurion University of the Negev, Israel
- Erik Arrhenius, Stockholm University, Sweden
- J. Esteban Bermejo, Jardin Botanico de Cordoba, Spain

- Jouni Magga, Nordic Saami Council, Finland
- Esther Mokowa, Njala Sande Society, Sierra Leone
- Amical Debar Taro, Sinti Community, Italy
- Reynaldo Mariqueo, Mapuche Community, Chile
- Secondo Massano, Opera Nomadi, Italy
- Jean Marie Betsch, Musèum National d'Histoire Naturelle, France
- Renè Passet, Universitè de Paris I, France
- Nils Stenseth, University of Oslo, Norway
- Louis Olivier, National Botanical Conservatory of Porquerolles, France
- Joaquin Galarza, Musèum de l'Homme, France

IV - STRUCTURE OF THE "DIVERSITY PROJECT"

We propose taking a qualitative approach to research on diversity, whereby the world is hypothetically divided into biocultural areas, making it possible to analyze situations in view of relational parameters and plan actions at the local level.

- *Aim*

On this basis, the general aims of the "Diversity Project" are:

* To progress from specialized research on biodiversity to interdisciplinary research on diversity conducted in partnership with indigenous peoples, nomadic peoples and traditional local communities;

* To develop an appropriate methodology for carrying on a dialogue and building a partnership between the formalized and non-formalized sciences;

* To develop interdisciplinary, interscientific and intercultural research projects in the areas of environmental management, economics and the use of technologies and resources for the purposes of reversing the trend towards homologation and to identify sound strategies for preserving diversity.

* To develop interdisciplinary, interscientific and intercultural training programmes taught in part by representatives of indigenous peoples, with the aim of broadening and devising new models for the transfer of knowledge.

* To help develop new modes of international cooperation and define new concepts of entitlement to resources and new models of intellectual property.

-Activity Programme

A) The organization of the interdisciplinary, intercultural seminars needed for the examination of topics related to "Diversity Project"

B) The organization of an international meeting on diversity

C) International and Intercultural Course on Environmental Quality

D) Sustainable developments; Research and practical projects in the service of the sustainable use of resources and the interdisciplinary intercultural management of the environment.

A) SEMINARS

In view of the positive results of the Paris meeting, the idea of organizing a series of seminars characterized by an interdisciplinary and intercultural approach was judged highly approrpiate for the purposes of investigating specific topics in depth and researching appropriate methods of dialogue between different kinds of science. The seminars would be held in various countries that offer venues of indigenous life, with the collaboration of local institutions.

The next seminar will be held in Brussels on December 16, 1994 at the premises of the European Commission. The meeting is being organized by DG XII, the Directorate General for Science, Research and Development. It will offer the opportunity to present the "Diversity Project" and discuss its possible development.

Other meetings could also be organized as indicated in the following proposals:

1. Seminar in Israel, hosted by the Ben Gurion University of the Negev and organized in collaboration with the Bedouin community. Suggested topic: the relationships among life under extreme environmental conditions (desert), the cultural and ecological role of key species, indigenous knowledge and resource management.

2. Seminar in Russia, hosted by the Russian Academy of Sciences. Suggested topic: the relationship between rights to traditional resources and models of sustainable development.

3. Seminar in the Arctic region, hosted by the Nordic Saami Council. Suggested topic: comparison between aspects of formal and nonformal sciences, such as their different concepts of time, their perception of human relationships with the environment, and the transmission of knowledge.

4. Seminar in Sweden, hosted by the University of Stockholm. Suggested topic: the relationship between global change and local prevention, focussing on economic and scientific aspects and the predictive capacity of different kinds of science.

5. Seminar in Spain, hosted by the Cordova Botanical Garden. Suggested topic: knowledge and sustainable use of biodiversity in urban areas through the recovery of traditional knowledge, with particular reference to the Mediterranean region.

6. Seminar in Italy (or France), hosted by the University of Rome (or Paris I). Suggested topic: the concept of limits to resources and technology in various economic models (neoclassical, sustainable development, trade, and so forth).

B) INTERNATIONAL CONFERENCE ON DIVERSITY

We propose to organize an international conference entitled *"DIVERSITY: RESOURCE FOR A NEW SCIENCE."* This would be a scientific meeting of great public importance, based on the awareness that it is both urgent and necessary to begin a dialogue between formal and nonformal sciences. The originality of this event lies in its providing what may be the first opportunity for western scientists and researchers to meet cultural and spiritual leaders of indigenous peoples, nomadic peoples and traditional local communities on an equal footing as regards scientific expression.

- Theme

The underlying theme is diversity in the makeup of living organisms and environmental relations. Making diversity the object of research and planning can foster the reorganization of science in interdisciplinary and intercultural terms. To progress in this direction, it is necessary to recognize that the knowledge and experience of indigenous peoples has the same dignity as formal science. Dialogue between different kinds of science can evolve by means of appropriate methodologies defined in joint research projects where equal expression is given to scholars specialized in the study of diversity, researchers who use it, and peoples and communities which are experts in and bearers of diversity.

- Sessions

The Conference will be divided into plenary sessions and work groups in such a way to handle general themes and their specific aspects. At its conclusion a document will be compiled which will be

presented to various scientific bodies as well as the European Communities and Conference of the Parties.

Possible subjects at the International Conference are:

1. Managing diversity

What is diversity?
Key descriptions and key species of the ecosystems
Knowing, using, producing diversity
Biotechniques and biotechnologies
Nomadism: movement as a resource
Manipulating to create or to model?
Diversity in cities
Integrated systems of palnt-animal management.

2. Formalized science and science of life

Man and time: arrow, cycle, or...?
Methodologies of dialogue between different sciences
Forms of living things
What is man without animals?
The transmission of knowledge
Oral culture
The origins of life

3. The right to resources

Traditional rights to resources
Social environmental rules
Collective knowledge
Local law

The principle of exchange
New model of intellectual property

4. Global change and local prevention

Climatic forecasts
The knowledge of environmental signals
The forecasting and adaptation of natural catastrophes
Economy without resources? Values of use and exchange
Economy of living things
Poverty and environmental quality
Indigenous and local people

The Scientific Committee was created in Paris and, with the addition of other interested scolars, will serve as the scientific committee for the Conference.

C) INTERNATIONAL AND INTERCULTURAL COURSE ON ENVIRONMENTAL QUALITY

The purpose of this course is to provide interdisciplinary and intercultural training, with representatives of indigenous peoples and traditional communities participating in the teaching on an equal footing. The course will be designed to train new types of environmental management operators, the goal being to introduce new definitions of environmental quality indicators and new criteria for environmental impact assessment.

D) SUSTAINABLE DEVELOPMENTS

We are involved in examining the following areas of analysis and applied research the common aim of which is to define technologies and/or territorial intervention modes from the point-of-view of the sustainable use of resources:

1. Research on an environmental plan for urban area: Environmental and cultural diversity in Europe - "The electric city".

2. Knowledge and use of biodiversity. A biocultural regional plan

3. Environmental Quality Agency. Environmental certification for industry. Courses in environmental quality, risk and safety.

4. Environmental economics. Economic models, tax systems and regulations. The green market. New waste recycling technologies.

We believe the above areas represent different aspects of a single problem, namely the relationship between man and his environment, a relationship that is currently facing a dramatic crisis, particularly in the industrialized world.

1. RESEARCH ON AN ENVIRONMENTAL PLAN FOR URBAN AREAS

a) Environmental and cultural diversity in Europe

Today, urbanization is the most powerful and invasive form of territorial transformation and is affecting ever larger areas of our planet. It has been calculated that after the year 2000 at least 70% of the world's population will live in cities, some of which will be megalopolies with an unimaginable environmental and social impact.

For a variety of reasons, the highest pollution rates are found in urban areas. This suggests that polluting is an an intrinsically human activity. In actual fact, as we have seen, this has not always been the case and is not, even now, universal. The problem lies rather in the improper use of energy, resources and the environment.

Let us look for a moment at the historic centres of western cities. Each derives its particular character from architectural, town-planning and environmental responses to a natural environment that was originally much more highly differentiated than it is today. Thus, there is no mistaking the historic centres of Amsterdam, Lisbon, Rome or Istabul. However, as soon as we move out into the new suburbs we can no longer distinguish between one city and another. All suburbs are similar, whatever the city, or indeed continent, they belong to.

But then, where do the citizens look for culture? Where do they gather in the event of a calamity? Where do a city's cultural and social activities tend to cluster? We all know the answer. The historic centres of our cities are known for such activities, not our suburbs. But why should that be? It is not enough to say that our suburbs are ugly and characterless. The truth is that our historic city centres epitomize a form of environmental interaction that gives rise to a subtle sense of harmony. They are the product of cultural diversity, of an ancient,

reciprocal give-and-take with their surroundings which has triggered forms that are not extraneous to their inhabitants; sitting on a bench in Rome's historic Piazza Navona we can be overwhelmed with the same sense of wonder at the mystery of life we encounter in the silence of a forest or as we gaze on a deserted beach.

It is not the presence or absence of "greenery" that makes the difference. It is the fact that our historic sites do not evoke the feeling of conflict with nature that is so nervously palpable in our standarized suburbs. If we think about it, our suburbs feel so alien, anonymous, out-of-kilter because they lack any connection whatsoever with the history of the place on which they stand. In other words, suburbs are built with total disregard for the link wetween cultural and biological diversity. The tendency towards uniformity that inevitably makes suburbs identical, whether they are in Calcutta or Rome, Paris or Mexico City, places that are far apart in time and in space, is itself a source of conflict between man and his environment. However, since it is not a natural phenomenon but an invention we can change it or, indeed, decide to do without it.

From these brief introductory remarks, we may draw several basic conclusions:

* urbanisation is not always a bad thing. It is only detrimental when it fails to express the cultural diversity that links the activities of human beings to their surroundings and hence to the proper use of their natural resources;

* ideally, historic city centres should be considered areas of great environmental value, since they incorporate cultural elements of ecological origin which ought to constitute the basis for urban planning and development;

* in cities, the degree of biodiversity declines, but at the same time tends to acquire important new features in a unique

interaction with cultural diversity. These features should be studied very carefully, since they constitute a resource.

b) The Electric City

It is fair to say that the machines and systems that operate in the modern urban environment are not efficient enough with the result that they produce huge quantities of waste. At the same time, urban activities and services cannot be called functional due to the enormous waste of energy and environmental resources they trigger. The irrational nature of urban activities and services means that too much energy is processed in too concentrated a fashion leading to a never-ending output of waste products. The result is that we fail to create the cultural, temporal and technical context necessary for recylcing. At the same time there is a tendential increase in the use of non-degradable non-recyclable materials.

Cities help to reinforce the tendency to standardise the use of environmental resources and are no longer synchronized with the factors such as the surrounding climate and ecosystems which are at the basis of environmental diversification. They tend, therefore, to lead to a reduction in biodiversity.

In this situation it is hardly surprising that all cities have similar problems, ways of functioning and features. However, two important points should be made:

* the city's most important services are related to eduction and information and this urban vocation ought to be preserved and exploited;

* as an "artificial" construct a city can be transformed, modified and improved;

On the basis of the above considerations we propose to carry out an environmental research project devoted to the 'Electric City'. Our aim is to investigate the reorganisation of urban activities on the basis of the hypothesis that sustainable development in an urban environment should aim to reduce the amount of energy usually processed therein and increase its biodiversity. Roughly speaking, this means making technologies more efficient and reducing the amount of resources consumed. With this in mind we propose to emphasise the use of electricity as the primary tool for running urban activities and managing the urban environment.

While we recognize that the production of electricity causes pollution, emissions of gases etc. it is nevertheless the type of energy that can most readily be upgraded, in the sense that it is esier to improve production and distribution and reduce noxious emissions with electric power than it is with other energy forms. In addition it is the most readily integrated power source and the one that offers us the best chance of modifying consumption levels and patterns.

At the same time an all out effort should be made to curtail the use of the internal combustion engine in urban areas since they are not at all efficient and produce vast quantities of noxious emissions. Moreover there has not, as yet, been any significant progress in making them more energy-efficient or in reducing their environmental impact. Finally we must also try to eliminate furnactype central heating systems. The large number of these in existence leads to the release of vaste quantities of noxious gases and particles, while the way they are scattered over the urban area makes it very difficult to monitor their efficiency or safety. The question of central heating (and air conditioning) needs to be linked to the production of electricity in such a way as to permit the use of the heat generated in some form of heat/power cogenerator system.

The "Electric City" would keep combustible fuels out of urban areas. It would downsize the movement of goods and people and is, in addition, a very safe form of energy. Finally, the electric city would enable us to reduce the volume of energy-processing operations that inevitably cause pollution.

- ***Research objectives***

Our research is designed to help quantify and qualify the elements required:

* to define sustainable development models for urban areas;

* to analyse urban energy processing and usage models in order to achieve an improvement in urban functions;

* to define urban environmental quality monitoring procedures and indicators;

* to analyse the relationship between urbanisation, biodiversity and cultural diversity;

* to draw up technical proposals.

- ***Implementation programme***

The programme will focus on the identification and critical analysis of energy systems related to both supply, production, distribution and energy use and to production recycling and waste abatement processes, which are the primary characteristics of urban life. In the process we shall be addressing the following topics:

a) Urban input of energy and environmental components and processes. Analyses, calculation and assessments of:

- fuel cycles. Supply and handling modes, quantity and quality, transportation/distribution efficiency;
- electricity input processes: distribution network mode, quality and efficiency;
- water: supply network and systems, treatment plants;
- identification of environmentally damaging goods, processes and services (Environmental Quality Agency) mobility flows
- demographic movements
- migratory fauna
- climate, heating/cooling, environmental energy

b) Identification of the links between efficiency, quality of life and sustainable development in the urban environment with analyses, calculation and assessment of:

- the primary use of integrated electric power/heat
- the urban energy-environment equation
- energy processing and the environmental impact of mobility
- the environmental impact (on air, water, biodiversity etc) of processes, systems and services;
- waste: production and disposal, storage, quantity and quality;
- radiation: sources, emission and disposal/storage;
- relationship between energy use, biodiversity and health;
- energy/environmental relationship between suburbs and city centres;
- links between energy use and waste;
- links between work, operational practices, services and energy.

c) Urban output of energy/environmental components and processes. Links with external areas/activities. Analysis, calculation, assessment of:

- solid urban waste: quantity, quality, production
- gas emissions: quantity, quality, production
- quantity and quality of merchandize output
- mobility flows
- demographic movements
- migratory fauna
- environmental links with the rural hinterland
- environmental links with farming and industry.

Conclusions

The conclusions should provide technical and cultural data on appropriate methods to be used in order to obtain:

- a widespread reduction in the use of fuel-burning vehicles
- the developemnt of electric goods and passenger transport systems
- the uprating and popularisation of telecommunication and telematic systems and the development of 'telematic markets'
- the use of electricity and the relocation of power stations to out-of-town sites
- the development of systems for the elimination of air/water-borne pollutants
- limitations on the introduction/use of combustible fuels and other noxious substances that are actually or potentially damaging to living things in the urban environment
- the development of biodiversity and its introduction into the urban environment
- the creation of a better balance between the goods/materials brought into the city and the recyclable/biodegradable

- waste produced waste treatment/recycling near city centres as an urban industrial activity
- the use of electric power or heat for central heating and air conditioning
- the elimination of chlorofluorcarbons
- monitoring and modifying the urban climate
- the creation of a continuous monitoring network with facilities for the publication of findings
- the development of environmental safety and monitoring systems
- forest plantation around power stations and other gas-emitting plants for the purpose of absorbing CO2 and promoting photosynthesis.

2. KNOWLEDGE AND USE OF BIODIVERSITY A BIOCULTURAL REGIONAL PLAN

A) The Mediterranean

In view of the EU's environmental policy and priorities as well as the objectives of the Convention on Biodiversity signed by all EU member states, we propose to develop a flag ship project for the creation of an integrated model for the socio-economic management of the region based on the knowledge and sustainable use of local biodiversity.

Starting from the concept of "sustainable development", the definition of which is still under discussion, the present project aims to identify socioeconomic models for the management of the region and its natural resources, which intrinsically and a priori contain the cultural, technological and economic elements capable of promoting the integration of human activities into the dynamic of the regional ecosystems. In order to achieve this, we need to bear the following two essential elements in mind in the development of the new model:

- cognitive and technical data regarding the bond between biological and cultural diversity, an aspect that has hitherto been largely ignored in the management of the environment;

- awareness *"...of the general lack of information and understanding of biological diversity..."* that has triggered the *"need to develop the scientific, technical and institutional know-how capable of supplying the cognitive framework on which to base the planning and implementation of appropriate measures"* (to quote the preamble to the Convention on Biodiversity).

On the basis of the above the general methodological approach underlying the project involves:

- developing a succession of pilot projects to facilitate prompt corrective action whenever the need arises, as it inevitably will;

- the encouragement of localised action that will allow us to conduct methodological and practical experiments;

- a preference for situations offering easier access to and collection of existing information; reliance on cultural and technical input dictated by relevant local experience; involvement of local communities, agencies and institutions.

Specific objectives

- establish a procedure for territorial management based on the knowledge, assessment and sustainable use of regional biodiversity;

- establish a procedure for the identification and monitoring of indicators for measuring the status of the region's environment and biodiversity

Operational programme

The Mediterranean territory is highly distinctive and vary diverse in environmental and cultural terms. National borders apart, its current administrative division into regions may not always correspond to any appropriate or acceptable ecological definition. Nevertheless the regions have a biohistory of their own and there is often a striking match between biological and cultural diversity, with the result that many areas have acquired a highly distinctive identity within their own administrative or political borders.

This offers us the possibility of developing regional management models and extrapolating shared methodologies. At the

same time, we need to construct a separate primary data base for each particular set of circumstances with a view to drawing up plans for diversified action.

The following project for a homogeneous biocultural area could serve as a guide for application to other situations.

The region examined offers a series of interesting features which include:

- a whole variety of ecosystems:
- coastal, wetland, mountains, hills etc producing notable biological diversity
- marked cultural diversity linked to primary use of territorial resources
- extensive human intervention has so modified the rural landscape over time that,in some cases, it is possible to reconstruct the historico-ecological process
- the diversification, extent and exploitation of agriculture
- the presence of important protected areas
- a significant experiences of local authorities in the management of terrritorial resources
- important research activities and istitutions.

Our approach is justified by the fact that we are dealing with a region characterised by diversity at various levels. The link with environmental resources has always played a major role in local history and has lead to interesting historical "experiments" in the use of biodiversity the results of which are to be found in the urban, agricultural and 'natural' ecosystems of the region as a whole. The area also suffers from major pollution problems that derive from its intensive industrialization.

We have tentatively divided our programme into three sections: *"Situation", "Pressure"* and *"Response"*.

Situation

- Identification of 'normal' or basic structures and functions of the region's rural ecosystems, with particular reference to protected areas, woodland, parks 'extreme' zones and peripheral ecological situations;
- relationship between biodiversity and climatic change;
- analysis of the historical transformation process and cultural diversification in the region;
- the relationship between biodiversity and agricultural areas;
- cultural relationship between man and biodiversity;
- traditional know-how and practices contributing to the preservation of biodiversity and ethnobiological assessments

Pressure

- Assessment of the anthropological and natural processes that are transforming ecosystems and resulting in habitat losses, over-exploitation of resources, climatic and demographic changes, pollution etc.
- The relationship between waste and biodiversity.
- The relationship between pollutants and human health
- The relationship between biodiversity, the use of various species and economics
- External influences on regional ecosystems
- The relationship between farming practices, biodiversity and food
- The relationship between biodiversity and demographic pressure
- Anthropological and natural catastrophes
- Measuring, metering and sampling

Response-Management Model

- On/Off-site conservation practices
- The sustainability of farming practices
- Assessments for the development of biological farming
- Biotechnology in protected areas and parks
- The relationship between biodiversity and sustainable development
- Catalogue of the components of biological diversity that are essential for the conservation of the latter (ecosystems and habitats, species and communities, genomes and genes)
- A contribution to the qualitative and quantitative definition of biodiversity
- A contribution to the qualitative and quantitative definition of 'sustainable development'
- A contribution to the definition of 'Environmental Quality'
- Assessment of the environmental risk inherent in current rural initiatives and projects.

b) Biological farming

We consider biological farming practicable in environmentally monitored areas and within a context of sustainable development. In effect the possibility of practising biological farming is intimately linked to the quality of the surrounding environment since this type of farming is intrinsically a production process that incorporates essentially local technical, environmental and cultural elements. Biological farming implies: exploiting local resources, both natural and cultural; winning back land that is over-worked, abandoned or degraded; solving pollution problems deriving from local activities. The basic aim is to incorporate environmental quality criteria into the development process. It goes without saying that any

biologically farmed land should acquire protected status and be subject to the sustainable use of biodiversity.

The present project envisages the implementation of a sustainable development plan based on:
- conversion to biological farming
- the introduction of environmental quality criteria into agroindustrial production
- the introduction of pollutant-abatement and waste-recycling systems
- the creation of a biological quality label for local products that would be recognized under international law.

Work Programme

1. Collection and analysis of data on:

a) Environmental aspects

- the basic structure of local biodiversity
- climatic features
- technical and cultural traditions
- landscape transformation processes
- the current environmental quality of air, water and soil
- the antropogenic phenomena that constitute a threat to both biodiversity and environmental quality

b) Agrotechnical aspects of the current production of farm produce, oil, wine and dairy products

- product quantities
- product and process quality
- current environmental impacts

c) The market

- quantitative and qualitative assessment of the biological produce market
- definition of demand

Project development

a) Assessment of the technical, environmental and economic feasibility of introducing biological procedures into the local production of farm produce, oil, wine and dairy produce;

b) pollutant-abatement measures for existing agrobusinesses and their conversion to environment-friendly practices;

c) definition of the biological quality label and the rules for its use;

d) plan for the development of agroindustrial processes that meet environmental quality criteria.

3. THE ENVIRONMENTAL QUALITY AGENCY

Agency membership would consist of consumers' representatives of local communities, experts, representatives of institutions, producers, representatives of bodies concerned with environmental monitoring and the drafting of technical regulations.

The Agency's main tasks are:

-to analyse and monitor goods, services and processes detrimental
-to the environment and to health
-to assess climatic and environmental changes
-to issue eco-label and eco-audit certificates
-to publish information

In the context, we propose to produce an analysis of environmental risk in particularly critical areas such as industrial zones as a preliminary to the design of an environmental quality risk monitoring network. The agency itself would be responsible for managing the network, and processing and publishing the data collected.

4. ENVIRONMENTAL ECONOMICS: Research project on the economics of diversity

- *Introduction*

Economic analyses and procedures based on neoclassical models and concepts are indifferent to the absolute scarsity of resources. In general, they do not examine the economic value of either biologi-cal and cultural diversity or the waste that is continuously released into the environment. If we sum up the problem in an economic statement of the Law of Entropy (which essentially affirms that there is an irreversable increase in the quantity of non-available natural resources) we may consider the hypothesis that economic processes actually accelerate the increase in entropy.

This faces us with the problem of assessing the relevance of economics and its models vis-à-vis the reduction in species and resources. This might lead us to modify both economic theory and the way it is applied and to develop a new discipline based on the relationship between cultural, environmental and economic diversity, as an alternative to current methodology.

- *Aims*

-to identify or construct ecologically compatible economic models and produce an economic assessment of resource markets and property rights.

-to produce a qualitative assessment of both environmental quality values and indicators and the economics of biodiversity

-to analyse the relationship between cultural, economic and environmental diversity with due regard to the economics of nature

-to develop technical and economic proposals for various biocultural areas.

Work programme

We propose to research the following areas:

A) Relationship between economics and ecology

-economics as an autonomous science and the multidisciplinary approach as a form of organic knowledge;
-economics as a subsystem of ecology: implications
-economics as a life science.

B) The problems of economic language and its concepts of dynamics, process, time and productivity:

- formalism in economic modelling: rigour and relevance;
- the relationship between rational mechanics and neoclassical models;
- the use of time in neoclassical models: dynamic, stationary, cyclic, reproducible models;
-the concept of process analysis: restrictions on the possibility of defining the outer limits and contents of processes;
- the funds-flow system: qualitative distinction between factors of production and marginal productivity;
- a new definition of production function.

C) Relationship between thermodynamics and economics

- enthropy as the arrow of time: methods for defining the direction of economic processes;

- the concept of relative scarsity in a thermodynamic context: implications;
- the problem of resources: setting quantities and prices from a neoclassical and a physio-thermodynamic standpoint;
- energy-matter analysis of economic processes;
- the production of goods and processes in growth models.

D) Relationship between the economy, development and diversity

- the relationship between growth, development and resource management;
- the concept of underdevelopment and sustainable development: new factors and critical aspects;
- the relationship between environmental, cultural and economic diversity: diversity as an element of energy/economic exchange and as an environmental resource;
- the endogenous environment of economic processes; analytical implications;
- global and regional economic policies: differences and relevance to environmental problems;
- the economic value of human activity: an analytical input.

The possible fields of application are:

1. Environmental economics:

- construction of an economic model for the interaction of economic and environmental factors;
- the input/output model, matter-energy analysis for energy consumption and yield;
- entropic models with rational expectations;
- the assessment of environmental quality in production processes;
- the value of waste products;

- the value of diversity;

2. Urban economics

- a multidisciplinary project for the organisation and functional development of urban areas.

3. An economic-energy balance sheet for cities

4. Agrarian economics

5. Research project based on the relationship between hydrogeological failure, pastoral economy, local culture. Proposed areas: to be established;

6. Research project on the relationship between land management and subsistence techniques in extreme environments: areas to be established;

7. Project for the mediterranean regions;

8. Labour economics:

The worker as input and output, models for the estimation of the value of spare time as a scarse resource.

Flexibility, mobility, the limitations to specialised activities. The speed of information flows, human capital: relationships and new organisation methodologies;

9. Public service economics:

The speed of transportation and information flows. The design and definition of a telematic transport project. Comparative cost-benefit analysis;

10. International economics:

International resource markets: rights of owners and users. Analytical models and sectorial research projects. Game theory, simulations, global pollution policies, models and alternative approaches.

Conclusions

Our conclusions should provide the technical, economic and cultural elements on which to establish the appropriate methods to use in order to obtain:

- **indicators of the environmental relevance of economic models;**
- **energy-economic assessments and analyses of waste recycling processes;**
- **indicators of resource scarsity in an inter-termporal context;**
- **property rights and resources;**
- **patents and utilisation rights on indigenous technologies;**
- **a regulation/taxation system that more accurately reflects the scarsity of resources;**
- **parameters and criteria for the valuation of environmental quality as an asset;**
- **economic policy methodologies at regional, territorial and local level.**