

**SOUTH-SOUTH CO-OPERATION PROGRAMME ON ENVIRONMENTALLY
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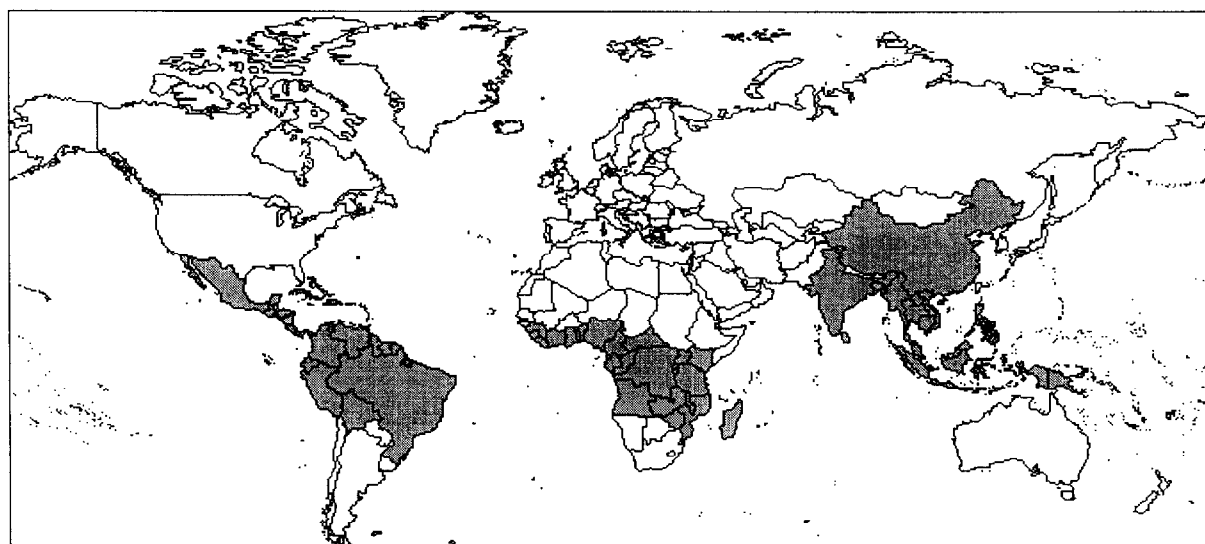
WORKING PAPERS

N° 24, 1998

**SOCIAL SCIENCES AND ENVIRONMENT
IN BRAZIL :
A STATE-OF-THE-ART REPORT**

by

Paulo Freire VIEIRA



The Working Papers series is a publication of the *South-South Co-operation Programme for Environmentally Sound Socio-Economic Development in the Humid Tropics*. The series aims to disseminate the results of the research on Biosphere Reserves on such topics as (i) the prevailing conservation and resource-use patterns and, (ii) the ways of improving the traditional practices and orientation for applied research aimed at a more intensive and sustainable use of the biodiversity to provide a better livelihood to the local population in the buffer and transition zones. On more general issues, the Working Papers are also an attempt to identify key problems that will become areas of concentration for international co-operation.

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Biosphere Reserves or similarly managed areas that are part of the *South-South Co-operation Programme*, are requested to produce an overview of their covering area containing first hand information on its conditions and urging problems.

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Paulo Freire VIEIRA
Social Sciences and Environment in Brazil :
A State-of-the-Art Report

Working Paper N° 24, 1998 (72 pp.)
UNESCO (South-South Co-operation Programme), Paris (France)

ABSTRACT

This state-of-the-art report on social sciences and environment in Brazil describes not only the history of the development of environmental issues, among "green" activists and into social sciences research programmes, but it also assesses new entry points to foster the social-ecological research towards a more action-oriented activity using the ecodevelopment approach as a central point of reference.

From the 1970's up to the 1992 Rio Summit, environmental activism was mostly oriented towards political lobbying through the denunciation of destructive impacts of large-scale economic development projects. Then, as an effect of the transition to democracy and the worsening of the environmental crisis, the environmental movement forms presently a complex multi-sectoral action conglomerate which can, in principle, actively participate in the implementation of local Agendas 21. But, up to now, the State has only made fragmented moves towards the implementation of preventive-proactive environmental policies.

Through a mapping of more than 340 references mentioned, the author presents the main contemporary research on environmental issues. The appropriation mode concept is one of the most elaborated new entry point for an action-oriented research to foster a proactive environmental policy based on comparative studies on experiences of decentralized community-based management of natural resources.

RÉSUMÉ

Ce rapport sur l'état de la question des relations entre sciences sociales et environnement au Brésil décrit non seulement l'histoire du développement des thèmes liés à l'environnement, parmi les activistes "verts" et au sein des programmes de recherche des sciences sociales, mais ce rapport évalue également de nouveaux points d'entrée pour faciliter le développement de la recherche socio-écologique vers une activité plus tournée vers l'action en utilisant l'approche de l'écodéveloppement comme référence centrale.

Des années 1970 jusqu'au Sommet de Rio de 1992, l'activisme en matière d'environnement était surtout orienté vers le lobbying politique par le biais de la dénonciation des impacts destructeurs des grands projets de développement économique. Ensuite, avec la transition vers la démocratie et l'aggravation de la crise environnementale, le mouvement en faveur de l'environnement forme actuellement un conglomérat complexe d'actions multi-sectorielles qui peut, en principe, participer activement à la mise en place des Agendas 21 locaux. Mais, jusqu'à présent, l'État n'a effectué que des avancées fragmentées vers la mise en œuvre de politiques d'environnement préventives et proactives.

Par une cartographie de plus de 340 références citées, l'auteur présente les principales recherches contemporaines sur les thèmes de l'environnement. Le concept de mode d'appropriation est l'un des nouveaux points d'entrée les plus élaborés pour une recherche orientée vers l'action ayant pour but de faciliter la mise en place d'une politique d'environnement proactive fondée sur des études comparatives d'expériences de gestion décentralisée et communautaire des ressources naturelles.

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INTRODUCTION

In recent decades, the growing concern about the worldwide expansion of the environmental crisis has opened up new avenues for scientific innovation. The general point of departure was the recognition that, in the context of the long history of man-environment interactions, the attained scale of destruction, its causes and possible remedies, confront modern societies with challenges of a new kind. We should then rethink radically what is meant by «development» and «progress», primarily because the dominant view of poorer nations catching up with the «developed» ones seems to be no longer socio-ecologically viable and politically legitimate in the long run. Giving a new and vigorous impulse to the search of non-mimetic and non-reductionist development strategies for the South is perceived nowadays as a possible starting point for an encompassing social response to a crisis of civilization.

In searching for a "middle path" between narrow economicism and radical ecologism, a demand for this new development concept has been advanced since the Founex Seminar held in 1971. But the translation of the normative **ecodevelopment** concept -or of substitute labels to denote similar points of view- into co-ordinated, operationally viable planning and management strategies presupposes a solid scientific and technological basis, to be achieved through increasing interdisciplinary integration.

It seems now almost a truism to recognize that more collaborative research efforts is needed to use, integrate and re-interpret the best pieces of knowledge that specialized scientific fields can offer. Researchers should be endowed with the necessary skills to venture outside their original disciplines, thus creating a new profile of intellectual responsibility towards research, professional training, social communication and political decision making.

But if the systemic character of socio-ecological problems has been gradually recognized within the scientific communities, applying system-oriented approaches in order to understand and to confront the complexity of the environment-development nexus, it is however not an achievement that can be taken for granted ! Up to the present, tangible efforts to reach this level of synergy are rather modest indeed (Cf. LEFF, 1986 ; GODARD, 1992 ; JOLLIVET ; MORMONT).

Considering the specificity of the Brazilian context, socio-ecological research in the last two decades has been pursued through various disciplinary perspectives, within the natural and social sciences, and both at the basic and applied levels. Most of the theoretical

and methodological shortcomings in this field of knowledge have been associated with a phase of exploratory research, lack of adequate conceptualization and incipient institutional and professional training capabilities. In addition, a careful assessment of selected pieces of literature shows a sharp contrast between a naïve, rhetorical commitment to interdisciplinarity and a recurrent option for discipline-based and multidisciplinary analytical frameworks. This pattern of scholarship contains usually only small slices of information derived from very large, complex real-life wholes. Through this reductionist point of view :

«the disciplines generally explore the larger interactions of the problems they are dealing with "from the discipline up". That is, they take the traditional academic division of labor as their starting point and then seek to build upon, expand, and reach out from that "slice" of the whole towards a larger understanding»
(Cf. DAHLBERG & BENNETT, p. 3).

A careful distinction should be drawn between multidisciplinary and interdisciplinary modes of integration. The former implies the involvement of individual researchers in exploring a common problem based on their particular areas of expertise, but with low degree of interrelationship among them. On the other hand, the viability of an interdisciplinary approach presupposes a common view underlying the component analysed, that is, a shared theoretical and methodological framework providing a systematic linkage among the several dimensions of the intended research effort. Members of the research team are thus immersed - since the beginning- in project design, thus creating in concert the general research **problematic**, implementation and evaluation.

More recently, as a result the mobilizing effect of the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992, the focus of the academic debate began to shift towards the identification of the deep, structural roots of our environmental crisis. Against the background of the «preservationist» tradition in political ecology, the **counter-intuitive** dimension of the environment-development nexus began to be perceived as a socially relevant issue on the part of a larger segment of scholars, planners and decision-makers. Contributions focusing on the search for alternative courses of action to face this challenge incorporates nowadays a massive and ubiquitous -yet conceptually still imprecise- reference to the sustainability concept.

Endless controversies about the proper way to define «sustainable development» continue to monopolize the debates in academic circles, in development institutions and in the mass media. In each position can be identified a different perception of the relationships

between human activities and nature, of the research priorities, of the relevant empirical evidence and of the ethical imperatives to be reinforced. Hence, the proponents tend to prescribe different strategic and tactic moves for policy-makers. Moreover, a substantial part of this debate seems used mainly as a shield for the consolidation of existing roots of socio-ecological imbalances within nations and in the world system.

The ecodevelopment approach mentioned above is just one of several existing styles of thought and action facing the environmental crisis. It can be viewed up to the present basically as a way of approaching planning and management problems, rather than as a rigorously prescribed set of procedures or as a catalogue of technological ready-made solutions. Curiously, its historical emergence and evolution, its conceptual framework and ethical-political assumptions have been submitted to a rather superficial scrutiny by both the community of scholars and of development actors in Brazil, where the terms of reference for internalizing the environmental challenge were taken essentially from the Brundtland Report of the World Commission on Environment and Development, on the eve of the Rio Summit (UNCED 1992).

Here, this concept is used to denote a knowledge-intensive, simultaneously preventive and pro-active kind of environmental policy, concerned basically with the assessment of underlying structural conditions giving rise to imbalances in man-environment relations and with the design of long term innovative "win-win" strategies of social change. System design is the central concern of this operational or "problem-solving" concept, where emphasis is placed on the need to modify the planner's field of vision in order to tackle integratively into account such diversified issues as new consumption patterns and production systems, changing life-styles, value changes, equity and "governance". In this context, both decentralization and "centralized synthesis" are considered complementary instances in establishing an effective institutional apparatus for future-oriented decisions : the former reinforces the utopia of rationalized **co-management** of society, and the later provides the capabilities for coping with widespread interdependencies, uncertainties and long term systemic effects (*Cf.* OZBEKHAN ; ACKOFF ; GODARD & SACHS ; JANTSCH ; SACHS, 1977).

In other words, alternative policy options are to be explored in a pragmatic, inventive way, through careful consideration of the five **interdependent** dimensions present in every socio-cultural system : the economic, the social, the political, the cultural and the ecological. The ecodevelopment perspective moves beyond the commonplace recognition that the

existence of bio-physical limits to economic growth in the long run must be faced, as beyond the ill-informed assumption that all undisturbed ecological systems in the biosphere are necessarily viable. Indeed, applied scientific research being conducted from the ecodevelopment perspective aims to clarify how, in what ways, and to what degrees the socio-economic objectives traditionally associated with growth can be reconciled with concerns for environmental quality, social equity, political decentralization and cultural diversity. At the same time, it remains a priority in the research agenda to demonstrate empirically **how** this intended multi-level planning and management structure can operationally take place in specific ecological settings.

Thus, we are dealing with the gradual epistemological refining and socio-political legitimation of a **comprehensive** and **normative** approach, fundamentally concerned with the sum of objectives and measures designed to regulate society's interactions with the environment as a natural system in the long run (*Cf.* LEFF, 1977 ; GLAESER ; SACHS, 1986a & 1986b ; COLBY ; SIMONIS).

The citizen's participation in planning and management affairs is meant to play a central role in this approach, both as an end goal in itself and as a means to achieve the other interdependent objectives. Planning and management are seen as ongoing social learning processes, to be worked out to avoid socio-ecological ruin-paths and to enlarge the matrix of creative, future-oriented political choices.

In a certain sense, producing scientific knowledge that contributes both to make social change and learning a self-generating and self-maintaining process and to open new spaces to decentralized problem solving in development policy and praxis could be envisaged as a special variant of contemporary **action-research** (*Cf.* THIOLENT ; GOYETTE & LESSARD-HÉBERT). Here, following the lucid comment of I. Sachs, a continuous feedback from practice to theory is called for :

«critical assessment of development/maldevelopment processes cannot be left to the sole responsibility of scientists. The civil society ought to establish its own management institutions in this field, in addition to the machinery set up at the governmental and intergovernmental levels» (*Cf.* SACHS, 1992, p. 8).

Research and theorizing is badly needed to illuminate how this dialogue between theory and practice can effectively take place as an evolving pattern of interactions submitted to the

constraints imposed by the globalization trends (Cf. DAG HAMMARSKJOLD FOUNDATION ; NERFIN, 1977 & 1986 ; SACHS, 1980 & 1993 ; SACHS *et al.*, 1981 ; CLÜSENER-GODT & SACHS).

This paper offers an exploratory assessment of the current status of social science research on these topics, including selected contributions issued from researchers -both in universities and public applied research institutes- associated with the disciplines of sociology, social psychology, social anthropology, political science, human geography and economics. The identification and mapping of research problems, analytical approaches and institutional linkages were undertaken using the ecodevelopment approach as a central point of reference. Special relevance is given to the identification -in the context of post-UNCED 1992- of important research gaps, vis-à-vis the need to foster science and technology developments in the near future.

I- ASPECTS OF THE ENVIRONMENTAL CRISIS IN CONTEMPORARY BRAZIL

In what follows, an attempt is made to approach the singular configuration of the Brazilian environmental crisis from the specific perspective of the trajectory followed by "green" activism in the last twenty five years. The challenges to be matched by socio-ecological research are thus placed in the wider context of the contradictory patterns of political responses to the environmental predicament. To trace these lines of evolution, I will rely mostly upon the arguments developed in a paper written in collaboration with Eduardo Viola before UNCED 1992 (Cf. VIEIRA & VIOLA).

The Brazilian Greens have just recently begun to move beyond the ideology of their formative years, based mainly on the creation and dissemination of public awareness about increasing environmental disruption in certain areas of the country. Historical experience demonstrates how difficult it is to link in a coherent political agenda the aspects of conservation of natural resources and promotion of new development options to better confront poverty, structural unemployment, disease and social exclusion.

At first glance, it appears that the highly unequal distribution of economic and political power, added to the astonishing levels of environmental disruption attained in the last decades, could have pushed environmentalist forces from the outset to a closer involvement with the complexities of the **development-environment nexus** in the policy-making realm. This, however, has not been the case. As a consequence, and in agreement with D. Cleary (1992), it seems that environmentalism in Brazil would be better understood if considered as

being up to the Rio Summit a conservation-oriented activity of **political lobbying**. This pattern of political involvement provides the ground for new types of political demands to other already institutionally-consolidated social movements. However, it turns out that, as a matter of fact, the Greens were essentially oriented to broaden the environmental appeal to those sectors of society which otherwise might not have been interested in dealing with issues so remote from common sense.

In spite of the impressive socio-ecological debt that will need to be matched in the near future, as a consequence of five decades of modernization based on high rates of economic growth coupled with income concentration at the upper level of society, empirical research into social perceptions, determinants of attitude formation and patterns of political action related to man-environment issues remains up to now largely incipient in Brazil (*Cf.* GUIMARÃES ; VIOLA, 1987 ; RATTNER, 1991 ; VIEIRA & MAIMON ; HERCULANO).

1) The formative years

The pioneering work done, for instance, by A. Diegues (1983, 1987 & 1988), C. Minc, J. Pádua (1987 & 1989), E. Viola (1987 & 1988), E. Viola & H. Leis (1990) and S. Crespo & P. Leitão demonstrates that the environmentalist "movement" in the period 1971-1985 was restricted to an effort to denounce the destructive impacts of large-scale development projects. From 1985 onward, passing through the promises and achievements of UNCED 1992, the launching of a gradual process of institutionalization can be identified. Activists began to experiment with new organizational patterns to overcome the political shortcomings of dogmatic ecologism, on the basis of the perception that poverty is simultaneously the cause and the effect of environmental damage. The issues concerning conflicts of interests around alternative options to cope with the satisfaction of basic needs, and to ensure fundamental human rights, became thus gradually a new element of the political debate all over the country.

Considering the central features of this period, the term movement is used here in a restrictive sense to denote an asystematic juxtaposition of action forms developed in situations of conflict on the part of small-scale, site-specific and interest-specific groups. This kind of activism was informed by a pluralist mix of ideologies and could not be subsumed under the still dominant concepts of new social movement (*Cf.* MELUCCI ; OFFE) or historical movement in line with the frameworks developed by A. Touraine, J. McCormick or R. Paehlke.

Several exogenous and endogenous factors were advanced to explain these first moves. The exogenous includes predominantly the political impacts of the Stockholm Conference, the worldwide expansion of the informational-communicational revolution, the erosion process of the Marxist left and the return of exiled political activists immediately after the political amnesty of 1979. Among the endogenous ones, it seems important to mention the dramatic intensification of socio-ecological ills as an outcome of the Brazilian «economic miracle», the formation of a new middle class demanding higher living standards, the beginning of a gradual political liberalization strategy in 1974, after the failure of the leftist armed revolutionary struggle, and the ambivalent relation between a rhetorical concern about conservation of the natural resources base and the ostensive political-economical reinforcement of predatory behaviour patterns.

The Stockholm Conference produced a limited impact on the public opinion, but aroused creative energies in those groups already sensitive to the worsening conditions of the bio-physical environment throughout the world. At that time, Brazil was subjected to acute political and cultural repression, and the Government supported the fight by several Third World countries against recognition of the crisis. This move was consistent with a domestic policy based on the attraction of polluting industries from the North and on the fostering of migration of poor rural workers to the Amazon region. Declaring this region uninhabited land in urgent need of settlers, the Government attempted in fact to demobilize the renewed struggle for agrarian reform carried out in more crowded areas of the country.

The Federal Department for the Environment was created in 1973 to mitigate the adverse coverage Brazil had gained after Stockholm. Some measures concerning pollution control and creation of natural reserves were undertaken by the State, but without giving up the usual support for intensive, short-sighted exploitation of natural resources. New directives concerning environmental quality have been advanced, rooted in the principle that not only the polluter, but the whole society should pay for damage. These directives corresponded to the worsening of environmental ills in urban settings, specially industrial pollution and sewage. In this context, the relation between State agencies and environmental groups remained ambivalent : grassroots organizations perceived State agencies as dealing too softly with polluting industries, while State agencies perceived grassroots as politically naïve and technically incompetent. As a consequence, in contrast with the historical experience in the North, the space for political bargaining was built up in the absence of the historical pre-eminence of civil society.

In relation to the endogenous determinants of "green" activism, it should be remarked that the impressive economic growth rates attained between 1967 and 1979 goes hand in hand with dramatic social-ecological costs. The maintenance of post-War policies, including those which emerged during the authoritarian period, were systematically widening the gap between poorer and richer sectors of society. In spite of the emerging sensitiveness to the negative spillover of uncontrolled resource depletion, the «Brazilian Miracle» has been directly responsible for an ever increasing accumulation of severe damage. Soil erosion, salinization and massive use of chemical inputs in commercial agriculture and water pollution, for instance, have continuously degraded the land's productive capacity.

The internalization of post-materialist value systems by more educated segments of the middle class (particularly the youth) in the South and Southeast should be considered as another important endogenous conditioning factor. From this point of view, the Brazilian case has many similarities with the North American, Western European, Australian and Japanese cases (*Cf.* INGLEHART). The difference lies probably in the scope of the social sector where post-materialist values emerged : this sector being much more incipient in Brazil, though similarly a product of economic affluence. Although small compared to its equivalent in the developed countries, the "post-materialist generation" predominates among "green" activists. In this sense, the significance of a minority armed with a limited consumption potential and educational background should be recognized as this segment remains proportionally much more important in comparison.

As a last endogenous factor explaining the emergence of environmental politics, one should not forget the permeability of Brazilian culture for issues related to the specificity of the country's natural resources endowment. Brazil's astonishing biodiversity has deeply penetrated the social imaginary. This fact has underlain the claims for independence from colonialist ties, but has gone paradoxically hand in hand with destructive patterns of resources management favouring the economic interests of European societies. As J. Pádua (1989), W. Dean (1990 & 1996) and J. Drummond have pointed out, Brazil has a long and significant tradition of thought about the use of natural resources, stretching back to the early XIXth century. As a consequence of the several cycles of economic development, large segments of the Atlantic forest have been destroyed and the predatory component of pre-industrial activities can be found in the political thought of writers and politicians such as José Bonifacio, Euclides da Cunha and Alberto Torres. Expressions like these probably have no equivalent in other Latin American countries. More recently, the same reverence for natural

exuberance was expressed by avant-garde movements in popular music, visual arts and poetry which attained influence among the masses. In spite of these tendencies, it seems problematic to believe in the existence of an overarching environmental movement.

From the organizational point of view, in this first period the political perception of "green" activists was restricted mostly to issues of local scope, in spite of some campaigns of regional and national relevance. Relevant issues in environmental conflict management include the project of the new São Paulo airport in one of the last remnants of the Atlantic forest (1971), the frustrated campaign for saving the Iguazu waterfalls in the Paraná river (which would be flooded by the giant Itaipu dam reservoir), the mobilization around the problems of intensive deforestation in Amazonia, and the movement against the implementation of nuclear energy plants in the State of Rio de Janeiro (*Cf.* ANTUNIASSI, 1989).

During the early 1980's there was a national campaign targeting the high consumption of insecticides, herbicides and fungicides used generally in agriculture. As a result, laws controlling the use of agro-chemicals were passed in the South and Southeastern States. Nevertheless, the campaign was not strong enough to defeat the lobby of the producers' corporations at the Federal level.

During this phase, the most common targets for the environmental struggles were as follows: factories conspicuously polluting the atmosphere or water systems, projected industrial plants suspected of being highly pollutant, protected areas whose degradation has been initiated by private semi-clandestine exploitation or by private predatory use, legally-defined ecological reserves (such as national, state or country parks) suffering from lack of supervision and control on the part of governmental departments and, finally, urban areas of historical or architectural value under threat of being destroyed by technocratically-conceived development programmes.

The efficiency of environmental struggles remained extremely low in terms of effective short term gains, but the "ecologizing" effects exerted upon the mentality of qualitatively important sectors of the public opinion is to be taken into account. Environmental disruption has not been halted, let alone reversed, but the perception of the problem grows slowly as the social visibility of some activist organizations is strengthened.

At the beginning of the 1970's the Greens remained isolated from the masses, failing to connect the environment to the worsening socio-economic crisis. Approaching the 1980's, they became strongly influenced by the dissemination of the radical democratic discourse in the transition to democracy. Greater sensitivity to issues concerning human rights and equity

led an important contingent of activists to realize that the connection with popular sectors was to be treated more seriously. For the first time, in many industrial cities a process of concerted dialogue with union activists was sought. As a result, case studies focusing on "green" support of grassroots involvement for environmental quality in urban settings began to emerge in the social science literature (*Cf.* FERREIRA, 1991).

Still in the course of this formative phase the ideological spectrum of the Brazilian Greens comprised the following positions.

* **The eco-social democrats** were proposing the handling of contentious environmental issues in the spirit of a socially regulated market economy.

* **Eco-socialists** tried to recreate the socialist utopia according to the new ecological imperatives.

* **Eco-fundamentalists** defended a community-oriented, austere strategy based on a skeptical assessment of industrialism's future, refusing any involvement with traditional ways of doing politics and promoting experiments with new life-styles.

* **Eco-realists**, by contrast, believed in the viability of a national project that keeps its distance from the liberal and the Marxist traditions. In this sense, they suggested a transitional strategy relying on selective coalitions of environmentalism with other progressive social forces.

In spite of some common views between eco-social democrats and eco-realists, the latter set the focus upon the decentralizing and participative dimensions of political life. If the eco-social democratic conception of the allocative process distinguishes the state and the market as the main regulative parameters, eco-realism stresses the broad political potentialities embedded in the process of strengthening civil society (*Cf.* VIOLA & BOEIRA ; VIOLA & LEIS, 1990).

Summing up. The main target of environmentalist forces was to raise social perception of the virulence of usual predatory patterns of resource use and to build a social identity for action patterns set in motion, under the ambivalent interplay of opportunities and constraints imposed by the military regime. At the same time, there occurs a gradual involvement of "green" forces with the general struggle to extend the limits of social and political citizenship in the country. Compared with other institutionalized social movements, however, its performance touched only peripherally the dynamics of the transition to

democracy. Unable to attain the much needed visibility among the masses, the Greens remained virtually at the margin of the policy-making arenas.

2) UNCED 1992 and beyond

From 1986 onward the Federal Department for the Environment launched the National Council for Environmental Quality (CONAMA), attached to the presidential cabinet. Two years later emerged the Brazilian Institute of the Environment and Natural Renewable Resources (IBAMA), the executive branch of the National Environmental System (SISNAMA). As a consequence, the set of institutions involved with the management of renewable resources was placed under a unified conservationist policy. Searching for a better articulation of the local, provincial and national management spaces, the emphasis was set on the design of decentralized, participative and scientifically well informed management strategies. At the provincial level, this second phase of "green" activism was related to the expansion of environmental related agencies, improving monitoring and control capabilities. The legal figure of criminal responsibility for environmental damage, for instance, opened to the civil society the prerogative to counteract development projects issued even by the public sector itself.

A gradual interlinkage with other social movements settled a broad and heterogenous set of political actors under the banner of **socio-environmentalism**. Can be mentioned, for instance, those groups affected by the construction of large dams, Amazonian rubber tappers involved in the expansion of Extractive Reserves in the humid Tropic, Indians (mostly from the Amazon region), some sectors of the rural workers who gave an environmental content to their fight for the land reform, feminist and pacifist groups, neighbourhood associations interested in the issues of environmental security in urban settings, consumer and labour health leagues, scientific researchers and research associations and «new age» activists (Cf. VIOLA & LEIS, 1990).

During the meetings of the Constituency Congress in 1987-1988, a Green Parliamentary Front was created to incorporate a chapter focusing the theme of environmental security in the new constitutional Charter. But only two party organizations became (at least rhetorically) truly involved with this challenge : the social-democrats (PSDB) and the *petistas* (PT). The efforts to create a Green Party collapsed as a consequence of its insignificant performance in the presidential election of 1989. A recurrent type of argument held by

political analysts at this moment stresses that these attempts were unsuccessful at that time mainly as a result of: i) the impressive heterogeneity of the ideological spectrum of environmentalist forces and ii) the low degree of political support offered by other social movements, including the more conservative ones, due mainly to their incapacity to perceive ecological and social imbalances as two sides of the same coin (Cf. VIOLA, 1988 ; PÁDUA J., 1989).

Indeed, until the mid-1980's, environmentalist forces approached only in a rather superficial way the debate about the ecological limits to economic growth and the need for alternative development styles. A substantial change in perception was triggered by the gradual worsening of the global environmental crisis, overriding the traditional hegemony of Marxist models of political analysis. In addition, the decision to host UNCED 1992 in Rio de Janeiro played an important role. From 1985 onward, a less reactive mood in this debate gathered weight through increasing involvement of scientific groups and entrepreneurs oriented towards the adoption of the sustainability principle.

The growing political relevance of action-oriented scientific groups can be assessed through the impressive expansion of the network of post-graduate programmes interested in the advancement of basic and applied socio-environmental research all over the country. This network includes federal Universities dispersed in the States of Pará, Alagoas, Pernambuco, Ceará, Distrito Federal, Rio de Janeiro, São Paulo, Paraná and Santa Catarina. The joint effort relating grassroots activists and research groups has lent strength to the former's gradual involvement in natural resources management activities in the remnants of the Atlantic forest, in the savannah and in coastal zones.

On the other hand, to the growing segment of entrepreneurs sensitive to the discourse on sustainability, the issue of environmental security offers new frontiers of opportunities for business in some specific sectors such as, for instance, renewable energy, sewage and water supply equipment and ecologically-sound agriculture (Cf. MAIMON). But, under the constraints of international competitiveness imposed by the external market, only a small number of enterprises are in the process of seriously internalizing substantial changes in their productive practices. In spite of advances in environmental legislation, the regulatory mechanisms set in motion by the public sector have been clearly insufficient to tackle the intensity of destructive impacts of the use of natural resources generated by the functioning of the industrial sector. The predominant attitude is thus reactive or *ex post*, where enterprises tend to reduce pollution levels mostly at the end stage of the production process (Cf. GUTBERLET).

At present, professionalized "green" activism is concentrated mostly in the South and Southeastern regions. But international sensitivity, availability of funding and technical assistance have provoked a persistent expansion of political involvement in the Amazon region. This **problematic** plays an important role in transforming the environmental question into a target strategically useful to other social movements, usually in search of conjunctural bargaining opportunities in the provincial, national and global political arenas (Cf. DIEGUES, 1996 ; COSTA ; VIOLA & LEIS, 1997).

In the fragile Amazonian ecosystems, just a few years of intensive mechanized cultivation, coupled with ranching practices, was enough to increase at an astonishing level the pace of desertification, the economic and political dominance of profit-seeking corporations and large-scale private plantations and the destructive impacts upon indigenous communities (Cf. MORÁN *et al.* ; MORÁN, 1990). Efforts to restrain disruptive tendencies and to recreate socially and ecologically sound strategies could be effective only if there is a way to counteract migration from the Southeastern and Northeastern regions and, at the same time, to abolish tax incentives and subsidies for cattle ranching and mechanized agriculture (Cf. FEARNSIDE, 1989a & 1989b ; SAWYER *et al.* ; CLÜSENER-GODT & SACHS).

Political involvement in the Amazon region has distinctive features both in relation to the western type present in southern Brazil and to the experience of other Latin American countries. Organizations representing local non-urban people (rubber tappers, Indians, fisherfolk) are at the core of Amazonian environmentalism. They have been supported mostly by international non-governmental organizations (NGOs) and scientific communities.

The intensity of the interplay between domestic and international environmentalism makes an important difference here. On this point, D. Cleary (1991 & 1992) argues that :

«it would be a serious mistake to interpret the recent growth of environmentalism in Brazil as a function of international concern alone, but it has had two important effects. The most noticeable has been to force the State to deal much more seriously with environmental issues, as a result, for example, of tying conditions to multilateral loans. This has opened up a political space which did not exist a decade ago, and has been one of the most important factors behind the increasing visibility of the environment in the country's political arena. The second effect has been the consolidation of very effective linkages between certain Brazilian groups and international organizations» (Cf. CLEARY, 1992, p. 152).

At the beginning of the 1990's, Green forces form a **complex multi-sectoral action conglomerate** whose actors include NGOs, technicians and directors of environment-related State agencies, scientific research groups and managers. In spite of impressive and conflict-laden differences in perceptions and attitudes, networking among them was intensified through the 1992 Summit and its follow-up activities. But political action patterns construed on the basis of strategic options that transcend the still dominant pattern of distrust vis-à-vis the State and the market and incorporate the search of a new **governance** concept are still scarce (*Cf.* SOUZA ; CRESPO & LEITÃO ; FREY, 1997 ; VIOLA & LEIS, 1997).

On the basis of a recent report accomplished by the Brazilian Association of NGOs, S. Crespo (pp. 290-296) pointed out that there is now a network of approximately 1 500 NGOs concerned with developmental and environmental issues in the country. The majority continues to operate as non-professional, grass-root organizations fostering mainly environmental education in the context of an emerging new civic culture (*Cf.* HERCULANO ; SCHERER-WARREN, 1998).

Up to now Brazilian environmentalists have shown an extreme organizational fragility in the effort to integrate the planned social change component into their political agenda. This implies the lack both of group cohesiveness and analytical capabilities for tackling the complex means by which power and influence are acquired in a social system already inserted in globalized economic and cultural circuits. However, political actors operating in the socio-ecological realm can, at least, find in the ecodevelopment approach and in the implementation process of local Agendas 21 a coherent focal point of reference for gradually overcoming internal conflicts and actualizing politically relevant linkages (inter-organizational and inter-movement networks) with a broader spectrum of social forces and with the public sector (*Cf.* FISHER ; SCHERER-WARREN, 1995 & 1998 ; CORDANI *et al.*).

Considering the most relevant follow-up initiatives of UNCED 1992, the moves toward effective implementation of the Conventions on Climatic Change and on Biological Diversity should be stressed. Both were ratified by the Brazilian National Congress in 1994. The same year surfaced in the political arena the Interministerial Commission for Sustainable Development (CIDES) and the Committee charged with management of Climatic Change issues, the latter in the realm of the Ministry for Science and Technology, while the former operates as a consultative board attached to the Presidential Cabinet. Today, a broad set of social actors (ministerial staff, political authorities, representatives of entrepreneurs and NGOs)

can, in principle, take part in all those issues related to the Agenda 21 follow-up (Cf. REBOUÇAS).

Energy and natural resources policies offer interesting points of entry for an updated assessment of these institutional innovations. A new impetus has been given recently to the largest biomass liquid fuel programme existing in the world: the now twenty year-old National Alcohol Programme (PRO-ÁLCOOL). Concerning other types of alternative energy sources, vegetable oils and solar energy are being subjected to a renewed debate on the basis of ongoing experimental pilot projects (Cf. MOREIRA). On the other side, in the field of biodiversity use and management, a National Programme for Biological Diversity (PRONABIO) was designed in 1994 as part of the efforts to implement the Convention on Biological Diversity (Cf. PÁDUA M.). At the same time, new spaces for public involvement in biodiversity management projects are being opened through the Pilot Programme for the Protection of Tropical Forests (PP-G7), supported by the Rain Forest Trust Fund and the World Bank, and through UNESCO's vigorous initiatives in the field of the Programme of Biosphere Reserves.

Lastly, a few words concerning the effort that has been made during this period to transform into action the recommendations expressed in the most comprehensive and far-reaching but non-binding document issued from the Rio Summit: **Agenda 21**. Some of the formal pre-conditions (legal and political) to assure the involvement of citizens' movements in corresponding decision-making processes can be seen as partially consolidated. Even without clear directives issued from the national level, at the provincial and local levels can be identified several attempts to elaborate and implement local Agendas 21. This effort has been supported mainly by segments of public sector technical staff and NGOs in tune with the "spirit" of the Rio Summit (Cf. VIOLA & LEIS, 1997, p. 276). However, I agree that:

«the road before these movements to achieve this goal is still long and calls for a greater clarity of purpose, better mutual understanding among the different components of these movements and also for setting the criteria of their representativeness» (Cf. SACHS, 1992, p. 5).

Viewed along these lines, the fragmented moves oriented towards the gradual implementation of Agenda 21 have been jeopardized through several factors. These range from the persistence of the traditional pathologies of the Brazilian political culture -cronical instability of political agendas and leadership, corporativism, corruption, clientelism, obsolescence of the governmental structure and ongoing controversies about how to tackle

State reform- to the difficulties involving the process of consensus-building among a rather heterogenous set of political actors (*Cf. RIBEIRO M. et al.*).

Hence, if the democratization process has opened up large spaces for participation by the formerly excluded, and has consolidated legally the arena for open political party competition, the shrinkage of resources and the decreasing ability of the State to respond to increasing popular demands produces a context of rising frustrations concerning the effectivity of environmental management practices. Governmental capabilities to control the persistent threats to the bio-physical environment have been literally "submerged" by assumed priorities that have to do with fulfilling the requirements of structural (economic and administrative) adjustment policies set in motion under the auspices of multilateral organizations, the deteriorating process of public administration or the short term political considerations, in a narrow range of options left by often contradictory national and international demands and conjunctures. In addition, the roles attributed to the different levels of public administration in the design and implementation of environmental policies are ill-defined. The reassessment of infra-constitutional legislation to cope with the superposition of conflicting rules becomes thus inescapable. Last but not least, preventive-proactive environmental policy makes sense within a long term perspective and their results are often not visible in the short run. This is one main reason why the State has so far shown a low effective involvement in fostering a co-ordinated and a scientifically well-informed strategy to implement local Agendas 21.

II- MAIN RESEARCH TRENDS BEFORE AND AFTER UNCED 1992

As I have suggested in the introduction, failure to think on the basis of an encompassing analytical framework offering the necessary guidelines to the co-ordinated design and implementation of ecodevelopment alternatives, perhaps constitutes one of the major shortcomings of the ongoing effort to better organize collective action around socio-ecological issues in Brazil. In proposing this thesis I rely on the assumption that proposals for practical environmental policy would be better supported by new instruments for understanding the nature and modes of operation of eco-social systems, where growing structural and functional complexity, hierarchical organization, non-linear relations among components, instability, irreversibility and learning are the norm. Underlying assumptions are crucially important parts of the context within which problems concerning man-environment

interactions should be interpreted. It is this new interdisciplinary point of view that might determine the essential questions to be asked, the kind of data to be collected and analysed, and the strategies for individual and collective action to be worked out. Here we are faced with a **gestalt switch** in perception through which relevant concepts, empirically testable sets of statements and values, are unified into a radically new epistemological platform (*Cf.* VON BERTALANFFY ; PRIGOGINE & STENGERS ; DUMOUCHEL & DUPUY, 1983 ; AIDA *et al.* ; GARCÍA ; LEFF, 1986).

The intellectual charge has changed from being oriented causally towards one-dimensional approaches in the form of singly identified chains of cause-and-effects to plural approaches considering interacting causal patterns which produce **counter-intuitive syndromes**, that is to say systemic in their essence. The usual tendency to base research and policy recommendations on partial analysis using linear frameworks is transcended by an effort to see non-linear phenomena arising from the feedback and feedforward connections in the causal web, and in addition to seeing these as the essential dimension of the analysis. Lastly, issues concerning man-environment relations are no longer seen as research objects separated from the social-cultural domain of values, norms, institution building and their changes. **Linkages** become the central topic, as the involved systems' complexity usually resists analytical-reductionist modes of perception and analysis, this means setting up processes of basically political learning (*Cf.* HOLLING ; ATLAN ; LE MOIGNE, 1990 & 1994).

However, recent efforts to reach interdisciplinary integration in research projects and teaching programmes, and in transmitting the produced results to the policy-making realm, remain increasingly disappointing. This point of view can be assumed even if it is considered that a holistic understanding of the structural causes and consequences of changing environmental conditions demands a piecemeal, considerable time- and energy-consuming effort to assimilate and re-elaborate knowledge developed in practically all existing academic disciplines (*Cf.* VIEIRA, 1993a).

To better understand this gap, we should not underestimate the role of controversies among researchers concerning the proper way to ground inquiry about man-environment interactions as a new and autonomous branch of basic scientific knowledge. One of the most influential lines of thought advanced in the last decade to tackle this challenge is represented by the so-called **new human ecology approach** (*Cf.* SCHNAIBERG, 1975 & 1980 ; CATTON & DUNLAP ; DUNLAP & CATTON ; BURCH & DE LUCA).

In a broad sense, the concept of human ecology denotes an area of research concerned with the description, explanation and prediction of structures and processes that condition the diversity of man-environment interactions. Pioneering work in this field has been realized from a sociological perspective by Park and Burgess in 1925 and Hawley in 1950. These classical, equilibrium-based approaches have been superseded since the beginnings of the 1960's by the notion of "ecological complexity", a sort of re-elaboration of the biologist's concept of ecosystem that takes into account the substantial differences between the socio-cultural and more fundamental bio-ecological orders. Culture, norms and organizational patterns are assumed as crucial as ecosystem variables for the analysis, extending the debate beyond the level of neo-Malthusian conceptions of **carrying capacity** (Cf. DUNCAN, 1961 & 1964 ; DUNLAP & CATTON, p. 251).

What is at stake in this more updated version of human ecology is the search for reliable answers to some guiding questions as to : **i)** how interdependent variations in population, technology, culture, social systems and individual systems influence the bio-physical environment, or **ii)** how resulting changes (and other variations) in the bio-physical environment modify population, technology, culture, social systems and individual systems, or any of the interrelations among them.

The central problems involving political regulation of resource use, quality of life and survival in the long run seems to define the problematic of environmental sociology and the new human ecology. Nevertheless, the idea that socio-ecological research constitutes just a new and more complex defined research area within the sociological tradition can lead to inconsistencies in the treatment of the interfaces between traditional social science disciplines (Cf. BUTTEL). In addition to the sociological tradition, other important axes of human-ecological research should be acknowledge in anthropology (Cf. STEWARD ; ANDERSON J. ; HARDESTY ; MORÁN, 1990 ; NEVES), in geography (Cf. ISARD) and in biology itself (Cf. MICKLIN).

A competitive epistemological platform to build an integrated socio-ecological field of inquiry can be labeled **open systems-oriented human ecology**. Here the analysis of composite **eco-social systems**, which includes both natural and socio-cultural systems as elements, is articulated around an autonomous research field which specifically focuses on man-environment interactions at the most encompassing level of analysis. Interdisciplinarity is assumed as a type of theoretical and methodological approach -general systems research-

suited to the requirements posed by the study of **complex systems** vis-à-vis the need to cope simultaneously with basic, applied and technological levels of inquiry (Cf. DEUTSCH ; GARCÍA ; GODARD, 1992 ; JOLLIVET & PAVÉ).

At the level of applied research, this alternative approach seems to offer a more updated and coherent conceptual and methodological device for viewing and confronting, in a preventive-proactive manner, the environmental challenge. Focusing on the broad macro-structural and collective implications of different types of change, it entails to establish the ecosystem as the basic analytical unit. Here the basic assumption is that the planning of social change must face the risks of sheer irrelevance without reliable understanding of: **i)** the historical emergence and persistence of destructive socio-ecological impacts of human activities, and **ii)** the short, medium and long term outcomes to be expected from the application of corrective measures to cope with these impacts in specific contexts.

From this point of view, the so needed in-depth studies in every possible research domains could be in principle integrated by interdisciplinary research teams regrouping social and natural scientists through co-ordinated efforts to tackle -at the operational level- the complexity involved in the understanding of non-linear, **counter-intuitive** dynamics of eco-social systems in the long run. Open systems-oriented human ecology appears thus to provide an organizing and integrating, as well as an explanatory and prospective framework for the analysis of impact events and action-relevant research processes (Cf. FORRESTER ; KLAGES & NOVAK ; WALLISER ; AIDA *et al.* ; VIEIRA, 1993b ; AUBIN ; JOLLIVET & PAVÉ ; VIEIRA & WEBER).

In what follows, this platform will be taken as a point of reference to overview and assess advances and blockages in the process of building an integrated socio-ecological field of inquiry in Brazil since the formative years of environmentalism. However, although there is a large and rapidly growing body of academic literature on this subject, I will set the focus on a rather selective slice of this already impressive mass of (dispersed) information.

1) Green activism and social impact assessment

Up to the beginning of the 1990's, the dominant research themes in the field of man-environment interactions were related to both analysis of environmentalism and socio-ecological impact assessment of development projects, programmes and policies in several regions of the country.

A quick look at some features of academic research about Green activism has already been taken in the first section of this paper. If we consider now the second theme, the analysis

of the literature suggests a concentration of research effort on the understanding of environmental conflicts in the Amazon region. A rather diversified body of literature deals with impact assessment of large engineering projects, agriculture, agroforestry, pastures, mining, extracting, fishing and industrial activities (Cf. VALVERDE, 1979 & 1981; MOUGEOT, 1981, 1983 & 1986; BECKER; LEAL; MONOSOWSKI, 1983; SALATI *et al.*; SIGAUD, 1984 & 1990; ALMEIDA JR.; COSTA *et al.*; HÉBETTE, 1987 & 1990; SAWYER; TORRES, 1988; SEVÁ FILHO; MARTINE & TURCHI; MOURA & MAIA; TUDE). Anthropological research has been firmly attached to the task of identifying the destructive effects of regional development on indigenous cultures (Cf. VIDAL, 1983, 1986 & 1989; WERNER; SANTOS & ANDRADE; SANTOS & NACKE).

But contrasting with the hegemony attained by a reactive, *ex-post* style of making environmental impact assessment, only a small number of case studies (mostly issued from the field of human geography) reflect the adoption of a proactive and integrated style of assessing the ongoing destructive dynamics in the humid Tropics (Cf. FEARNSIDE, 1984, 1985, 1989a & 1989b; ALLEGRETTI, 1987 & 1990; FRANCO *et al.*; RIBEIRO B.; LÉNA & OLIVEIRA). As a consequence :

«much of the available data on the Amazon does not constitute a coherent body of individual studies. What we have thus far are a relatively small number of micro-level studies that can only explain the internal dynamics of those sites. While even extrapolations from weak data sets can increase the probability of success in reducing negative impacts of development interventions, caution must be exercised to limit the scope of conclusions arrived at by this “salvage” approach to ecological analysis» (Cf. MORÁN, 1986, p. 113).

Of course the trend towards a more macro-oriented or biome-level approach becomes more intensive after the Rio Summit, when the design of transition strategies towards a sustainable development style in this region attains greater social visibility and political legitimacy (Cf. CLÜSENER-GODT & SACHS; MAGALHÃES S. *et al.*; PAVAN).

Methodological issues in prevention-oriented environmental impact assessment have emerged slowly as an applied social science research theme since the transition to democracy (Cf. MONOSOWSKI, 1986; SÁNCHEZ, 1990 & 1993; MILARÉ & BENJAMIN; VERDUM & MEDEIROS). The ongoing search for a more comprehensive and democratic type of risk assessment emerges from a dense literature focusing conflicts on the management of high-risk systems such as nuclear power plants in the coastal zone of the State of Rio de Janeiro (Cf. ROSA, 1981, 1984, 1985 & 1986; ROSA & CECCHI, 1984; ROSA & HESTES, 1984; ROSA & MIELNIK, 1988), industrial complexes in the chemical sector in the Cubatão valley, State of São Paulo

(Cf. HOGAN, 1988a & 1988b), «green revolution»-based agriculture in the South (Cf. GUIVANT, 1989), and, more recently, science-based biotechnological innovations and biosafety regulations (Cf. SILVEIRA ; SILVEIRA & SALLES FILHO ; SORJ & WILKINSON ; GOODMAN, SORJ & WILKINSON ; SALLES FILHO ; TRIGUEIRO ; BONACELLI ; SALLES FILHO *et al.* ; KAGEYAMA *et al.* ; WILKINSON, 1993a & 1993b ; VIEIRA & GUERRA ; VALLE & TEIXEIRA ; VARELLA ; VIEIRA, 1997).

A contribution to the debate focusing on the potential and shortcomings of science-based biotechnologies for the benefit of small-scale farmers and producers in present-day Brazil has been offered by P. Vieira & M. Guerra. This issue is especially relevant given the relatively high investment costs and sophisticated nature of such research, in addition to the fact that this new set of tools has already demonstrated its capacity to give a new impetus to traditional farming systems research in developing countries.

A rich tradition of communal management of renewable resources is still partially alive in many areas of the South. Traditional forms of social organization may still serve and provide the framework within which communities could assume responsibilities for collective renewable resource management. However, traditional practices are often insufficient to meet the constraints imposed by structural adjustment mechanisms and globalized economic circuits. No standard model to tackle this challenge does of course exist, and the conditions to actualize science-based biotechnological research in public-sector research, in tune with the ecodevelopment approach, remains to be determined with greater precision in the years to come. The assessment of new development paths to be followed cannot obviously neglect the crucial role that has been fulfilled by vested interests and political influence of powerful transnational corporations and specialized biotechnology firms in the private sectors, operating mainly in agriculture, forestry and medicine. Moreover, the high controversial implications of the emergent legal framework regulating intellectual property rights should be taken more carefully into account by social scientists (Cf. KAGEYAMA *et al.* ; WILKINSON, 1993a ; RAUD-MATTEDI, 1995 ; VARELLA).

Among the most sensitive and controversial new topics that are being slowly introduced into the academic debate in the field of social perception of biotechnological risks, I include the proliferation of genetic engineering techniques and uncontrolled dissemination of genetically modified organisms (GMOs) in the environment -even before capabilities to assess the possible outcomes can be established-, global socio-economic consequences of

biotechnological development, the social-ethical dimension of genetic engineering and, lastly, the legal aspects involved in biosafety regulation.

Biosafety regulation has been considered as an essential tool for the deployment of biotechnology in the environment. In a certain sense, it is a special form of impact assessment related to genetically modified organisms. Lack of such regulation has raised concerns about developing countries becoming testing grounds for biotechnological research-and-development and has induced the inclusion of a special article in the Convention on Biological Diversity. But most developing countries are still in a process of designing and implementing such regulatory procedures (*Cf.* FONTES *et al.* ; VARELLA).

The adoption of agricultural innovations became likewise a topic of major interest in the emergent field of sociology of rural environment, against the prevailing paradigms of urban and rural "ill-development" (*Cf.* GRAZIANO NETO ; MARTINE & GARCIA ; ROMEIRO, 1987 ; VIEIRA, 1989 ; GUIVANT, 1992, 1993, 1994 & 1997). Growing sensitivity to the causal processes through which environmental conditions may influence social organization have stimulated the debate on the prerequisites for sustainable development strategies in rural areas within conventional rural sociology and anthropology (*Cf.* TAVARES DOS SANTOS ; WILKINSON, 1995 ; ALMEIDA & NAVARRO).

Besides agriculture, other relevant policy-related case studies made, both before and after the Rio Summit, are worth mentioning here. They cover the following sectors : science and technology (*Cf.* RATTNER, 1989 ; VIEIRA, 1993b ; ARAGÓN, 1994 & 1996), energy (*Cf.* GIROTTI ; BOA NOVA, 1985 & 1987 ; SACHS, MAIMON & TÓLMASQUIM ; LA ROVERE, 1992 ; SEVÁ FILHO *et al.* ; MOREIRA), biomass based and small-scale rural industry (*Cf.* RAUD-MATTEDI, 1996) and environmental planning (*Cf.* COELHO *et al.* ; GUIMARÃES ; MONOSOWSKI, 1989 ; BURSZTYN ; MARTINE, 1993 ; CORDANI *et al.*).

2) Environmental management

The review of the literature covering this topic confirms a trend similar to that mentioned above. The priority given to the *ex-post* assessment of environmental damage induced by capitalist modernization strategies largely contrasts with the scarcity of case studies devising a more positive view of the environment as a resource potential. By case studies I mean contributions that go beyond the mere descriptive level of analysis and tackle issues related to critical evaluation of project results.

Still more scarce are those studies which try to assess how this potential could be put effectively at the service of rural and urban communities in several regions of the land, without endangering socio-ecological balances in the long run and maintaining sensitivity to the constraints imposed by the country's insertion in the trend towards globalization (*Cf.* MOURÃO ; BARROS, 1985 & 1987 ; ALMEIDA JR. ; LAGO, 1986 & 1988 ; BAUTISTA VIDAL ; DIAS ; VIEIRA, 1989 ; ANDERSON A. ; DOWBOR ; NEDER, 1990 ; BEGOSSI ; CAVALCANTI ; SCHMITT ; LOPES *et al.* ; SEIFFERT, 1996 & 1997 ; RIBEIRO M.).

Keeping coherence with the urgent need to offer proper analytical frameworks to confront this demand at the policy level, pioneering work in social impact assessment of resource use and resource conserving strategies in traditional communities of fishermen in several coastal zones was advanced by A. Diegues (1983 & 1987), R. Ramalho Filho (1983), O. Teixeira & P. Teixeira, L. Cunha (1989), M. Oliveira & F. Ribeiro Neto and, Y. Breton. More recently, J. Andriguetto-Filho and A. Diegues (*et al.*, 1994, 1995a, 1995b & 1996) have developed a similar socio-anthropological approach to deal with conflicts relating traditional communities and technocratic management of natural resources in protected areas. These experiences seem to confirm that improvement in the entitlements of population inhabiting these areas could be the proper way to protect biodiversity in the long run. I am convinced that this line of thought constitutes, in contemporary Brazil, a rather pioneering integrative account of research dealing with shifting ways to represent the concept of nature and with social conflicts involving conditions of tenure and use of common resources (*Cf.* MONTGOLFIER & NATALI, 1987 ; BERKES ; BERKES *et al.* ; OSTROM ; BROMLEY ; LAGES ; BARROS, 1997 ; VIEIRA & WEBER).

Attention to natural resource use problems by experts working in the field of political economics has been greatly stimulated by the perception of the interactions between ecological disruption, increasing technological capabilities and the low degree of productivity of Brazilian agriculture (*Cf.* ROMEIRO, 1981 & 1982 ; ROMEIRO & ABRANTES, 1981 ; GRAZIANO NETO).

Additional source of stimulation was launched through comparative studies developed within the Food-Energy Nexus Programme of the United Nations University (*Cf.* MOULIK). The first steps towards the consolidation of research teams dealing with the design and operation of integrated food-energy production systems in Brazil have been described in the contributions of, for instance, E. La Rovere (1981 & 1989), L. Rosa (1981 & 1984), FINEP/UNDP/UNESCO, E. La Rovere & M. Tolmasquim, COPPE/AIE, I. Bautista Vidal, R. Ramalho Filho & J. Vasconcelos, and, E. La Rovere & P. Audinet.

These authors usually tend to reinforce the perspective of making the best possible use of a rather diversified resource base to meet primarily -and through empowerment of people involved in community-based management systems- the larger segment of the Brazilian population who live below the poverty line. Following this line of thought, some case studies focusing the social and ecological impacts of the National Alcohol Programme have pointed out the impressive potential to be exploited through the integral valorization of agricultural wastes and their optimal allocation among five potential uses as fuel, fertilizer, animal food, industrial feedstock and, occasionally, food for human consumption (Cf. SACHS, MAIMON & TOLMASQUIM ; VIEIRA, 1989). However, a study presented one year after the Rio Summit shows that an overall positive evaluation of this programme can only be supported on the basis of its contribution to incurring the increase of air pollution in Brazilian cities and of the greenhouse effect (Cf. LA ROVERE & AUDINET).

Lastly, a far-reaching document that establishes a first partial assessment of the efforts made by public and NGO sectors in Brazil to implement the programme of action recommended in Agenda 21 can be found in U. Cordani *et al.*.

3) The «built» environment

Concern with research on man-made or «built» environment in Brazil grew mainly out of Marxist oriented human geographical approaches. The dominant research focus of this voluminous literature incided on the political-economical determinants of social exclusion and poverty -the hidden social costs of modernization- in urban settings (Cf. SANTOS M., 1978, 1982 & 1996 ; WILHEIM ; PIQUET & RIBEIRO ; DAVIDOVICH ; MESQUITA & SILVA). These contributions assume that both physical and social structure are shaped by the economic and political structures of society, which provides selective access to opportunities, and further discriminatory patterns of land use and investment.

Contrasting with these approaches, policy oriented case studies dealing with the influences of the man-made physical and cultural environment on different aspects of human behaviour are a recent phenomenon in the social sciences literature. Development of architectural design adapted to ecological and cultural contexts, as well as use of ecotechniques in buildings (Cf. ALVA, 1997), might be included here. Nevertheless, as a consequence of UNCED 1992, it became more apparent to the scientific community that the need existed to develop new approaches and theoretical frameworks to link poverty, epidemiology, environmental perception, consumer behaviour and education for citizenship in

urban settings (Cf. FERREIRA, 1989 ; BARBOSA ; HOGAN, 1992 ; LOUREIRO *et al.* ; TORRES, 1992 ; MAGALHÃES L., 1994 ; JACOBI & TEIXEIRA ; ABRAMOVAY & SACHS ; FREY, 1996 ; JACOBI ; NEDER, 1997). This requires comprehensive, long term strategies to enhance the capacity of the local ecosystem to produce food and energy, to recycle wastes and protect and improve water resources, and to encourage resource-conserving modes of public transportation and lifestyles. Such strategies are just beginning to evolve in some cities, but whether or not this research trend will become a foundational matrix for a new generation of inter-regional and comparative urban ecodevelopment strategies is still an open question (Cf. DIAS ; MAY *et al.* ; ALVA, 1996 ; CANO ; SACHS, 1996 ; RIBEIRO M. *et al.*).

4) Global change and social dynamics

Several aspects related to the phenomenon of «global change» have been tackled in environmental sociology and political ecology research before UNCED 1992. In my opinion, the most impressive are : the changing roles of the public sector and of environmentalism in the context of North-South asymmetries (Cf. VIOLA & LEIS, 1990 ; MARTINE, 1992 ; LA ROVERE, 1997), the influence exerted by foreign interest groups in social-ecological degradation of the Amazon region (Cf. HÉBETTE, 1987 ; MOURA & MAIA ; PROCÓPIO), the driving socially disruptive geo-political and economic forces behind the so-called «new global ecological order» (Cf. SILVA ; PERICÁS NETO), the prospect of technological innovations in the context of economic and cultural globalization (Cf. FURTADO, 1980 & 1987 ; RATTNER, 1980, 1987 & 1989 ; SORJ & WILKINSON) and the **global commons** debate concerning regulation of climate change, loss of biodiversity and marine pollution (Cf. CAUBET ; FEARNESIDE, 1985 ; LEIS).

Immediately after the Rio Conference, attention has been mainly focused on the socio-ecological dimension of development styles, against the background of opportunities and constraints imposed by the globalization process. More recent works deal, in a recurrent fashion, with issues related to alternatives in international **governance** in the face of the «global change» phenomenon, the emergence of a global society, and the assessment of obstacles and advances in the process of implementing UNCED's follow-up activities in Brazil (Cf. CLÜSENER-GODT & SACHS ; FERREIRA & VIOLA ; PAVAN ; SACHS, 1996 ; BECKER & MIRANDA ; VIOLA & LEIS, 1997). An associated issue concerns the innovations in patterns of involvement of civil societies in the environmental arena, especially those related to global networking strategies (Cf. SCHERER-WARREN, 1998).

It should be acknowledged, however, that if there is a great deal of concern about traditional micro-economic analysis of natural resources and the environment in these emergent lines of research, contributions focusing on environmental macro-economics are urgently needed. It has been recognized recently that :

«in order to perform a successful transition from the present pattern of development to a pattern of sustainable development, it will be necessary to shift a significant share of the total investments from environmentally damaging to environmental improving activities. Small-scale efforts will not be able to perform this task. The NGOs, and many other activities happening nowadays, are certainly relevant, but they are only samples, small anecdotes, of the very major shift that will have to take place» (Cf. SUNKEL, p. 185).

III- NEW ENTRY POINTS FOR A SOCIAL-ECOLOGICAL RESEARCH AGENDA

In assessing the most impressive obstacles to a cumulative growth of research about man-environment interactions in Brazil, I have always insisted on the persistent deficit in the reception and use of systems thinking by social scientists. From the above analysis, it becomes clear that this deficit goes hand in hand with the hegemony of "react-and-cure" strategies for facing the environmental crisis and with the lack of a co-operative research style within the communities of social scientists and between these and the communities of natural scientists, humanists and development agencies.

Most of the reviewed studies deal with particular problems and sectors, most often from the viewpoint of the several disciplinary social science traditions. Though often contributing to interesting viewpoints and recommendations, they rarely attain the level of theoretical and methodological competence which the "anticipate-and-prevent" approach demands. It seems, at present, quite redundant to insist that this fragmented research style might be nurtured by the cultivation of a language of common discourse, which includes a basic set of categories and principles to describe, explain and predict non-linear interactive processes in eco-social systems. In addition, it seems essential to understand why the scientific community remains unable to attain the desired level of institutional co-ordination and to find the adequate mechanisms to promote certain thematic axes where research is, up to the present, not being done, or is being done but in an ad hoc, fragmentary and theoretically ill-informed way.

As a second obstacle it was acknowledged that still today we continue to rely on a rather precarious understanding of how socio-ecological problems are perceived by specific social groups, how this perception is related to values and attitudes and how new behaviour patterns, oriented to far-reaching and lasting changes in life-styles, could be predicted from induced changes in attitudes (*Cf.* BOULDING ; BENNETT ; SJÖBERG ; DUCLOS ; BUTTEL).

All too often socio-ecological issues are not perceived or addressed until their impact becomes highly conflicting and sometimes irreversible. In this context, the citizen can be seen as both a victim and a cause of social-ecological damage. He might be considered a source of damage not necessarily as a result of his unawareness of the negative environmental consequences of his actions. Concerned most and foremost with survival -the fight for a secure livelihood for himself and his family- it is possible that under certain socio-economical and political constraints he simply cannot afford to take secondary risks. In any case environmental issues are often perceived as something diffuse, lying beyond his individual scope and requiring the exercise of collective effort.

This ambivalence induces the need for empirical assessments of long term tendencies of change that are already apparent in public awareness, life styles and consumption patterns. Such studies should contemplate a better understanding of what the population is effectively learning about the environmental challenge, the possible social acceptability of future environmental policies, the pre-conditions for long term individual value change, changes in consumption styles, and psycho-social impacts that environmental damage has on groups in different societal situations. Lastly, we might also recognize that even citizens already sensitive to the complexity of the environmental debate often lack the minimal analytical capabilities necessary for their involvement in the policy-making realm, thus making permanent, long-life political education a social priority.

The critical assessment of work done in the field of environmental education in Brazil up to now indicates the practical consequences of this deficit in basic and applied research on environmental perceptions, attitudes and behaviours. Scholars engaged in this field fall short of the level of producing analytically precise and empirically testable arguments about the complex relationships between attitudes and prevention-oriented individual and group behaviour patterns and life-styles. The outcomes remain up to the present mostly prisoner of an ideological-prescriptive bias (*Cf.* ANTUNIASSI, 1988 ; CUNHA,

1990 ; DOWBOR ; HOGAN, 1990 ; SOBRAL ; REIGOTA, 1991 & 1994 ; MAGALHÃES L., 1992 ; MAZZOTTI ; MORAES ; PENTEADO ; MININNI-MEDINA ; SANTOS E.).

A renewed effort is thus needed to analyse the strategic variables of a policy of proposed change in life-styles and to incorporate in the research agenda those theoretical and methodological advances that offer a more reliable foundation for the constitution of effective **educational technologies** coherent with the ecodevelopment approach in the years to come.

It is likely that this gap is similar in other countries where the tackling of the environmental challenge in planning and political decision-making continues to be regarded essentially as «highly technical» rather than simply a complex bio-behavioural issue (*Cf.* LABORIT ; CORNING ; BENNETT ; SKINNER). Moreover, in line with the findings of L. Sjöberg, I subsume under the broad concept of behavioural modification the cognitive and attitudinal approaches that have been developed in contemporary psychological, social-psychological and human ecological theory. Fundamental changes in environmental perception and behaviour seem to depend on something more than pure abstract reasoning alone : deeply-rooted moral and aesthetic commitments can be seen as essential pieces of the social-ecological puzzle. Moreover, the description of behaviour involves reference both to an environment to which the behaviour is adapted and to the **representations** of the environment which the organism utilizes. This is, of course, a basic tenet of the open systems-oriented human ecological approach.

Lastly, I have already mentioned the problem associated with the availability of data, and the means of storage, retrieval, transmission and overall management of that data to fulfil the requirements of preventive-proactive environmental policy making, implementation and long term monitoring. Information is required about how the factors lying at the root of social-environmental damage develop and expand. To provide decision makers with convincing data on socio-ecological changes due to adverse development impacts, or to check ecological improvement after a disturbance has been reduced or suppressed, a rather special data sets are needed. To be effective, the long term monitoring process must be designed to relate human-induced and natural environmental changes to biotic responses, thereby informing the predictive understanding of ecosystem dynamics and the various functional roles of biodiversity. Hence, there remains a great need for scientifically founded concepts and methods of environmental monitoring and assessment that are acceptable nationally and internationally. It has been acknowledged that even for economically advanced countries it is

still difficult to articulate an adequate system for continuous observation of the state of the environment and the results of social-ecological policy (*Cf.* SIMONIS).

The selection of sites for long term monitoring depends on the questions to be investigated, but it can be stressed that in this context, an adequate knowledge of their ecological and resource-use and management history is most relevant to a deeper understanding of pertinent social change mechanisms. Another major problem in monitoring programmes is to have a baseline reference situation with which to compare the collected data. Any impact study should refer to a supposed original, non-disturbed or lowly-disturbed ecosystem. But indeed, what would be a "healthy" system which could serve as a reference point for an action-oriented research under contemporary conditions of the world system? Hence, difficult methodological problems of defining environmental quality from the **co-evolutionary** perspective of systems oriented human ecology are still waiting for experimental solutions and cumulative theory building (*Cf.* BOTKIN ; SACHS, 1994).

Five years after the Rio Summit, my impression is that such priorities continue to be treated in Brazil with great lassitude among both social scientists and funding state agencies related to them. I have already commented on the exceedingly modest results that have been achieved and would hence recommend a drastic revision of the dominant patterns of action within the scientific-technological system in the years to come.

Moreover, some innovative issues with differentiated theoretical and practical significance have come to light recently, opening up new perspectives for an updated research agenda. My suggestions in this context are necessarily sketchy and tentative, merely an invitation to a deeper reflection about the complexity of the issues involved and about the political blockages to the viability of the needed alternative course of action. Nevertheless, I hope that a fruitful convergence with the long term, comparative research effort being made at present within UNESCO's South-South Co-operation Programme can be here presupposed.

It was argued above that advances in preventive-proactive environmental policy require considerably more investment in analytical frameworks and data bases than do reactive and sectorialized approaches. In addition, the mounting level of uncertainty involving the behaviour of complex systems seems to exacerbate the role of both scientific and social controversies. These uncertainties are broad indeed, covering the reliability of data concerning long term global environmental change, a hypothetical re-balancing role of environmentally sound technological innovations (for instance biotechnology, new materials and alternative sources of energy), the social-ecological long term impacts of the proposed strategies of

ecodevelopment at the local level, or lastly the most effective strategies to exercise social control of behavioural patterns (Cf. GODARD, 1997).

One way to reduce complexity in confronting in a proactive manner the environmental challenge is to put emphasis on co-ordinated experiments with **decentralized, community-based management of natural resources**. This point has been intensively stressed in recent years among social scientists working in several regions of the world (Cf. CORDELL ; MONTGOLFIER & NATALI, 1987 ; BERKES *et al.* ; BROMLEY & CERNEA ; FEENY *et al.* ; OSTROM ; FARVAR ; BROMLEY ; AGARWAL & NARAIN ; McKEAN & OSTROM ; SWAMINATHAN). In Brazil, this debate re-emerged with a certain intensity during and after the Rio Summit, in relation with the imperative to foster the implementation of **local Agendas 21**.

In my opinion, underlying this point of view are two important assumptions that have to be taken more seriously into account by social scientists in Brazil. The first states that the encompassing man-environment crisis is essentially the result of site- and culture-specific modalities of access and use of all these elements that :

«are not privately owned or are crossing the private property»
(Cf. WEBER & BAILLY, p. 274).

And the second assumption states that :

«an improved and sustainable use of the natural resources base in the long run depends decisively on improving the patterns of **social organization** for their management by the users themselves» (Cf. CERNEA, p. 24).

On the basis of the assumption that research about the forms and patterns of social organization within societies using natural resources is essential for enriching the preventive-proactive version of environmental policy, the crucial question remains how to confront and manage the specific kinds of social conflict related to the dimensions of the **unappropriated** and of the **trans-appropriation**. Environmental degradation is often related to an inadequate «assignment» of property rights to **common resources** such as, for instance, natural forests, wildlife, water and fishing resources, soil, range-land and associated pastoral production, and biodiversity. One of the central points is thus related to a broad concept of **tenure**, denoting the terms and conditions upon which land and other natural renewable and non-renewable resources are effectively held and used. It is obviously not easy for societies to impose equitable limits and controls on the use of resources which their members traditionally regard as limitless and freely available.

Analysts usually identify four resource regimes in categorizing these arrangements :

- i) under **state property regimes**, rights of ownership and management are vested in the State ;
- ii) under **private property regimes**, these rights are vested in an individual «owner» ;
- iii) under **common property regimes**, rights are vested in specified groups or communities of people and
- iv) in situations of **open access**, no resource regime applies and no property rights are recognized.

A growing body of empirical evidence shows that the collective action related to management of common resources clearly defies the deep assumptions and usual analytical procedures of mainstream economics. With the lack of private property, the regulatory role of market forces is said to be played imperfectly. In particular, free access to the **commons** is considered as a condition leading to diminishing profits and, in some circumstances, to depletion of the resource. This perception is at the core of G. Hardin's classical argument in the field of natural resources economics.

In fact, as suggested by J. Weber and D. Bailly, Western thought traditions are impregnated with the perception that private property might be the only possible option for dealing with conflicts involving access and use of the **commons**. Unable to cope with resources that do not belong to anyone in particular or which cross the property, these traditions tend to strengthen those approaches that emphasize the virtues of both privatization and statization.

Among the critical points of view considering the pertinence of these dominant paradigms, the so-called «**patrimonial approach**» postulates that the conflicts of interests caused by the involvement of a large number of social actors, expressing multiple perceptions and interests, might be in principle **negotiated** on the basis of a shared interest for inter-generational quality of natural resource base and habitats. Even if the notion of patrimony can induce a cautious attitude among social scientists attached to the empirical tradition, this alternative approach emphasizes the notion of a heritage to be transmitted, of a common good to be managed with prudence regarding actual and future generations. Hence, it tends to make us more sensitive to the risks involved in certain options that could produce irreversible environmental damage in the long run (Cf. KAPP, 1970 & 1972 ; PERROUX ; HENRY, 1987 & 1990 ; MONTGOLFIER & NATALI, 1987 ; BARTHOD & OLLAGNON ; OLLAGNON ; VIEIRA & WEBER).

In my opinion, the essential core of this argument could be identified already in the context of the preparatory meetings for the Conference of Stockholm. During the 1970's, the gradual working out of both the ecodevelopment and the so-called «eco-energetical» approaches in the field of the economics of natural resources follow more or less directly. The

accent is set on the possibility (and the necessity) to overcome the dominant economic approach based on «internalization of externalities» through a more encompassing, cross-cultural and cross-disciplinary theoretical framework (Cf. PASSET ; SACHS, 1986a & 1986b ; NORGAARD ; BOTKIN ; LEFF, 1994 ; VIVIEN ; FAUCHEUX & NOËL).

This «patrimonial» view of people-resource relations has been re-elaborated in recent times around the more encompassing notion of **appropriation mode** (Cf. WEBER). The perception of the constitutive limits of analytical-reductionist approaches in neo-classical environmental economics opens up the way to a creative interdisciplinary framework that mobilizes different research traditions in the socio-economics of natural resources, economic and juridical anthropology, political sociology, human ecology, cognitive sciences and systems research.

Among the several dimensions of the concept of appropriation mode, it can be identified : **i)** the **cognitive representations** of the social actors ; **ii)** the possible **uses** of the correspondent resource base ; **iii)** the patterns of **access** and **control of the access** to the resources ; **iv)** the choices concerning **transfer of access rights** and lastly **v)** the choices concerning the **sharing** of the resources themselves or of the outcomes of their exploitation. Hence the notion of property covers only two of the five levels that constitute a specific mode of appropriation : the patterns of access and transfer of access rights. Moreover, if a given mode defines a historically-existing «state» of a set of interrelations involving social groups and the bio-physical environment, it is taken for granted that the understanding of the system's dynamic requires the empirical analysis of **decision-making processes** taking place within it (Cf. WEBER).

Furthermore, this model considers the possible consequences for all actors while the analysis undertaken from the perspective of decision theories currently used in economy tends to set the focus on the options to be confronted by just one social actor (individual or collective). In the case of the issues related to the patrimonial management of renewable resources however, the additional challenges posed by the heterogeneity of social actors involved in the planning and decision-making process must be faced. Here the choices must be processed most of the time with uncertainty concerning data bases and controversies among laymen and experts -all related to the scope and depth of the risks faced- and to the nature -more or less irreversible- of the destructive impacts to be expected from the project, programme or policy in the long run. Hence, each actor tends to assume a specific

representation of the issues, disposing of unequal bargaining capabilities in the political arena (Cf. WEBER).

In the first place, to operate competently with this emergent analytical framework it must be learnt to perceive that virtually all interactions with the bio-physical environment are filtered through the social environment. Giving more attention to the cultural dimension of human interactions with the natural environment seems crucial if we are engaged in changing them from the ecodevelopment point of view. Cognitive research suggests that humans see nature through a screen of beliefs, knowledge and purposes, and this view determines how societies handle the environment in daily practices. Culture does not merely adapt a population to its environment, it mediates the human experience of nature. It is in terms of these **images** that people interact with nature, rather than in terms of how nature may actually be. The general message here is that development actors and planners that undermine or neglect the internalization of this cultural dimension run the risk of shaping analytically high sophisticated, but socially unacceptable, courses of action. Indeed, forms of life, traditions and cultures are historical variables but, nevertheless, often cannot be voluntarily manipulated. They seem to constitute the indispensable non-rational basis for any kind of rationality principle and for strategies aiming to reduction of complexity in the policy-making realm.

Secondly, it must be better understood that eco-social systems are composed of positive and negative feedback loops in complex, hierarchically organized networks of relationships over time and space. One crucial aspect of the problem is the extensive globalization of issues. Understanding the specific role of the ecological-economic aspects involved in this circular-causal web of counter-intuitive interactions might be considered here as indispensable in the field of community-based resource management (Cf. DIEGUES *et al.*). This kind of assessment might be subsumed under the broader methodology of social-ecological impact assessment, covering both *ex post* and *ex ante* analysis of ecodevelopment alternatives (Cf. CARLEY & BUSTELO ; SÁNCHEZ, 1993 ; BOUSQUET *et al.* ; MONTGOLFIER & NATALI, 1997).

Thirdly, the patrimonial approach incorporates the analysis of data concerning both co-operative and conflicting relations among social actors involved in a decentralized management system. Social institutions, or sets of rules governing human behaviour accompanied by value systems, cognitive maps and strategic goals, are seen as the key factors to the understanding of human responses to the bio-physical environment and to the social process itself. As stated above, conflicts that have a significant effect, whether negative or

positive, on the conditions of access and use of common resources might be better regulated through viable **co-management institutions**. Rights of use for a certain group of resource users are defined and enforced, thus contrasting with the idea of a «non-institution» through which individual actors harvest open access resources without any restraints from existing social institutions.

Lastly, to understand the **commons** as a certain kind of development institution means that it might become more sensitive to take into account evidence provided by comparative and preventive-proactive-oriented research programmes focusing on the (social, economic and political) viability of decentralized and democratic-participative co-management arrangements all over the world. The focus is set on conditions leading to intercultural learning about how to develop creative problem solving skills and techniques to **empower** people to better tackle social-ecological disruption at the local level of intervention through common property regimes. A historical comparative understanding of underlying causes of conflict would thus improve selection and refinement of the appropriate management methods to be used **inventively** in specific socio-ecological contexts (*Cf.* SACHS, 1980).

This approach requires setting-up, monitoring and evaluation mechanisms as well as the training of community members in participatory planning, so that they can progressively take in charge the design of their own resource management regimes at the local level. It appears therefore that there exists a new challenge regarding the design of new training methods focusing on these issues and aimed at providing the communities with the capacity of using these techniques to address conflicts related to man-environment interactions.

However, as a knowledge-intensive societal learning process, this negotiation-based prospect should not be misinterpreted as an excuse for national States and for the international community to withdraw from transition strategies oriented toward ecodevelopment. On the contrary :

«it imposes on them the urgent task of establishing innovative forms of **enabling policies**, providing at the right time the access to the kind of resources needed to overcome bottlenecks that prevent a fuller use of local resources, manpower, talents and enthusiasm» (*Cf.* SACHS, 1992, p. 7).

IV- ORGANIZING ACTION-ORIENTED RESEARCH

The research-and-development critical mass and capability of the community of scholars working on man-environment interactions in Brazil seem to be much more impressive nowadays than in the past decade. The variables considered in this assessment include the number of PhDs among active researchers, the volume of individual and institutional projects supported by the research-and-development funding agencies, the emergent network of consolidated and surfacing interdisciplinary research and training centres focusing on the environment-development nexus, the presence of foreign experts and the usual indicators of scientific production.

The impressive concentration of the qualified scientific resource base, as well as public funding, in the Southeast and South contrasts with the scarcity identified in other regions. However, at the operational level, the distribution of financial support tends to favour the individual in detriment of institutional projects and programmes. The perception of the need to foster the socio-ecological research area grows within the research-and-development system, but the allocation of funds for research projects or for the functioning of post-graduate training programmes remains focused upon traditional disciplines or areas of knowledge. Still today the specificity of a new interdisciplinary field of inquiry cutting across the usual compartmentalized scientific areas has not been adequately institutionalized. As a consequence, the demands of support for interdisciplinary research projects tends to be operationally processed by consultants attached to traditional disciplinary fields, even in applied biology (*Cf.* SOBRAL & TRIGUEIRO ; FERNANDES & SOBRAL) !

Most of the above suggested core structural problems of this new field of inquiry persist today. Indeed, the ongoing review of the literature shows that the situation is far away from the goal of setting up open systems-oriented human ecology as a well-established subject for human and social sciences. The statement of this goal in itself seems to supply insufficient orientation for small steps leading towards more integrated training and research operations. The limited effectiveness of the ongoing effort to build interdisciplinary linkages at the university level around the concept of **institutional programme** and on the basis of an encompassing system-analytical framework seems to confirm the persistence of this vacuum (*Cf.* VIEIRA, 1993c).

In addition, the lack of adequate co-ordination among strategic policy-making spaces (scientific-technological, educational, agricultural and industrial) persists. This shortcoming

goes hand in hand with the fact that inter-regional comparative applied and technological research programmes have been little exercised. It seems that most individual researchers and research teams are so driven by their case-focused endeavours that little time is left to accomplish the essential operations of looking back and around for cross-cultural comparisons, partial ordering and synthesis of the literature and careful systematic testing and generalization of findings and policy recommendations.

Hence, in my opinion the density of individual and inter-group exchanges oriented to a previous definition of thematic priorities, the epistemological quality level of the research and teaching work being done, and the effective social and political impacts of the contributions remains weak, making the existence of a genuine scientific community (in the sociological sense) attached to this field of inquiry today more of an optimistic hope than a concrete reality (*Cf.* VIEIRA, 1993c).

Of course, an action-oriented, long range research programme of this type constitutes a formidable challenge that seems to depend directly on the strengthening of inducing, co-ordinating and evaluating mechanisms at the national level. New institutional arrangements and political procedures are urgently needed, in order to make preventive-proactive development strategies socially more visible and politically legitimate. Bringing about those conditions would imply a profound transformation of existing patterns of interactions in the academic environment.

However, attempts being made to foster co-ordinating, assessment and monitoring mechanisms for research and training at the national level have not passed the embryonic stage. The trajectory of the Association for Training and Research in Ecology and Development (APED) is very illustrative in this respect. Launched in the early 1990's as a network of scholars deeply influenced by the work of Ignacy Sachs, the APED has concentrated its efforts mostly on the organization of annual meetings, the launching of intensive pilot projects in informal environmental education, and the co-ordination of an editorial programme aiming at nurturing post-graduate programmes with updated and reliable teaching materials. Academic exchange with first-level research units in France has been intensified since the beginning (CRBC/EHESS, CIRED/CNRS, GREEN/CIRAD, UNESCO). In this case, in spite of the increase in number and quality of disciplinary and multidisciplinary research projects advanced by its members in recent years, the outcomes remain clearly below

the ambitious requirements of an encompassing and politically credible ecodevelopment action plan for the country.

Nevertheless, promising attempts to save environmental research from sheer political irrelevance set in motion integrated regional strategies for research and training more in correspondence with this prospect are slowly emerging. Important networking activities have been intensified recently under the heading of the Association of Amazonian Universities (UNAMAZ) (Cf. ARAGÓN, 1994 & 1996; LOURENÇO) and of the Regional Post-Graduate Programme on Development and Environment in the Northeast (PRODEMA) (Cf. RAMALHO FILHO, 1997). Moreover, as a consequence of ongoing programmes for scientific-technological development in strategic sectors, that is to say the Support Programme for Scientific and Technological Development (PADCT), the Human Resources Training Programme in Strategic Sectors (RHAE) and the Pilot Programme for the Protection of Tropical Forests, several interdisciplinary and inter-institutional centres working in the academia with socio-ecological issues have been strengthened in the last years. It is worth mentioning here the National Institute for Amazonian Research (INPA), the Emilio Goeldi Paraense Museum, the Coordination of Post-Graduate Programmes in Engineering / Federal University of Rio de Janeiro (COPPE/UFRJ), the Centre for Environmental Studies and Research / State University of Campinas (NEPAM-UNICAMP) and the Centre for Sustainable Development / University of Brasília (UNB) (Cf. VIOLA & LEIS, 1997, p. 278).

At the same time, preliminary moves oriented towards the design of an international joint research programme focusing on common property resource management as part of ecodevelopment strategies for the coastal zone have been set in motion. The Biosphere Reserve of the Atlantic Forest can provide the logistic support for selected pilot-projects in the Southeast and the South (Cf. DIEGUES, 1995b). The mobilization of several teaching and research units placed in different Universities in the Northeastern, Southeastern and Southern regions is being sought in support of this initiative. The research agenda is being structured in accordance with the directives of the National Plan for Coastal Management, including the search of synergical interactions with the network of NGOs involved with biodiversity conservation programmes in this region (Cf. VIEIRA & RAUD-MATTEDI).

A substantial part of the research effort will be concentrated on the prospect of integrated production systems including agro-forestry, aquaculture and small-scale, decentralized industrialization based on a comprehensive use of terrestrial and aquatic

biomass as food, feed, fuel, fertilizer and food processing and non-food agro-industries. Recent advances in domestic biotechnology research offer a promising entry point for the design of development alternatives (Cf. VIEIRA & GUERRA ; SACHS, 1997 ; VIEIRA *et al.*).

It is important to always bear in mind the intrinsic complexity involved in the attempt to formulate and enact such an encompassing, long term basic and policy-oriented research and training strategy, supported by a coalition of development actors with diversified belief systems, interests and concrete demands. It might concern itself with the dynamics out of which problems arise, anticipating potential problem areas and their alternative solutions as the means to translate desired values into effective policy. This will involve identifying possible futures and the consequences of action or inaction for their attainment, a policy dimension usually neglected by social scientists. The basic assumption here is that if something is known about the impact of social structure on behaviour, it should be possible to propose models for changes in social structures that will effectively implement values which have priority status in the effort to manage man-environmental relations on a sustained basis (Cf. BORGATTA & COOK).

This prospect includes the consolidation and expansion of capabilities to generate and organize data and knowledge bases through interdisciplinary linkages, the systematic incorporation of the results in environmental management systems and the permanent critical assessment and monitoring of this process. But, as it has been recently stated by an impressive review of the state of socio-ecological research in India, the crucial guiding question to attain this goal remains :

«how does one begin to develop a theoretical framework that will provide a better scientific understanding of society-nature and, at the same time, be forward-looking, aiding the ambitious “search for sustainability” ?» (Cf. GUHA, p. 348).

Some years ago, Ignacy Sachs warned against excessive emphasis on theoretical research in a context of dramatic socio-ecological threats facing mankind. He argued that the first priority was to put the considerable body of already accumulated knowledge on man-environment relations to controlled use, rather than to postpone action on the pretext that more research is still required. In his opinion, the acknowledgement of «social urgencies to be attended» should develop more sensitivity to the need for shortening the time-span between production of knowledge and its application, of pointing to the research gaps and, in this way,

of pragmatically assisting in the formulation of development-oriented science and technology policies (Cf. SACHS, 1992, p. 9).

Five years after the Rio Summit, I continue to share his commitment to a pragmatic involvement with applied and action-research strategies to tackle the complexity involved in the development-environment nexus in Brazil. In some cases, what is needed is not necessary new knowledge about the problem dealt with, but only a willingness to act, prudently, in the light of what is already known. But the careful assessment of research outcomes in the last years makes me hesitate to accept the view that the task of confronting long term and large-scale trends associated with environmental planning and management could be claimed and performed by a sort of "a-theoretical" and ad hoc pattern of applied environmental science, either by neglecting the use of updated results of basic research or by producing results that do not lead either to an encompassing, solid theoretical understanding of man-environment interactions or to its permanent conversion into policy-relevant issues. As recent assessments of shifts in contemporary development anthropology have shown :

«to combine and convert knowledge and field findings into predictive and prescriptive policy propositions is intrinsically a theorizing operation» (Cf. CERNEA, p. 29).

Researchers using the ecodevelopment approach must be able to figure out, with growing analytical precision, which available building blocks of social organization can make up more adequate institutional arrangements and culturally sound action strategies for changing given circumstances in the long run. These basic elements to be considered in the practice of **socio-ecological engineering** at the local level include a clear specification of : the social actors' set ; the social contracts governing co-operative and conflicting relations among resource users and stakeholders (local and distant) ; the prevailing symbolic and cultural systems ; the rules of entitlements ; the authority systems and enforcement mechanisms ; the producers' organizations and, finally, the macro-social factors that affect the local social organization.

Hence, in my opinion, it is a clear and detailed specification of priorities concerning the interplay between basic and applied research and training capabilities, institutional and economic requirements and evaluation criteria for research projects and programmes that should nurture the design of corresponding strategies, always from the point of view of an **eco-realist** account of existing social opportunities and constraints, to continually fulfil these demands on the public policy-making realm.

An encompassing social debate to make possible a maturing elaboration and political legitimation of this prospect simply has not moved forward in the Brazilian society. Furthermore, considering the seemingly inexorable insertion of Brazil in the dynamics of globalized (social and ecological) **disorder**, the best way to proceed from here is therefore, up to now, less than obvious.

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