

**Natural vs. Social Science Concepts in Applied Research on Amazonia:
A Critical Assessment**

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Recent Strategies for the Amazon

The Amazonian rain forest has attracted international attention because of its role in the global climate, its largely still undiscovered wealth in biodiversity, its endangered indigenous peoples, and its unresolved challenge of harmonizing the conservation of nature and the use of natural resources. On one side, the Brazilian society has embarked on the valorização and integração of its remaining frontier areas, much in the same spirit in which the whole of Brazil has been occupied over the last 500 years. The establishment of new federal States by converting territories into States and by subdividing the large territories of Pará, Amazonas and Goiás is simply a continuation of the conquista and frontier philosophies, recent documents in this spirit being the "Plano Plurianual 1996/99" (SUDAM 1995) and the "Brasil em Ação" ("Brazil on the Move") programme (Presidência da República 1996). In later years, "Avança Brasil" ("Forward Brazil") and the "Programa de Aceleração do Crecimento – PAC" ("Program for the Acceleration of Growth") continued this approach.

However, there have also been other signals: On the occasion of the Brazilian President's state visit in Germany in 1995, the Brazilian Federal Government published a brochure on Amazonia in German with a markedly different tone, emphasizing the "Umkehr" ("turn-around") from a policy of deforestation to one of protection (Brasil 1995a:8), and in another brochure (in English) of the Federal Ministry of the Environment, Water Resources and the Legal Amazon (MMA) one finds mention of a reversal of the process of degradation towards sustainable development (Brazil 1995:15). The recent "Agenda 21" brochure of the MMA (1997) even goes so far as to propose a "biomass civilisation" in the Amazon because of

"the extraordinary potential of this region to lead in implementing a modern 'biomass' civilization based on the sustainable use of renewable resources, given the size of

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Amazonia, its exceptional biodiversity and its role as a macro-regulator of climates and water systems. This is a major contribution made by Brazil and the other Amazon nations to a global strategy for sustainable development“ (p.8).

However, this exaggerated statement insinuating that it would be possible to lead a modern life based on ”biomass“, without mineral and fossil resources, especially oil and natural gas, is openly contradicted in Part III (”From Ideas to Action“) of the same document, since the ”multi-source energy grid“ for the Amazon is declared to include large hydro-electric plants and natural gas (p.49). This example shows that declarations of that kind should not be taken too seriously, but it also shows the present concern in Brazil for political correctness in the international sustainability discourse.

The local rural populations, indigenous as well as other traditional groups, such as rubber tappers, quilombo settlers, ribeirinhos and other cabôclo inhabitants of the forest, and their advocates, have always argued against the myth of an empty space in the Amazon. Ever since the publication of the influential international report ”Amazonia without Myths“ (IDB/ UNDP/ACT 1992), the vision of preservation and sustainability has become widely shared, not only in Brazil, but also in the other member countries of the Amazonian Co-operation Treaty. However, public policies and the actions of local government agencies, enterprises and individuals have not yet changed very much. Outside the primary and near-primary forest areas, large cattle ranching, logging and small silvi-agro-pastoral production have been in conflict over land use; garimpo-type as well as large-scale mining has contributed to the pressure on the land, to environmental destruction and pollution. Urbanisation has created cities and towns around which intensive agriculture has developed. Between these urban areas a modern infrastructure in transport and communication is being built along so-called axes of development.

As one of the largest areas of the world still covered with primary tropical forest vegetation, central Amazonia is seen by many environmentalists as a prime target zone for strict conservation policies, where only traditional or new forms of *extrativismo* which do not damage the forest would be permitted. The ”Pilot Program for the *Conservation* of the Brazilian Rain Forests – PPG7“ (emphasis added), a co-operative effort of the Brazilian Federal Government and the Group of Seven (G7), placed particular emphasis on those areas, but it also envisaged and promoted sustainable use and ecologically sound development strategies.

Deforested areas covered with spontaneous secondary vegetation („capoeira“), with mixed perennial and annual crops, or even with monoculture plantations and with certain forms of pasture are not always destined for obvious degradation. There does not seem to be a direct and unavoidable one-way road ”from green hell to red desert“, as had been assumed by many in the 1970s (Goodland/Irwin 1975). On the contrary, violent and legal land conflicts show that there is a very wide range of options, and if violence and *grilagem* (illegal land-grabbing by falsified titles and similar means) are to be avoided, those options should be discussed in civil society and decided through democratic procedures, public administration measures and the courts.

Mining is also open to different policies - between strictly limited enclave activities

and broad corridors and axes of inter-linked development areas; furthermore, by definition, mining is not sustainable, since every geological deposit is finite. This makes the very term rather problematic when referring to a region which has been and will remain largely one with what is often called a *mining vocation*, such as Amazonia.

On the whole, there is an urgent need to discuss the recent strategies for Amazonia. The prevailing decision-making criteria and procedures for determining land use in the region require a critical assessment. Wide-ranging concepts and arguments are being put forward by the defenders of the rain forest and ecological sustainability at the local, regional, national and international levels, but at the same time, destruction is going on, and poverty remains the major social challenge for public policies. A variety of approaches have been suggested and also partially implemented so that not only the inherent logic and the plausibility of these proposals should be examined critically, but also the actual results of certain strategies and, last but not least of their semantics.

It is interesting to note that the academic participants in the debate on Amazonia and ecological matters in general differ systematically between natural sciences, including geography, and social sciences, particularly economics and sociology. That is why this conference on biological as well as cultural diversity should provide an appropriate forum for an articulation of those differences in order to bridge the gap between the "two cultures". Since anthropology and other humanities are also represented here, let it be allowed to trespass into the fields of communications and linguistics, too, so that a rather comprehensive debate on the concepts and arguments to be employed or not employed can be advanced.

Starting with economics, my own academic discipline, the international debt-nature issue is taken up first. The term debt is used here in a larger sense, including all kinds of international grants and cooperation projects. In the Brazilian Amazon, the major endeavour in this field is the "Pilot Program" which by 2001 had reached a critical stage with its development, conservation and research projects, just entering an intermediate period before step-by-step decisions were taken with regard to the next phases, before the Program was finally absorbed by the Ministry of the Environment and Water Resources in the years after 2006. In the next section, a close look at the national and international documents and research reports published at the end of the 1990s during the heydays of the PPG7, reveals that basic concepts such as *carrying capacity* and *sustainability* from the side of natural science, agronomy and geography, and *opportunity costs* and *resonance* from the side of economists and sociologists play an important role in the formulation of strategies for Amazonia by all persons and institutions involved, - often without a clear understanding of the implications. The critical examination of these concepts is followed by a review of recent zoning ("zoneamento") endeavors in the Amazon which are directly based on some of those concepts and related ones. Finally, the question is brought up what strategic effects are triggered when Amazonia is considered and called a *frontier* region. The analytical summary can be resumed by "no way around hard political choices" as the heading of the final section

Debt for Nature and the G 7 Pilot Program

For Amazonia, the international dimension and global interest, as evidenced through the PPG7, add further weight to large-scale land-use decisions on the national as well as on the state and local levels. When the industrial countries are willing to pay for the *conservation* of the primary forest, the size of protected areas and the restrictions on land use become a question of price. That is why the debt-nature debate has a role to play in the analysis of recent as well as future strategies with regard to the Amazon.

The discussion on debt for nature often suffers from a confusion of dimensions:

- *Thousands* of dollars are involved, when a non-governmental organisation (NGO) buys a debt instrument in the secondary market and cashes it at the Central Bank in order to support a sister NGO in a rain forest country;
- *Millions* of dollars are at stake, when a program of international co-operation sets up a series of projects, such as the bulk of bilateral and multilateral activities within the G7 Pilot Program;
- *Billions* of dollars are involved, however, when the rescheduling of debt in the Paris Club is negotiated, including the IMF and World Bank consultations before; - afterwards the New York steering committee of the private banks normally follows suit.

Public opinion in Germany and other industrial countries as well as the report to Chancellor Kohl by Dietrich Oberndörfer, published in 1989 (a and b), which formed the basis of the G7 decision on the Pilot Program, referred and still refers to this third level, the Paris Club and Brady Plan heights where - in the case of Brazil - billions of dollars were at stake. In 1992, Brazil renegotiated its debt with public as well as private creditors successfully (IMF 1995: 14f.). Confidentiality prevents detailed empirical research, but there can be little doubt that the change in the stance of the Brazilian government before the Rio Conference UNCED 1992, from protest against alleged attempts to "internationalise" the Amazon toward conservation and sustainability by the Collor Administration in general and José Lutzenberger in particular, was very helpful.

However, in the course of time, other priorities were set at the German Chancellery, and the implementation of the Pilot Program was handed over to project administrators who think in millions, not billions of dollars or deutschmarks. The impact of *projects*, however, is often the opposite of what Oberndörfer and Kohl had in mind, namely strict conservation; still influenced by the acute debt crisis of the 1980s in Latin America on the one side, and the *Waldsterben* ("death of forests") in Germany on the other. They intended to link substantial debt reduction to the preservation of the forest: Since a great deal of the claims were to be written off anyhow, the reasoning goes, one might as well try to get something out of it, i. e. public relations as well as an environmental benefits. As to the costs of stopping deforestation in the Brazilian Amazon altogether, recent estimates for the net loss of income range between US\$ 0.5 and 10.8 billion per year, Abreu et al. (1996: 248) pleading for 6.5.

Since the motivations as well as the participants in debt (re)negotiations on the creditors side are generally different from those working on the project level, co-ordination

is not spontaneous nor automatically assured through administrative procedures. Looked at from the outside, it seems that somewhat more could have been done by the G7 in the next round(s) of debt negotiations at the Paris Club level in order to back the Brazilian conservationist interest groups, environmental agencies and NGOs as well as the Cardoso and the Lula Administrations in general, in their efforts to implement the announced *reversal* of policies. But the debt-nature link at the billion-dollar level in the Paris Club and the private banks' Steering Committees did not remain any longer on the agenda, when the Lula Government changed its macro-economic policies from growth-cum-debt to export-led growth after 2003. Therefore, the lever of debt relief for nature is no longer at hand.

A final word about the debt-nature issue: Million-dollar cooperation projects and thousand-dollar back-ups for environmental NGOs, municipal agencies, national park authorities, etc. have their own logic and their own merits. One should not discredit them, because they would hardly contribute to substantial debt alleviation. Sometimes, this confusion leads to an unfair criticism of both the high level for not being operational and the grassroots level for not being substantially debt-alleviating, whereas a test of the „willingness to pay“ on all levels, according to the agenda in question, could enhance the objectives of the Pilot Program and its followers by putting the international weight primarily on the protection side in all conflicts over land use in the national, the regional and the local framework, because that is the motive of the taxpayers, volunteers, and donors providing the resources. Furthermore, there is a great potential for synergy effects between these three levels, once their respective merits and limits are clearly perceived and taken into consideration. Without entering too deeply into the PPG7 details, let it be recognized that the specialized staff members in the relevant institutions are generally well aware of this potential, but that they need support from the outside.

The Concepts of *Carrying Capacity* and *Sustainability* versus *Opportunity Costs* and *Resonance*

Two of the most prominent concepts in land-use planning discussions about Amazonia are *sustainability* and *carrying capacity*. In his doctoral dissertation in Biological Sciences at the University of Michigan, Philip Fearnside (1986) elaborated a definition of "carrying capacity", namely "the number of individuals that can be supported in a given area" (p. 70). In this thesis, he limited himself to human beings in rural settings alongside the Transamazônica Highway. However, in a recent paper (Fearnside 1996:274) he extends this concept to include towns and cities:

"*Carrying capacity* estimation work needs to embrace the wide variety of productive systems used and contemplated for Amazonia and to be able to interpret this information at scales ranging from local communities to the region as a whole. This will require not only studies of different land-use systems in rural areas, but also integration with studies of energy use and the *support limits* of *urban* populations" (emphasis added MN).

Fearnside is not the only scientist who uses the term *carrying capacity* in that sense. The former chairman of the International Advisory Group (IAG) for the Pilot Program, the German geographer Prof. Gerd Kohlhepp has quoted the renowned grand old man of *eco-*

development thinking, Prof. Ignacy Sachs in a recent article on the PPG7 in the following way (Kohlhepp 1995:24):

”The PP consists of a set of projects that will contribute to the sustainable development of natural and human resources. ... What is the crucial meaning of sustainable development? ... The key issue of sustainability can be defined as ‘improving the living conditions of human communities, while keeping within the limits of the carrying capacity of the ecosystem’ (Sachs 1992).“

The writings of these and other authors who use *sustainability* and *carrying capacity* more or less synonymously, have been very influential in Brazil and abroad, particularly in environmentalist and policy circles, but there has been very little, if any, critical assessment of these concepts and their implications on the part of social scientists. In this workshop on inter-disciplinary research in the natural and social sciences as well as the humanities, some critical remarks calling for caution in the application of these biological and geographic concepts without, in any way, putting into question the sincerity of the intentions behind the use of the terms, should nonetheless be in order. The aim of this critical assessment is to further our common objectives through the intelligent use of the appropriate analytical means and instruments of various disciplines thereby combining forces in an inter-disciplinary effort.

Today, most people in the Amazon live in towns and cities (see Becker 1995) with their nearly universal lifestyles, more dependent upon inputs and transfers from as well as to markets in the rest of the world than upon their immediately surrounding rural areas. The options with regard to industry, transport, trade, services and communication vary greatly, and a strong point can be made for the assertion that there is no way to determine those options solely with reference to a quasi-biological *carrying capacity* of a *given area*. For human beings, the term makes sense only for the very limited field of small-scale agricultural and forestry uses of land, on the one hand, or for the Earth as a whole, on the other. In between, there is simply no viable method to define a “given area” the carrying capacity of which one can reasonably talk about in a meaningful way, because that area would have to include every piece of land, including the subsurface, the resources of which are made available through mining and transportation from other parts of the globe.

Ever since the bronze, if not the stone age, man has been a mining animal (for an introduction of the concept of *homo minerus* or *homo minerator* see Nitsch 1994a:189), and mining, by definition, is not “sustainable“ in the strict, biological (“biomass“) sense as used by forest engineers and sometimes transferred to the Amazon or other geographical entities (“given areas“). It might be argued that carrying capacity and sustainability are nowadays en vogue, and undoubtedly, they make sense as gradualist (more-or-less) concepts; they are also quite useful when biological species and human impacts on small islands or plots of land as well as when the whole Earth and her climate are at stake, - so why not use the words and defend the environment in Amazonia with these terms going beyond clear-cut wildlife and protection issues?

As every intellectual knows, words are weapons, - not merely useful tools and concepts in theories. That is why one has to evaluate the power and connotation of words very

critically, and the possibility that they could instead backfire should always be considered. Since no human settlement for the last 10,000 years or so has been biologically *sustainable* in a strict sense, there is a great danger that it is not only unconvincing and useless, but even counterproductive to introduce the forestry notion of sustainability into the present debate. If mining and transport are taken into account, not even Manhattan Island can unequivocally be proven to be crowded beyond its carrying capacity, nor the South of Florida or the Miami region. How then can *madeireiros* in Rondônia or *garimpeiros* in Roraima, road builders in Amazonas or the military in Acre, cattle ranchers in Pará or eucalyptus plantation planners in Amapá be convinced that the small piece of land they want to use cannot carry that additional human activity which they have in mind? Using non-operational yardsticks such as carrying capacity and sustainability in their strict biological sense, it is easier to turn poor caboclos into a population far beyond the carrying capacity of any forest ecosystem threatening its biodiversity, than to fight the clearing of the primary forest for the well-planned establishment of an economically and ecologically viable modern dendê or eucalyptus plantation which uses great quantities of fossil energy, fertilisers, pesticides, etc., but whose management might have the economic means and even the will to invest in soil protection etc. When economic feasibility and environmental assessment studies show a long-term viable enterprise, it is hard to imagine successful political and administrative resistance based on scientific analysis when well-intentioned bureaucrats should try to take up and operationalise the *carrying capacity* of the original local primary or secondary forest ecosystem as its basic criterion.

The attentive reader will have noted that in fact a semantic experiment has been tried in the previous two sentences: *sustainability* has been replaced by *viability*, a term whose connotations are more modern, more economic, more technical, more developmentalist, and, at the same time, seemingly more convincing when it comes to defending entrepreneurial interests. Whether traced back to the Latin *vita* (life) or *via* (way), the word “viable” suggests a way toward life in the future without reference to a “given area”. That is why it is analytically more correct as an intellectual tool in the modern world, but at the same time it is a more dangerous weapon, when it comes to destroying the forest, because a soybean plantation, a cattle ranch or a tourist jungle resort can easily be shown to be economically more “viable” than the standing primary forest.

There is an additional anti-ecological bias inherent in these terms. The very term *capacity* implies the quest for a maximum, thus driving planning considerations as well as scientific research toward identifying the *limits* of most intensive human use; strict conservation areas can thus never be justified, because some kind of human impact can always be “carried” by the ecosystem in question. *Sustainability* has a certain maximising connotation as well, even though it is somewhat weaker than the one implicit in *capacity*. Finally, *viability* elicits implications such as “where there is a will there is a way” and/or “life always goes on”, which both tend to play down environmental costs and conservationist goals. There is a basic paradox or even tragedy in the fact that those concepts which are meant to combat destruction and degradation of the environment turn out to have an inherent anti-ecological bias.

Natural scientists who follow maximising lines of argumentation, surrender the basic critical role which we, as economists and social scientists, expect from them in interdis-

ciplinary research and discourse, namely to voice what, in the first line of the "Declaración de Caracas" of February 21, 1992, on "Parques, Areas Protegidas y el Futuro de la Humanidad", is beautifully formulated in the following way (Barzetti 1993: 235):

"Reconocemos que la naturaleza posee un valor intrínscico y merece respeto, independientemente de su utilidad para la humanidad."²

Without recognising the "intrinsic value" of nature, the utterly utilitaristic, anthropocentric concepts of carrying capacity and sustainability cannot serve to justify a single national park. In areas with fertile soils and low erosion vulnerability, any coverage with primary forest becomes an obsolete relic of the wilderness past, because the human carrying capacity of the land and even of the forest in that given area can always be proven to be under-utilised; it only depends on the technology which is supposed to be applied by the additional human population.

Is it not the biologist's role to check and balance the commercial *homo oeconomicus*, not to praise and aggrandise him? By using maximising terms, he is being even more blindly utilitarian and greedy than the economist's *homunculus* who, at least, always thinks in *opportunity costs*, i.e. the value of the opportunity forgone, when taking a decision, thus evaluating even the unspoiled forest and the virgin land for its eventual future value (e.g. biodiversity, reserve land and use of indigenous knowledge), and contrasting this with their immediate use (see Amelung/Wiebelt 1991, Beckenbach 1991, Hampicke 1991, 1992). The example of a beach hotel in a national park in Santa Lucia in the Caribbean (Barzetti 1993:3) provides a case in point: Cost-benefit analysis based on opportunity costs showed that the economically better option was leaving the park untouched and *not* building the hotel. It is hardly imaginable, how a carrying-capacity analysis, let alone sustainability or viability criteria could have achieved that result, since the "given area" at the beach could certainly have carried or sustained that "one and only" hotel in a viable way, depending on the parameters. If Miami Beach is not overcrowded in terms of any convincing and somehow *objective* method to determine the *carrying capacity* of that piece of land in Florida, - how could anybody show that the limits are reached on a virgin natural park beach in Santa Lucia? The point is that the value of *lost opportunity* to have an untouched park, with hotels farther away, can hardly be incorporated into a calculus which refers to a "given area".

Hampicke (1991 and 1992) and every other textbook on ecological economics provide a vast range of methods and examples of how it is possible to operationalise the concept of opportunity costs with regard to the valuation of nature. The above-mentioned reference to the willingness to pay in debt-for-nature deals on all levels is, in fact, one application of that line of thought. It also shows that costs and benefits do not always refer to the same individual or decision-making body. This is why cost-benefit analysis is not a panacea either. Natural resources simply do not have prices attached to them and can be appropriated freely, as long as society does not put price tags on them. Thus, cost-benefit analysis

² "We recognize that nature has an intrinsic value und deserves respect, independently from its utility for mankind" (translation MN).

often proves to be a weak tool, too, or even a weapon that has backfired: When costs are borne by others, including nature, any benefit appears to justify a *project*. Nevertheless, the defenders of the Amazonian rain forest and of ecologically sound human development should not pass up the chance to take the economist's lost opportunity seriously and attempt to use his weapons which are often believed to be only useful and available for the other side!

Social sciences offer not only the arsenal of the neo-classical economist with his thinking in alternatives and opportunity costs, but also the ecologically rather gloomy vision of the social-systems theorist writing on *ecological communication*: According to Luhmann (1988) and his school, political decisions and socio-economic processes should be analysed as systems having their own logic and their own dynamics of auto-reproduction (*auto-poiesis* in general systems theory); interaction between different systems is always precarious; at the interface, activities in one system must find *resonance* in the code of the other one. The *resonance* metaphor refers to the interdependence of response between mechanical waves and sound waves, and every violin builder can tell you about the precarious nature of the *interface* and what an art it is to tune the two systems - music and its acoustics on the one side, and wood and its mechanics on the other - and their respective *codes* in a compatible way.

In a more general sense, any response between different, but somehow interdependent and co-existing systems each of which functioning and reproducing itself according to its own logic can be called resonance. The killing of a protected animal, for instance, must be detected, recorded and transferred into the language and procedures of penal law within the judicial system, before the death of the animal can be sanctioned, i.e. find resonance through a fine, imprisonment or other punishment.

What gives direction to land-use patterns, conservation and development in a modern society based on fossil energy, minerals, international trade, communication networks, etc., are socio-economic-politico-administrative processes which function within their own logic and even without much regard to one another, let alone to local resources, landscapes and nature in general. Socio-political processes might destroy the forest, poison the water, kill the animals and the human beings, or it might protect them, leave them untouched or develop them. The lesson from this type of sociological systems approach with its emphasis on ecological communication, is to pay very close attention to the resonance which natural phenomena find in society and its specialised subsystems. In general, resonance and reactions are inadequate, oscillating between dumbness, negligence and hysteria. The identification and measurement of critical variables and their critical values by natural scientists have to be combined with the transfer of these information bits into the relevant human communication systems, such as the economy, which only understands the code of money so that environmental concerns have to be translated into fiscal incentives or disincentives, fines, profits, and the like.

Another social subsystem, namely the political system, only understands votes, - at least that is the norm in a democracy. Therefore, the electorate's wishes with regard to land use find resonance at the political level in the politicians' decisions over planning maps, demarcation of reserves, budgetary allocations for environmental agencies, etc.

The concept of *resonance* forms the basis of what is often called *environmental monitoring*. It leads one to see very clearly the importance of environmental agencies and NGOs, since generally they are the social subsystems to monitor the critical variables and values which the scientists determine, detect and measure. They also direct the relevant information toward the specialised social macro systems such as the economy, politics and the judiciary.

The outcome of all these very complex social activities is independent of the intentions of individual political and economic decisions, since there is no mastermind managing a *tabula rasa*, but always a multiplicity of decision-makers whose actions might, in sum, lead to some kind of equilibrium as well as to chaos. The assumption of a mastermind, sometimes projected into politicians and usurped by technocrats, can even lead to counter-productive behaviour, as will be discussed in the following section.

The Concept of Zoning ("Zoneamento Ecológico-Econômico")

On the national level and on the level of the individual states, Amazonian strategies in Brazil have recently centred around serious attempts at zoning ("Zoneamento Ecológico-Econômico - ZEE"). Large areas, for instance, a whole state like Rondônia is divided into zones of graded intensity of use (Rondônia 1989): In Zone 1, agricultural production is allowed to take place, whereas Zone 6 comprises areas of complete protection, Zone 5 is destined for careful forest use, etc. The idea underlying zoning is to integrate the geographical and thematic maps of soils, vegetation, settlements, etc., with land-use planning maps for future infrastructure projects, national parks, other protected areas and zones of more or less intensive agro-silvi-pastoral use of the land.

The idea of the six zones has spread from Brazil to the other Amazonian countries through the above-mentioned report "Amazonia without Myths" (IDB/UNDP/ACT 1992:73) and also to the rest of the world through the World Bank's "World Development Report 1992" (World Bank 1992, Box 7.6). In a more general way, FAO (1993) has also propagated a similar approach. Meanwhile, zoning has become a constitutional mandate in various States of the Brazilian Federation, and the Pilot Program has been trying to push its practical implementation so that a critical assessment of that concept gains an international as well as a very practical local and national dimension.

The basic problem with the allocation of land to one or the other use by means of governmental planning decisions rests in narrowing the options for a large area down to a comprehensive map of various zones with definite limits. Generally, thematic maps on soils, vegetation, animal habitats, etc. provide a solid basis; then, the concept of *ecosystem* serves as an integrating vision which is assumed to be able to embrace all aspects of nature as well as man, modern society and the human impacts on nature.

The next operational step has succinctly been described by the well-known Brazilian geographer Ab'Saber (1989:4):

”Estabelecer as bases de um zoneamento ecológico e econômico em uma determinada conjuntura geográfica equivale a realizar um estudo para *determinar* a *vocação* de todos os subespaços que compõem um certo território, efetuar o levantamento de suas *potencialidades econômicas*, sob um critério basicamente ecodesenvolvimentista“ (emphasis added MN).³

Listening to the ”voice“ of nature in order to detect and ”determine“ the ”vocation“ of ”all“ parcels of land is, of course, a romantic, pre-modern idea; however, it becomes a powerful driving force, when scientists, technocrats, environmental non-governmental organisations and the military join ranks and efforts. Proceeding in this way, the definition of more or less homogeneous ”sub-spaces“ and the *diagnóstico* studies of their ”economic potential“ for ”all of them“ is bound to become an unending endeavour. Because of the inherent and unavoidable arbitrariness in the definition of the zones and the borders between them, it turns out to be of crucial importance to gain access to the small, elite decision-making group of listeners who convert the mandates of nature’s *voice* into laws and decrees for man and society, and who cloud and protect this secret.

With the integration of clean geographical maps on one side and utterly political planning maps on the other, by a small group of academics, technocrats and military men, the basic philosophical difference between analysing what *is* and deciding on what *should be* done, i.e. between science and politics in modern society, is lost. Once again, *carrying capacity* creeps into the discussion as a normative concept, and some kind of general vulnerability of nature, measured by an index combining items such as inclination, soil quality, rainfall, sunshine, vegetation, rare species, wind exposure, etc. The selection and the weights attributed to the items within the index remain arbitrary, but *vulnerability* turns into a seemingly objective intermediate stepping stone between what *is* and what *should be* done or not done. The scientists and the planning professionals are misused in an attempt to avoid transparency for hard political choices that need to be made.

The fact that other options tend to be pushed aside in a technocratic gesture could be tolerated or even welcomed by advocates of protectionist policies and truly sustainable use, if zoning had a pro-environmental bias. But it does not: Ab’Saber’s concept of *economic potentialities* is, like *capacity*, an inherently maximising concept, one that seeks for the most potent economic uses and condemns conservationists to playing the role of unscientific romantics which is, of course, exactly opposite to his own explicit writings and conference contributions as well as to his intentions as one of the most active defenders of the Amazonian rain forest, - but it is immanent in his words.

The false holism hiding behind zoning is sometimes even accompanied by an anti-Cartesian discourse as well as an usurpation of *harmony with nature* for the resulting map. However, because in the context of zoning as a planning device, a *zone* is always defined as prohibiting certain forms of use, nobody likes zoning, neither the landowner, nor the la-

³ “To establish the bases for ecological and economic zoning in a circumscribed geographical setting means to make a study in order to determine the vocation of all the sub-spaces which compose a certain territory, and to make a survey of their economic potential under a basically eco-developmental criterion“ (translation MN).

bourer, the shopkeeper nor the teacher; since everyone wants to live in a zone that permits a somewhat more intensive use of the land, e.g. the paving of roads. In city planning they say: "Zoning is negative" (Babcock 1966:65). For this very reason, every citizen and voter hates it, and zoning can only be carried through confidentially. Here, the military come into the picture, the co-ordinating agency on the national level being the Secretaria de Assuntos Estratégicos (SAE) at the Presidency of the Republic, the institutional successor of the extinct Serviço Nacional de Informações (SNI), the former secret police of the military government (for a certain continuity until recently see Chimanovitch 1993). And within SAE, the General Secretariat for Zoning has been headed by a retired general since September 1997.

An alternative way to have zoning legislation passed is to sweeten negative zoning with positive promises of substantial infrastructure projects balancing the loss of options (cost) with additional infrastructure value (benefit).

Serrão/Homma (1993:291) stress that point very clearly:

"Agroecologic and economic zoning *must be* accompanied by strong technical assistance programs and a strong social infrastructure" (emphasis added by MN).

Zoning, however, is an activity which is, by its very administrative logic, something definitely different from infrastructure planning which is typically a sector affair. That means that there is an incentive for the all-round *zoneamento* planners to promise oversized sector projects and - because of uncertainty which leads to high discount rates for all kinds of vague promises - for the people to demand much more than they can ever expect. Bureaucrats in the individual sector infrastructure departments of public administration love zoning because of that, of course. Finally, scientists are also generally in favour of zoning, since, as already mentioned, their thirst for never-ending studies and the corresponding funds as well as their dream of converting knowledge into power, i.e. of scientific information of what *is* into a definition of what *should be* done, seems to become true. The pro-zoning coalition, then, is quite strong, even though the predictable results are unrealistic plans, an anti-democratic lack of transparency of public decision-making, general discontent with politicians and administrative agencies because they confine every citizen to a negatively defined zone (put him or her "in a cage"), anti-ecological bias (since oversized projects are put into the air), and everybody's interest in intensifying land use is encouraged by this type of land-use planning which seems so convincing and rational at first sight.

The history of zoning provides the clue to its merits and shortcomings: Zoning has been applied to land-use planning in cities for a long time and with certain success; as in the countryside, every landowner has an interest in the most intensive use of his or her own plot of land, because it increases the value of that land; however, it is only in towns and cities, particularly in residential areas, that the owner of nearly every house or neighbourhood has a definite interest in keeping *down* the intensive use of his or her neighbours' plots - a green park area nearby being his or her preference; that is why there is a socio-political equilibrium between conservation and intensification in the use of land and nature in city planning. In contrast, no rural dweller has any interest in limiting a neighbour's intensity of use.

In the Brazilian countryside, there is probably an additional clue for the attractiveness of zoning to be found in the vastness of large fazendas: Of course, every large ranch or plantation with tracts of primary or secondary forest is being *zoned* by the owner according to the perceived *vocation* of all the diverse parcels of land, - but also according to his or her preferences and capital endowments. The transfer of this principle of plain rational behaviour from the micro-economic agent with full private property rights, i.e. the patron, to the public planner who can only prohibit or not prohibit the full use of those private property rights, leads to the fundamental problems of *zoneamento* as described above, which can thus be seen as results of something like a *patronal misunderstanding* of the role of the State in a capitalist society.

Meanwhile, the problematic experience with detailed, comprehensive zoning of the Rondônia type in practice has led the Ministry of Environment, Water Resources and the Legal Amazon to recommend limiting zoning exercises by concentrating on Special Zones (Indian Areas, Extractive Reserves and Conservation Units) and Critical Zones which, „in view of the specialty of their environmental systems require adequate technologies for their management“ (Brazil 1995:22). All the rest is left to the category of “Productive Zones”, again a term with an anti-ecological bias, since the law of the land requires 80 per cent of the forest to be left untouched and not under “production” as a “legal reserve”, whenever land titles are given to private investors in Amazonia. That way it should be possible to define the first two zones as corresponding more or less to the scarcely populated categories 6 and 5 in Rondônia. However, when the third category is left as the large residual comprising zones 1 to 4, it would hardly be possible to avoid massive deforestation there, as long as the term “productive zone” is being officially applied to those areas. No wonder that there is a widespread tendency to ignore the 80 per cent, and ever once in a while there are moves in Congress to reduce the figure to 50 per cent or introduce other amendments allowing more deforestation. Only with more neutral words or stronger pro-ecological concepts reflecting the mandate of the Federal Constitution which speaks of the Amazon Forest as a “Patrimônio Nacional” (art. 225) could the most problematic anti-ecological and anti-democratic biases of zoning be avoided. Unfortunately, the word “zoneamento” cannot be completely avoided, since it figures as a mandate in various of the state constitutions.

The rather reasonable reduction of the previous six zones with various sub- and sub-sub-zones to only “*three* basic types of zones“ (emphasis added MN) in the paper in English from the Ministry at the national level has not yet found its way into the “Diretrizes Institucionais“ sobre „Planejamento e Zoneamento“ in the “Documentação Básica“ of the recent policy paper on the “Política Nacional Integrada para a Amazônia Legal“ of the National Council on the Legal Amazon (Brasil 1995b: 26f). It has not even trickled down to the SAE document of August 1995 (SAE 1995) nor, on the side of the scientists, to the “Details of the Methodology for Execution of Ecological-Economic Zoning (ZEE) by the States of the Legal Amazon Region“ of 1997 (Becker/Egler 1997) in which *four* categories are suggested: areas for *expansion*, *conservation*, *consolidation* and *recuperation* (p.41), according to a matrix superimposing high or low *natural vulnerability* with high or low *socio-economic potential*. The resulting graph (ibid., last page, p.42) reserves only one quadrant for *conservation*, namely the one with high vulnerability and low potential, one for *recuperation* (high vulnerability and high potential), both of which are called “critical

areas". The combination of low vulnerability and low potential is astonishingly destined for *expansion*. A conversation with the authors revealed that they had "use of potential" in mind, which means the reciprocal value. This does not become clear at all, however, because the quadrant of low vulnerability and high potential is recommended for *consolidation*, insinuating an equally intensive use, because both types are called "productive areas". The overall impression for the reader is one of opening up Amazonia for "production" through this ZEE type of zoning, leaving only highly vulnerable and low-potential areas for conservation (for detailed criticism see Nitsch 1998).

Another approach to more convincing *macro-zoneamento* planning has recently appeared in the discussions and documents around the second phase of the PP/G7: The *development corridors* which have been established and already partially implemented in the *Brazil on the Move* Program are to be flanked and/or compensated by *ecological corridors* connecting already existing protected areas and stretching into hitherto unprotected territories (Brasil 1997). The planning around these large tracts of land does not correspond to the current ZEE endeavours as described above, but it concentrates on special areas which might be crucial for preserving those particularly important parts of the Amazon forests, not only hotspots of biodiversity, but also areas under special pressure from recent and future infrastructure axes.

Amazonia as a *Frontier* or *Post-Frontier* Region?

The attraction of zoning as a planning instrument is particularly high in such *tabularasa* situations as following colonial colonial conquests. The very term *mapping* has come to signify a search for domination and control, for definition and allocation by fiat decisions, - the typical metaphor being the *frontier*.

This term has often been applied to Amazonia, and it can be said to contain more than a grain of truth. But, again: *Words are weapons!* That is why a critical assessment of the implications of the term *frontier* is essential, before its use or non-use is recommended for intellectuals in public discourse.

In contrast to a "border", a "frontier" always presupposes a line (or area) between us and them, between cosmos and chaos, between inside and outside, between here and there, between civilisation and barbarism. The frontier marks the line between legitimate private violence (toward the barbarians) and the state monopoly of violence (within the civilised area); beyond the frontier, there is a lawless zone, an area which is typically disputed between barbarians, other outsiders such as pirates and competing nations (including *internationalisation* agents) on the one hand, and the civilised on the other. Since the conquest takes place in the name of progress, order, development and civilisation, nature as well as the human beings living beyond the frontier are necessarily regarded as aliens, enemies and obstacles to progress and civilised life. Bringing law and order to the frontier justifies violence and all kinds of club-law against the alleged law of the jungle (there) by self-appointed sheriffs and their alleged constituencies.

If these are the implications of *frontier speak*, all efforts of the defenders of the

Amazon and of human rights should be directed toward de-legitimising its use. They should insist that *the frontier is the border of the country*, and every piece of land as well as every human person on Brazilian soil belongs to a civilised, modern nation, where the State has the legitimate monopoly of violence, and its citizens in Amazonia have the same right to human security, to public services and infrastructure as in other parts of the nation.

Amazonia might have been the last frontier in the past few decades, but now the Amazonian people live in a "post-frontier society" (Cleary 1993, with a somewhat different intention), where the laws of the land rule as everywhere else in Brazil and where the primary tropical forest has become something like the Botanical Garden, the Central Park, the Bois de Bologne or the Grunewald of the civilised city-nation of Brazil. How else can a tropical forest be turned from a wilderness to be conquered into a precious treasure which is to be preserved and protected as a "national patrimony"?

Academics as well as journalists, planners and administrators might disagree with this plea, saying that Amazonia *really* and in fact still presents traits of a typical *frontier*. Nobody can deny that, but it is not the point. When the use of this word promotes violence and destruction, why not try to take this weapon away from the *madeireiros* and *grileiros*, the violent men and the *tabula-rasa* planners? At least stop playing their game by using the word uncritically! The relation between reality and words is always loose and full of opportunistic and emotional as well as pragmatic implications; in epistemological terms, it is an essentialist error to postulate a direct link. Intellectuals have no other weapons than words, so they should not hesitate to use their limited power of defining the world through words and to introduce a different type of discourse, when old words turn out to promote harmful ideologies and actions.

An interesting, though not very prominent approach to analyse the allocation of the Amazonian resources to conservation, sustainable or not so sustainable use, and to degradation, is provided by the German economist Stadermann's tripod of allocation mechanisms: taboo, force, and money (Stadermann 1995): He asserts that only those three instruments have, with differing predominance, reigned the ancient world (through taboos), the middle ages, feudal and colonial as well as communist regimes (through force), and the present capitalist order (through money). At any time, all three pillars have been present so that no monetary exchange on the market place for apples would be possible, if there were no enforcement of contracts through the courts and finally the police, and not a widespread taboo not to steal the apples in the first place. Money has a role in slave markets, but it is brutal force which is dominant in regimes with slavery. And there certainly was a great deal of violence beyond taboos, in the ancient world, and some money, too.

Applying the tripod model to Amazonia, the frontier image conveys a taboo structure in which deforestation is part of progress and welfare so that monetary incentives as well as legislative, administrative and police actions have to run counter to widespread public sentiments and taboos. Zooming in on the different actors, *madeireiros* often combine money and private force and violence, Indians combine taboo and administrative, i.e. at the end of the day, police support against money, and the anthropologists and NGOs try to convert the socially dominant taboos by challenging frontier speak through conservation slogans such as "*Desmatamento Zero!*". PPG7 donors, administrators and field staff try to

use money for converting the same taboo structures, and to provide the bases for forceful action by the State when empowering, giving money, and fomenting the environmental agencies of the Amazonian States and other state actors.

Summary: No Way to Avoid Hard Political Choices

The point can hardly be overstated that, for good or evil, there is a very wide range of land-use options in the Amazon as everywhere else in the modern world, and that there is no way to avoid the corresponding hard political choices. Immense sums of money are at stake which will, according to the political decisions taken with regard to their use or non-use, determine, one way or the other, what is going to happen in the region. The presumed *vocation* of this or that hill for managed forestry, strict preservation, annual cropping, plantation production or sheer degradation can hardly be taken seriously, even when this *voice* and its *calling* should find resonance in the ear of a shaman or the paper of a keen scientist. Not that detailed maps should not be drawn, - quite the contrary; but *clean* maps should be made available to civil society, to the authorities and to the international community, and the future planning maps should be *scenarios* to be decided on by democratic procedures, not the result of technocratic exercises.

Since nature has no voice in all this, her advocates and their arguments become of prime importance, since they determine the *resonance* and, by that, to a certain degree the feedback of human action on nature. Furthermore, since protection of nature always signifies a restriction on human activities, the usual procedure for protecting larger tracts of land, namely national parks in their various forms, including extractive reserves and recent *biological* or *ecological corridors*, turn out to be a wise social invention: Note that the decision in favour of national parks is taken in the *national* capital, so that only a small fraction of the relevant electorate is restricted, - and the others are untouched and even relieved of further infringements on their freedom to pollute the planet.

One other alternative to comprehensive zoning turns out to be also ecologically and politically wiser: Planning around large infrastructure projects in a *Plano Diretor* offers a certain valuable service to the population while, at the same time, demanding the protection of certain areas; there is a positive *quid pro quo* for the inherently negative zoning which goes with this method and which makes protection of nature acceptable and planning alternatives transparent for political debate.

Risk, uncertainty and insecurity surround every choice with regard to the future. That is particularly true when dealing with the unknown details and treasures of primary forests and their irreversible destruction. Therefore, *moratoria* and other forms of careful resource management with regard to reserves in a wide sense make sense and should be advocated from an economic as well as from a biological point of view. This general attitude signifies the opposite of eco-technocratic presumptions which try to *determine* the *vocation* or maximum *carrying capacity* of a certain *given area* with seemingly objective accuracy and certainty, sometimes even usurping an alleged *harmony* with nature for the *optimal* solutions for which *consensus* has to be sought in society.

Beyond uncertainty, choices have to deal with social interests and alternatives. In a democratic society, scientists do not have the task to rule the country, but to analyse, to build scenarios, to open options and to discuss those options in open fora with civil society, pressure groups, and with the authorities; the democratic process undertakes the constitutional steps for converting political choices into binding rules, and the administrative organs execute and implement them with force. Environmental education and communication endeavours to change the taboos of society in favour of the protection of the forest should go hand in hand with monetary incentives, in recent days also in terms of carbon trade and compensatory financing, and with legislative, administrative and police measures to enforce the protection of the Amazonian forest as Brazil's precious "national patrimony". Natural as well as social scientists and representatives of the humanities should be able to subscribe to that credo. A critical reflection on their concepts and words used in academic as well as public discourse should help to achieve that goal.

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Abstract

Public discourse on recent strategies for the Amazon has been loaded with concepts from the natural as well as the social sciences. Among these, “sustainability” and “carrying capacity” turn out to be rather problematic because of their inherent lack of operationability in the modern world, whereas the economic term of “opportunity costs”, including risk considerations, can provide a powerful instrument in the hands of the defenders of the forest. The concept of “resonance” taken from sociological systems theory, can also enlighten the debate in that it draws attention to the precarious interface between nature and society: States of nature and her perils have to be translated into human communication systems such as law, politics, education, economy and media, before protective action can be taken. Recent experience with “Ecological-Economic Zoning” in the Amazon is taken as the prime example to illustrate the semantic and methodological points. Finally, the “frontier” illustrates the point that the relative weight within the tripod of taboo, force and money reigning the allocation of resources, varies widely between the actors involved. The struggle between the advocates for the protection and the actors in favor of destruction or sustainable use of the Amazonian rainforest is an open-ended process

Resumo

O discurso público sobre as estratégias recentes na Amazônia está carregado de conceitos das ciências naturais e sociais. Entre eles, “sustentabilidade” e “capacidade de suporte” são bastante problemáticos porque não podem ser operacionalizados objetivamente no mundo moderno. Porém, o termo econômico “custo de oportunidade”, incluindo o aspeto do risco, poderia servir como instrumento poderoso nas mãos dos defensores da floresta. Também, o conceito “ressonância” da teoria sociológica de sistemas ilumina o debate, porque lida a atenção à interface precária entre natureza e sociedade: Estados da natureza e dos perigos e ameaças a ela têm que ser traduzidos aos sistemas de comunicação humana, como por exemplo o sistema de justiça, a política, o sistema de educação, a economia e mídia, antes de se efetuar qualquer ação protetiva. Se recorre, hoje, em primeiro lugar, às experiências recentes com o “Zoneamento Ecológico-Econômico” na Amazônia para exemplificar os argumentos semânticos e metodológicos. Por fim, o conceito da “fronteira” ilustra o argumento de que o peso relativo dentro do tripê de tabu, força e dinheiro, que determina a alocação de recursos, varia amplamente entre os atores relevantes. A luta entre os advogados da proteção e os atores in favor da destruição ou do uso mais ou menos sustentável da floresta amazônica é um processo com destino aberto.