

# Scale of Interactions of Brazilian Populations (Caiçaras and Caboclos) with Resources and Institutions

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## Abstract

*One important question concerning the sustainability of local or native populations refers to their interactions with local and global institutions. We should expect that populations with the capacity to interact economically and politically with institutions, might have a better chance for ecological and cultural continuity as well as for trade and subsistence. The level of ecological and social interaction of local populations, following concepts from ecology, occurs at different scales: for example, from the territories of individual fishers in the Atlantic Forest coast to communal organized Extractive Reserves in the Amazon. The scale of organization (individual/family/community) may influence the capacity to deal with institutions. This study analyzes how Brazilian native populations, especially caiçaras of the Atlantic Forest coast, and caboclos from the Amazon, have interacted with regional, national and global institutions, concerning environmental demands. Concepts such as common management, natural capital, resilience and sustainability are useful when trying to understand these illustrative cases.*

**Keywords:** sustainability, Brazil, population, Atlantic Forest, Amazon

## Introduction

The purpose of this study is to analyze sustainability associated with local management and with the scale of interactions of Brazilian native populations, such as the caiçaras of the Atlantic Forest coast, and the Amazonian caboclos. This approach takes into consideration the scale and types of interactions among native populations and institutions, in light of local and global environmental concerns. The association of human ecology with ecological economics brings together concepts (such as capital, common property and resilience) that are useful for management at local and global levels. The key point regarding sustainability is that it ranges from a fine (low) to a coarse (high) scale: local sustainable regimes are a foundation for global sustainability,

even if global sustainability is not *only* based on sustainable local regimes, and it requires institutional shifts at global levels *as well*. Brazilian cases, from communities of the south-east coast of the Atlantic Forest, called *caiçaras*, and from Amazon communities, called *caboclos*, are examples of resource users in areas of high biodiversity and are potential cases for management.

## The Caiçaras and the Caboclos

The information that follows is detailed in Begossi (1995a, 1996a and 1998a). Populations living in the southern part of the Atlantic Forest coast are called *caiçaras*, and are a sort of analogue of the Amazon *caboclo*: both descend from Indians and Portuguese and depend on agriculture and fishing for cash and for subsistence. The *caiçara* communities in this study are located on the northern coast of São Paulo State and southern coast of Rio de Janeiro State. In general, these communities have small populations, ranging from 12 families (islanders) to 100 (coastal communities).

Among the *caiçaras* agriculture is usually based on manioc (the main crop), but it may include potatoes, yams, beans, and a variety of fruits. In the processing of manioc to produce flour they utilize techniques, which go back to indigenous practices. These practices rid the manioc of toxic cyanidric acid. Many different plant species are used by the *caiçaras* for food, medicine, handicrafts and construction (Begossi et al. 1993).

Fish is the main source of animal protein for the *caiçaras*, ranging from 52% at Puruba Beach to 68% at Búzios Island and Gamboa (see Table 1). Common marine animals used for food and sale at Búzios Island are bluefish (*Pomatomus saltatrix*), squid (*Loligo sanpaulensis*) and half-beak (*Hemiramphus balao*); at Puruba they are snook (*Centropomus parallelus*) and mullets (*Mugil* spp.), along with freshwater catfish; and at Sepetiba Bay they are shrimp (*Penaeus schmitti*), sand drum, weakfish (many Sciaenidae), mullets and kingfish (*Menticirrhus americanus*).

The caboclos: just as for the *caiçaras*, manioc cultivation and production of manioc flour are typical of *caboclo* subsistence activities. Slash-and-burn techniques are used for

Table 1. The local diet of caíçaras, illustrating their dependence on local resources, especially fish.

| Locality<br>[Southeast Atlantic<br>Forest Coast] | Percent of local<br>fish in diet | Reference                    |
|--|----------------------------------|------------------------------|
| Ponta da Almada                                  | 60                               | Hanazaki et al. (1996)       |
| Gamboá*  | 68                               | Begossi (1995a)              |
| Jaguanum*  | 65                               | Begossi (1995b)              |
| Puruba Beach                                     | 52                               | Begossi (1995b)              |
| Búzios Island                                    | 68                               | Begossi and Richerson (1993) |

cultivation. A variety of fruits from trees and from the highly diverse species of palms, are collected in the Amazonian forest. While we found communities showing a detailed knowledge of medicinal plants, other communities seem to have lost part of this knowledge.

*Caboclo* livelihood is based on small scale agricultural activities such as the cultivation of manioc, maize, rice, beans, water melon and papaya. *Caboclos* also fish in rivers, *igarapés* (small rivers) and *igapós* (flooded forest). River water level is usually important for the *caboclos* because their subsistence activities rely on river conditions: when the water is low ("summer") fishing is an important activity; when the water is high, in the wet season ("winter"), wildlife hunting in the forest tends to be important for subsistence. At the Upper Juruá Extractive Reserve, *mandí* (species of *Pimelodella*, *Pimelodina* and *Pimelodus*), surubim (*Pseudoplatystoma fasciatum*), Curimatidae (*Prochilodus nigricans*), as well as species of the families Loricariidae (*bodes*) and Anostomidae (*piau*) are very important for consumption. We observed that game was a very important protein source in the wet season at the Upper Juruá, when deer, peccaries, monkeys, and small-rodents are hunted (Begossi et al. 1996a). *Caboclos* and *caíçaras* both have a detailed knowledge of their environment. *Caíçaras* and *Caboclos* show different levels of interaction at the regional, national and at global scale.

### Sustainability: A Fuzzy Concept?

According to the well known definition of the Brundtland Report in 1987, sustainability concerns meeting the needs of present generations and preserving the opportunities available to future generations (Perrings 1994). Sustainability embodies a variety of additional meanings. Goldman (1995) provides different definitions of sustainability found in the literature, from food efficiency, to stewardship, to the capacity for indefinite survival of the human species. Gatto (1995) shows definitions given by the applied biologist (sustained yield), the ecologist (sustained abundance and biodiversity), and the economist (similar to the

Brundtland Report definition). Goodland (1995) describes social, economic and environmental sustainability. These definitions show how sustainability is a difficult concept to grasp. Ehrlich (1994) alerts us to the fallacy of a general assumption (including here the Brundtland report), that global economic activity can be safely multiplied five- to ten-fold, or even more. The author stresses how the level of knowledge in ecology is still insufficient to determine how much biodiversity should be preserved in order to avoid large regional and even global collapses of ecosystem services.<sup>1</sup> For Holling (1994) sustainable development is a paradox because something must change and something must remain constant. One paradox suggests that the diversity of life is a function of a small set of variables, each operating at different speeds, with a few structuring processes occurring at different scales: ecosystem dynamics include a small number of nested cycles, each driven by a few dominant variables. Another paradox suggests that the management of ecological variables leads to more brittle ecosystems, more rigid management institutions, and more dependent societies.

One of the central questions is how to link sustainability in a gradient scale from local to global, including criteria, rules, rights, and institutions that work towards it. Local and small communities are linked to a global world, and local behaviors that transcend *in situ* responses are important variables that affect a community's ability to reach sustainable local development. These are central points to this study, illustrated with particular cases from the southeast coast (Atlantic Forest) and northern (Amazon) Brazil.

### The Global World

According to Ferreira and Viola (1996) globalization embodies different perspectives in different times of history, as follows: in the *military*, since 1950, when two poles were represented by the USSR and the USA, in *politics*, since 1945 when the United Nations Organization was conceived (including IMF, World Bank, and G7, among others), and in the *economy*, when the multinational corporations that arose in the 1950s were followed by transnational corporations. *Cultural* globalization was stimulated by the transmission of the American way of life associated with communication improvements, such as fax, e-mail, and world TV channels. *Environmental* world problems gained social attention in the 1980s. These included climate change, the ozone layer, biodiversity, chemical and radioactive contamination, energy conservation, population growth and health. Also in the 1980s, thanks to communication facilities, *technological and scientific* development became global with frequent exchanges and communication among universities and research centers on a worldwide scale.

In Brazil, new relationships concerned with politics and the environment are also the result of world global interactions. Viola (1996) shows a detailed sketch of these interactions, creating group categories such as nationalists, globalists, sustainabilists, progressive and conservative. Our study addresses what Viola (1996) calls “progressive-nationalists-sustainabilists” or “progressive-globalists-sustainabilists,” which include actors interested in approaching sustainable development and social justice. The difference between the two is related to beliefs about the level of interference that the national state should be allowed to have in order to carry out a sustainable program. A supranational institution dealing with a planetary socioenvironmental crisis is considered important by globalists, but not by nationalists (Viola 1996).

This study asks the following questions. First, how do local communities respond to these new relationships and categories? Second, how are local approaches (such as local management) tied to the categories shown?

### Scale: Local Communities and Interactions

Scale is a basic question for general ecology, since different questions are drawn and analyzed according to the level approached (Begossi 1996b). Scale refers to resolution (such as spatial, grain size, time step), and to time, space, and number of components modeled (Constanza 1996). Solbrig (1992) shows that different levels of analysis on biodiversity are fundamental for management: moving from the biodiversity of genes, to that of species (the ultimate source of biodiversity), to the community (patterns of species richness), to biogeographical patterns such as spatial scale, immigration and extinction, and to ecosystem levels (the biosphere and global change).

Patterns of scale related to conservation, in a fine/low/local scale, include knowledge of species, population dynamics, resource uses and users, and the value of natural resources. At coarse/high/broad scales, they include common management,<sup>2</sup> landscape ecology, and political ecology (Begossi 1996b).

In both ecology and economics, primary information and measurement are collected at small scales (plots, farms) and are used to build models at regional or global scales (Constanza 1996). Levin (1992) stresses that there is no ‘correct’ scale on which to study populations or ecosystems, and that we should understand how information is transferred from fine to broad scales. According to Holling (1994) the lessons for both sustainable development and biodiversity are clear because the physical and temporal infrastructure of biomes at all scales sustain the ‘theater.’

In human ecology, information is usually collected from local communities at small scales, such as individuals or fam-

ilies. As in general ecology and ecological economics, a tricky question is how to use local information to make general predictions and analyses that go beyond the local community and extend to global issues. For example, how is the information collected on local subsistence used for general propositions of management, integrated with regional, national and global institutions? The case studies in this research will illustrate this point.

### Scale of Interactions of the Communities

The *caíçaras*’ strategies for decision-making concerning fishing or farming, or even local disputes, are variable among communities. In some communities, such as at Búzios island, the lineage system based on kinship is dominant. Decisions are usually a family task and leadership is an attribute of the older community members, who are usually consulted over problems related to the community (Begossi 1996a).

On the other hand, at Sepetiba bay, fishermen discuss communal problems at organized meetings and leadership is a consequence of local fishing activities. Fishermen perceive both the importance of the bay as a spawning and growing area for marine organisms, and the impacts caused by the industrial fishery. Fishermen involve local politicians and the local press in the defense of the bay against intruders, such as industrial fishermen (Begossi 1995a).

Contrary to the informality of most *caíçaras* in dealing with internal and external questions, *caboclos* are organized in associations and participate in local environmental politics. For example, fishermen from the Lower Amazon river have developed new management strategies for lake fisheries that involve excluding outsiders and regulating fishing activities (McGrath et al. 1993). Rubber-tappers (*seringueiros*) have organized themselves in associations and created Extractive Reserves, an example of common management practice.

Extractive Reserves are defined as “forest areas inhabited by extractive populations granted long-term usufruct rights to forest resources which they collectively manage” (Schwartzman 1989). Usufruct rights means that *caboclos* can exploit and manage the forest, but that they are not allowed to sell any area of the Extractive Reserve. The first Extractive Reserve (Upper Juruá) was legally established in 1990. This reserve is located in the State of Acre in Brazil. It includes about 860 families of rubber-tappers and small farmers and it is managed by the ASAREAJ (Association of Rubber-Tappers and Farmers of the Extractive Reserve of the Upper Juruá *Associação dos Seringueiros e Agricultores da Reserva Extrativista do Alto Juruá*) and by the CNS (National Rubber Tapper Council - *Conselho Nacional dos*

*Seringueiros*). The organization of the reserve is an activity involving local people in meetings, along with researchers, and representatives of the councils. As a result of local meetings, in 1994, the first management plan was proposed by the Rubber-Tapper Council and approved by the Environmental Federal Agency (IBAMA).

*Caiçaras* have responded to local conflicts involving industrial fishing and state environmental regulations (Begossi 1995a) at very specific levels, usually at an individual-family scale. *Caboclos*, influenced by the Liberation Theology and leftist parties, built strong political organizations and movements, that culminated in the common management of resources throughout the Extractive Reserves. In the case of the Alto Juruá, State of Acre, communications among the scattered families along the Juruá river were through the radio *Verdes Florestas* (Begossi 1998a). The range of *caboclo* action includes local communities (alliances of the Forest People), regional politics (Worker and Communist parties: *Partido dos Trabalhadores* and *Partido Comunista do Brasil*, among others), national politics (the creation of Extractive Reserves) and transnational behavior (such as *Chico Mendes* case). The different behavior of *caiçaras* and *caboclos* as well as their different approach to local and regional institutions led to different practices for management and conservation. Observe that to work towards a common management practice, it is important to interact at higher scales, beyond individual-family levels.

Table 2. Scale of resource distribution, ownership and management (based on Begossi 1996b).

| Resources               | Scale of ownership | Management                                      |
|-------------------------|--------------------|---|
| Specific, defined patch | Individual, family | Local rules, kinship                            |
| Forest, bay, lake       | Community, Village | Local, Common management:<br>Extractive Reserve |

## Market Demands

Both *caiçaras* and *caboclos* local subsistence and economy is based especially on fish, on the production of manioc flour, and (in case of *caboclos*) on rubber and nuts, with participation in the regional market. Regional market demands affecting the *caiçaras* were associated with the economic cycles of the last century, such as sugarcane (before 1800), coffee (1800-1870), and again sugarcane (including the production of rum) in the first half of this century (França 1954). After the fifties, fishing replaced agriculture as a source of cash (Begossi et al. 1993).

The *caboclos* participation in the regional economy was especially through agriculture, such as the production of rice,

juta (*Corchorus* sp) and malva (*Malva rotundifolia*), and among others; mining, timber extraction, cattle ranching and extraction of rubber and nuts (Fearnside 1991). Moran (1993) stressed the importance of cattle ranching as a source of deforestation in the Amazon. Deforested areas represent about 10.5% of the original forest. (Fearnside, 1995). Commercial fishing replaced agriculture in the area of the Amazon *varzea* (floodplain), as showed by McGrath et al. (1993). In contrast to the Atlantic Forest, the Amazon has always been an area of international attention. For example, international agencies, such as the World Bank and IDB (Interamerican Development Bank) lend funds for projects in the Amazon such as the Polonoroeste (Northwest Regional Development Pole), Planacre, and Grande Carajás (mineral deposits) (Fearnside 1987).

Besides the local subsistence and the regional economic cycles, associated with both *caiçaras* and *caboclos*, international attention, funding and projects have usually been a typical feature for the Amazon region. Because of this historically international focus on the Amazon, *caboclo* communities and culture have been more tied to the global economy and relationships than the *caiçaras* of the Atlantic Forest.

Local history along with political alliances, and international interactions might explain why we find a communicative and interactive behavior among the *caboclos*, and relatively isolated behaviors among the *caiçaras*. The importance of historical patterns of settlement, of colonization, and of economic interactions associated with environmental degradation are found in the literature (Amanor 1994; Franke and Chasin 1980).

The relative political isolation of *caiçaras* is currently helped by a high degree of religiosity, with many adepts of Pentecostal Churches (God Assembly, Christian Congregation, and Adventists, among others). Most adepts change their original lifestyle, participating intensely in church activities and avoiding social activities in which the church is absent (parties, meetings, TVs, radios). With regard to the *caboclos*, international concerns were historically associated with Amazonian areas. International environmental concerns regarding the Atlantic Forest are more recent and do not have the same tradition as that found in the Amazon.

## Scale and Resilience: From Local to Global Issues

The term *resilience* is an ecological concept associated with stability. It represents the ability of a system to maintain its structure and function after disturbance. It is characterized by events far from the equilibrium, it stresses the boundaries of stability, and it shows a high degree of adaptation and variability (Jansson and Jansson 1994). Holling (1992) defined

cycles organized by four functions: exploitation, conservation, release and organization. In this case, resilience is determined by the release and reorganization sequence.

Cultural behaviors may contribute to ecological resilience via practices that increase biodiversity or avoid overexploitation (Folke et al. 1998). Many have interesting attributes. On the one hand, it is the high flexibility of human behavior that made humans adaptable to different environments. On the other hand, human behavior may be very conservative and hard to change (or resistant), as seen in traditions. Changes of behaviors, or the maintenance of traditions, may or not be ecologically sound, depending on the context of the interaction between resources and users.

The high variability of *caboclo* interactions, and *caboclo* responses associated with their communicative interaction with institutions at various scales, has resulted in a resilient system of management (Extractive Reserves), when compared to the *caíçaras*' predominantly individual-family management practices. The implications of such behaviors, that transcend the local community to interact at various scales, are important for management, because:

a) the resilience of the ecological system increases, because locals are managers of natural resources. It is not a case where the State regulates some area, only officially defined, such as a conservation area without clear boundaries and supervision;

b) the resilience of the cultural system becomes strong, because community members may increase their capacity to survive in terms of the local economy, subsistence and cultural attitudes;

c) the community may guarantee, at a national level, the state contribution to local initiatives (such as the legalization of Extractive Reserves by the IBAMA). It is politically important for the so called "nationalists-sustainabilists";

d) the community may enforce their local/national management approach through international pressures (for example, Extractive Reserves, or the Chico Mendes case), a politically important attribute for "globalists-sustainabilists."

When incorporating the concepts of natural capital and human-made capital,<sup>3</sup> a sustainable society is defined by Ferreira and Viola (1996) as maintaining the natural capital available, or compensating for it through development of human made capital, and reducing the depletion of natural capital (allowing it for future generations). Daly (1994) observed that sustainability has also been incorporated into the definition of income as the maximum amount that a community can consume over some period and still have the same amount at the end of the period, as at the beginning. The author pointed out the definitions of *strong* and *weak* sustainability: the first considers natural and man-made capital as substitutes; the second view considers them as complements.

Even if a weak sustainability might improve current practices, strong sustainability is what really matters in the global environmental context, because production of man-made capital depends on the availability of natural capital. Daily and Ehrlich (1996) stressed that carrying capacity embodies the concept of sustainability: it is any process maintained without interruption, weakening or loss of valued qualities.

The problem facing those who want to promote sustainability is to define the mechanisms needed to accomplish it. For example, global information, reforms of government and institutions, information on how to address sociological, political and ethical factors, on how we manage systems, on how to preserve genetic, ecological and indigenous knowledge, on how to equitably limit world population, and other factors, can help communities to reach sustainability (Folke et al. 1994). Recently, Daily and Ehrlich (1996) addressed the relationship between sustainability and equity at different scales: they took into consideration food production and gender inequity. They also considered distribution of land among farmers, between urban and rural populations, and between nations.

Ecological economics deals with the problem of scarcity of resources, or with depletion of natural capital, a question not included in classical economics, which was performed for an "empty world", or a world without limits for exploitation (Hardin 1993). As pointed out by Constanza (1996), ecological economics views the socioeconomic system as part of the overall ecosystem, emphasizing carrying capacity and scale issues associated with human population growth, systems of property rights and wealth distribution. Folke et al. (1994) stressed that the approach of ecological economics should include the following points: a) evolutionary paradigm - it incorporates uncertainties, surprises, learning, multiple equilibria, and thermodynamic constraints; b) scale and hierarchy - or how hierarchical levels interact with each other, related to the question of scaling complex, regional, ecological and economic systems; and c) nature and limits of predictability - there may be limits to the predictability of a natural phenomenon at particular resolutions and we should access rules of how data and model predictability change with resolution.

Bergh and Straaten (1994) compared economic systems and their relation to the environment and their degradation capacity, over time. Hunting, agriculture and "modern" economies are compared. In hunting/fishing economies, the economy is viewed as stable with no technological changes and population increases; in agricultural economy, population and technological changes occur<sup>4</sup> and local environmental effects are noticed. In modern economy, mineral resources are introduced along with investments and residual processes. The examples described by Bergh and Straaten (1994) are

useful frameworks to consider when examining neo-traditional<sup>5</sup> populations of *caiçaras* and *caboclos* as agricultural economies (small-scale agriculture), where slight changes in technology and population may cause local degradation, but strong links to modern economies exists.

Sustainability for *caiçaras* and *caboclos* means a local managed system with institutional (local, regional and global) support. Still Extractive Reserves<sup>6</sup> are a fair example: they are common managed areas (*res communes*) with legal and governmental support in which local behaviors may be used for ecologically sound practices.

## Conclusions

The association of ecology, in particular of human ecology, with ecological economics brings with it the possibility of new approaches to management, using concepts such as scale, resilience, natural capital, and common management. National environmental policies are influenced by international and global variables, and by local Amazonian *caboclo* populations. Local influences are exemplified by Extractive Reserves, an example of common management. A less communicative or more isolated behavior is observed among the *caiçaras* of the Atlantic Forest coast: their systems of resource use and dispute resolution seldom go beyond family-community levels. On the other hand, *caboclos* interact at various scales with institutions, and have formed a variety of alliances, from other native populations (Forest People) to international institutions. Their behavior is consistent with progressive-globalists-sustainabilists categories. A central question, remains: how can *caiçaras* interact at higher scales? Initiatives that avoid patronizing by institutions (the state or universities) but include local decisions and participation are exemplified by *caboclo* experiences.

## Endnotes

1. Ecosystem or environmental services are the result of the structure and function of ecosystems. They include maintenance of air quality, climate, the hydrological cycle, recycling of nutrients, pollination, and maintenance of a genetic pool, among others (Berkes and Folke, 1994).
2. In a common property, communal property, or community-based management systems (*res communes*) individuals have claims on collective goods as members of groups. In these regimes, resources are managed by rules for user-groups and their continual use depends on other group members. Other regimes are open-access (*res nullius*, or free-for-all) and state property (*res publica*) (Berkes and Farvar, 1989; Gibbs and Bromley, 1989).
3. *Natural capital* includes non-renewable resources, renewable resources, and environmental services. *Human made capital* is generated through economic activity and technology (economist defini-

tion of capital). *Cultural capital* refers to factors that provide human societies with means and adaptations to deal with the environment and to modify it (Berkes and Folke 1992).

4. Following Boserup's (1981) theory.
5. Neo-traditional systems are defined as including elements from traditional and newly emergent systems (Berkes and Folke 1994). They include, besides traditional knowledge, new variants and knowledge that comes from outside the population. For this approach on *caiçaras* and *caboclos*, see Begossi (1998a).
6. The term extractive reserve is originally related to the extraction of rubber and nuts. Recent developments and practices show that extractive reserves must include a variety of other economic activities, such as small-scale agriculture, handicrafts and local markets for medicinal plants, among others (Begossi, 1998b).

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