

Averting a Global Environmental Collapse

**Averting
a Global
Environmental
Collapse**
The Role of
Anthropology
and Local
Knowledge

Edited by
Thomas Reuter

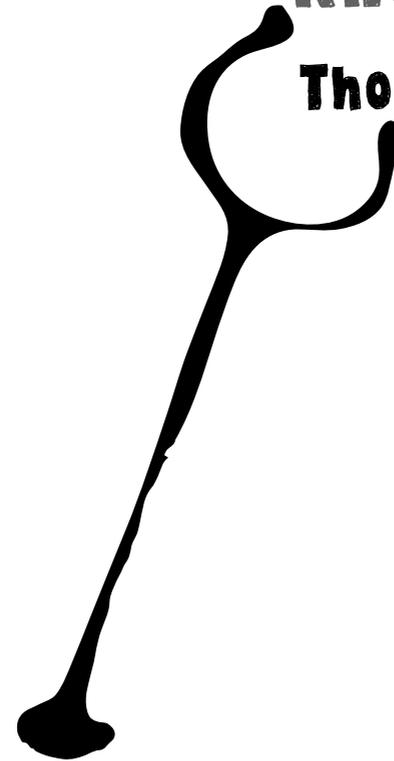


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The Role of Anthropology and Local Knowledge

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CHAPTER ONE

IN RESPONSE TO A GLOBAL ENVIRONMENTAL CRISIS: HOW ANTHROPOLOGISTS ARE CONTRIBUTING TOWARD SUSTAINABILITY AND CONSERVATION

Thomas Reuter

The Greatest Challenge in Human History

Innovative, sustainable and equitable solutions are urgently required to address a rapidly escalating global environmental crisis. A few examples of the anthropogenic environmental damage that has already occurred quickly illustrates the vast scope and seriousness of this crisis: Permeation of the oceans with toxic micro-particles of decomposed plastic that accumulate in marine animals right through the food chain (Setälä et. al. 2014); the loss of two thirds of all coral reefs due to fertilizer runoff and rising acidity (Pandolfi et. al. 2003); the decline of ocean fish stock worldwide (Roland 2012); rising sea levels (Lemonick 2012); the killing of bees and wild pollinator insects due to the use of neonicotinoids and other insecticides – threatening pollination of countless domestic and wild plant species (Mercola 2013); a massive loss of forest cover and other wildlife habitat (Szalay 2013); the overuse of groundwater irrigation and associated salinity and aquifer depletion issues (Brown 2013); the loss of sweet water stored in melting glaciers and continental ice shelves;¹ global water pollution;² global decline in soil quality, erosion and loss of arable land to development throughout the world;³ and, most widely discussed, the ever accelerating rise of global temperatures due to a growing pool of atmospheric CO₂ – threatening great upheaval in our food and water supply, acidification of the oceans and frequent hurricanes, wildfires, floods, drought and a normalization of other ‘extreme weather’ events (*cf.* the IPCC’s AR5, 2014).⁴ As a consequence of these and other environmental changes, so many life forms have already disappeared from spaceship earth that evolutionary scientists are classifying

the present time as one of a few great mass extinction events recorded in the 3.5 billion year history of life on earth. Recent studies suggest one quarter of all species will be gone forever by 2050 (Conservation International 2006). This multidimensional environmental crisis is underpinned by a number of core problems, such as the ubiquitous use of fossil fuels, population growth and the global growth of industrial production and per capita consumption. This unsustainable consumer culture is still promoted vigorously by vested interests, with nearly half a trillion USD spent on global advertisement annually.

At the same time, our knowledge of alternative ways of living is declining as cultural diversity is eroded by neoliberal development and the spread of a homogenized, media-driven, global consumer culture. The monetization of human relations, labour mobility and many other factors have seen local communities, extended family networks, and even nuclear families fall victim to social atomization in most parts of the world. In short, we are witnessing a loss of cultural diversity as well as biological diversity, and an associated loss of social capital and local knowledge. This creates an urgent need to explore and encourage culturally diverse, localized forms of managing human relations with the environment.

The evident lack of determined action to ameliorate today's looming environmental crisis is an indictment to us all, who have become accustomed to an unsustainable way of life. But political action is lagging far behind public sentiments on environmental issues in many countries, suggesting that political causes of resistance to a culture change toward sustainability requires special consideration. The main issue here is an ever more blatant failure of national political processes and institutions to deliver programs that accord with the best long-term interests of the public. From the 1970s onward we have witnessed a sharp decline in the sovereign capacity of national governments to set limits through legislation to the vested interests of transnational corporations operating across multiple jurisdictions. This has translated into an inability to protect the environment and to ensure a fair distribution of diminishing resources. Meanwhile, control over some of the pillars of a democratic society (such as public banking, independent media, professional non-politicized bureaucracies and free universities) and key environmental assets (transport, water and energy supply) has fallen into the hands of private interests in many countries. The middle class is declining in the US and Europe, and society is economically and politically polarizing in the wake of neoliberal austerity measures and so-called structural reforms. Public assets have been privatized and public funds plundered to 'bail out' banks and corporations,

or to pay back public debt accumulated in the people's name by corrupt national elites. In anticipation of social unrest, surveillance measures have increased and anti-terror laws have removed civil liberties.

While some nation states remain powerful and have considerable influence, these major regional powers are too distracted by their seemingly endless contest for global hegemony to take responsibility for protecting the global commons. Indeed, it seems that some political leaders still assume that the likelihood of survival in a crisis situation is proportionate to an individual's or a nation's superior capacity for violence, a philosophy of life still glibly referred to as 'realism' in the study International Relations. Anthropology suggests that the opposite may be closer to the truth, namely, that human survival and evolutionary success has been about our unique capacity to maintain complex cooperative social systems, especially in crisis situations. The global nature of the present crisis suggests we now need political mechanisms for global cooperation and solidarity rather than succumbing to fear, with everyone grabbing as much as they can from a dwindling resource base. The latter would seem more like a recipe for civilizational collapse.

A global platform for ensuring that humanity will exercise responsible environmental guardianship over the planet and manage its resources fairly is unlikely to emerge while the powerful influence of industry lobbies permeates most nation states, urging them to keep subsidizing fossil fuel production and to promote economic growth and profit at all costs, and while political rivalries between states take precedence over the pressing need for unified action. International political institutions thus still struggle to gain a mandate strong enough to make up for the globalization deficit of the nation state. International political and civil society institutions, nevertheless, have been multiplying rapidly under the influence of globalization, and their scope is steadily increasing (Camilleri & Falk 2006). Very important contributions have already been made to the cause of environmental protection by global institutions such as the UN Environmental Program (UNEP), the UN Commission on Sustainable Development (UNCSD), the United Nations Framework Convention on Climate Change (UNFCCC), the Intergovernmental Panel on Climate Change (IPCC), as well as countless international NGOs such as the Belmont Forum, Conservation International, Friends of the Earth, Greenpeace, the World Wildlife Fund, and many others.

While the international community thus struggles ever so slowly toward a consensus position, against a headwind of substantial opposition, we are in danger of drifting haplessly towards a converging crisis. The

crisis is, on the one hand, about rising inequality, increased totalitarian potential, growing indebtedness or bankruptcy of nation states, growing potential for resource wars and lack of community, and on the other hand, it is about natural disasters, chronic food and water insecurity, energy and resource shortages and other ‘natural limit’ conditions. Despite these alarming developments, a global environmental and societal collapse is not yet inevitable.

The environmental challenges we face today can be remedied, first, by addressing the evident failure of current socio-political structures to serve the common planetary interest of present and future generations and, second, through global implementation of already available technical solutions, with sensitivity to the diversity of local cultural and environmental conditions. This is no easy task. The impact a transformation to a sustainable world economy will have on our consumerist way of life is significant, and cultural change resistance at a grass roots level proportional to such impacts, real or perceived (Reuter 2010).

In view of the political and socio-cultural nature of change resistance, it is no exaggeration to say that the social sciences are now the key to achieving a global shift towards sustainability. Indeed, an International Science Union (ICSU) and International Social Science Council (ISSC) co-sponsored side event at the Rio+20 Earth Summit in Brazil in 2012 was designed to highlight this fact. I was quite impressed to hear natural scientists at this event calling for urgent assistance from the social sciences, to produce a comprehensive analysis of the socio-cultural and political issues at the heart of change resistance. Social science knowledge is thus being recognized as an indispensable part of a global scientific, policy and social mobilization effort to address the crisis.

IUAES and WCAA, the two major international organizations in anthropology, have responded to this call by jointly sponsoring a symposium at the 2013 Manchester World Congress, with the aim to bring global environmental concerns to the mainstream of this major social science discipline. The present volume is based on this symposium, with some additional papers from a follow-up symposium at the IUAES inter-congress in Tokyo in 2014, which I also chaired. Overall, our main finding was that anthropologists today are not only contributing significantly to a wider research effort in social science, but that our contribution is unique and essential.

Anthropologists are very conscious of the fact that the diversity of human cultures and societies is a great asset, embodying the vast store of knowledge and skills humans have accumulated over millennia and across

very diverse local environments. Demonstrating the value of cultural diversity for human survival in the past, and also under today’s crisis conditions, is an urgent task in view of the steady decline of local cultural knowledge. It is for each individual anthropologist to consider the broader relevance of the knowledge they encounter locally, and to help link such knowledge to the major concerns of our times. To name but one example from my own research, there is much local knowledge of seasonal natural phenomena in Indonesia, such as the swarming of certain insects, that can reliably predict the onset of monsoon even as monsoon patterns are becoming unstable due to climate change. There are efforts now under way to systematize and share this kind of knowledge.⁵

Research in this new field of environmental anthropology is growing rapidly but remains in the early stages of development, and relatively marginal to the concerns of the discipline as a whole. Many anthropologists still ask themselves whether and how they can utilize their existing research to contribute to environmental sustainability and justice. At this point I therefore would like to review briefly the state of research on the environment across different branches of anthropology. The aim is to identify some of the key opportunities available to researchers who would like to contribute to this field.

Anthropologists Respond: A Brief Review of Environmental Anthropology

A growing number of anthropologists are recognizing the seriousness of today’s environmental issues, and indeed, a few pioneers have been conducting research on local impacts, responses and solutions for decades. The following overview of environmental anthropology is based on a review I wrote for the International Social Science Council’s *World Social Science Report* (Reuter 2013). It does not capture the full range and scope of this new field of research but seeks to provide a typology of the contributions anthropologists have been making. Anthropology has certainly made a significant and unique contribution to the study of human-environment relations already. At the most general level, anthropology is bringing to the global debate on environmental change a comprehensive, long-term perspective on the human story, together with an acute awareness of the importance of cultural diversity and local knowledge as a resource for sustainable living, and of tailored solutions for successful local environmental change mitigation and adaptation.

One of anthropology's major theoretical contributions draws on the cross-cultural character of the discipline. Meta-cultural understanding is a prerequisite for addressing the ecological challenges that are now rocking the cosmological foundations of our late modern way of life (Crutzen & Stoermer 2000). This way of life had its historical origins in the industrialization process of 18th century Europe, expanded worldwide in the wake of colonial imperialism and globalization, and has left unprecedented environmental destruction in its wake. And yet – we take this way of life for granted. We thus urgently need a self-critique of the cultural underpinnings of contemporary consumer society if we are to arrest its suicidal consequences (Baer 2008; Sayre 2012). Anthropologists, professionally trained to study and compare cosmologies, are best equipped to accomplish such a foundational critique. Cultural comparison allows us to look back at our own cosmology from the outside, as just one perspective among many others, rather than mistaking the familiar modernist philosophy and way of life for an inescapable, natural state of affairs and, hence, as the only option for humanity. The challenges and opportunities of today's world call for a new meta-cultural awareness, an evolutionary leap that will enable humanity to become conscious creators of our own future and responsible stewards of Planet Earth (Reuter 2010).

Anthropology has shown that one of the greatest assets of our species has been the diversity of local knowledge systems, languages, beliefs, social formations and livelihoods, which is testimony to our human ability to learn and adapt to variable historical and environmental conditions. Research shows how humans have either locally adapted or fallen victim to environmental change, from prehistoric times until today (Potts 2012; Sandweiss & Kelly 2012). We can learn from these past experiences of environmental change, and from drawing comparisons between contemporary experiences in different locations. And while global cooperation may be essential for stemming the present tide of environmental crises, the key to mitigation and adaptation is still local action, in accordance with the always very specific dynamic of locally regulated human-environment interactions (Rayner & Malone 1998). These variable circumstances have become the subject matter of numerous ethnographic 'observation studies.'

More 'reception studies' are needed as well, to address local differences in receptivity to climate change science and technology, and to proposals for local people to cooperate in associated mitigation and adaptation strategies (Rudiak-Gould 2011). For example, the global need to curb methane emissions implicates cattle farmers in the USA

and irrigated-rice farmers in Thailand alike, but they bring very different needs and capabilities to the task, and each have their own unique pattern of change resistance to overcome. While local impacts and responses to environmental change thus vary widely, there are also similarities – for example between rice farmers in widely separated locations – that provide enormous scope for local knowledge transfers (Hornidge & Antweiler 2012). This is why local adaptation and mitigation studies using anthropology's holistic ethnographic methods are extremely valuable.

Anthropologists also are keenly aware of and draw world attention to environmental justice issues arising from the disproportionate impact of environmental crises on some countries or regions, the difficulty for locals to obtain the necessary capital to respond adequately to such crises, or the fact that some of the most affected populations historically have contributed very little to the creation of climate change and other global threats. Some examples are Agarawal and Narain's (1991) distinction between *survival* and *luxury emissions*, Nuttall's (2004) work on the plight of indigenous people in the Arctic, and Lazrus' (2012) work on island communities threatened by sea level rises. Crate (2011:186) rightly notes that climate change is both a human rights and a human security issue, and alerts us to the need for a "continuous dialectical reflection between local and global discussions of climate change." Similarly, Warren (2006:213) includes inequality, social justice, globalization impacts and subaltern challenges in her list of issues for an engaged, eco-anthropology.

Major professional organizations in anthropology have been seeking to coordinate environmental research at national and global levels. The American Anthropological Association, for example, established a section for the 'anthropology of the environment' in 1996, comprising members from all sub-fields of the discipline in the US. The symposium at the IUAES Anthropology World Congress in Manchester 2013, on which this book is based, subsequently led to the establishment of a global network of researchers in this field, the 'Commission on Anthropology and the Environmental' (CAE). Anthropologists are now seeing it as part of their responsibility to debate what social change may be needed to preserve the natural environment that sustains us all, and of which we are an inextricably part, and the discipline is transforming itself in the process. An ecological approach to the study of humanity is now gradually superseding the nature-culture dualism that has long dominated the anthropology due to the influence of the western religious and philosophical traditions on which it was built (Descola & Pálsson 1996). A new understanding of humanity is emerging from this debate.

Outline

The preceding review of focal areas of research in environmental anthropology that have emerged to date is just a guide, and rather abstract. It does not illustrate how ethnographic skills and methods are being applied to the study of human-environment relations in concrete fieldwork settings. The remainder of this volume therefore is dedicated to illustrating such applications with the help of a number of in-depth case studies and analyses across the full spectrum of environmental anthropology. The case studies and their authors are very much international, representing diverse national anthropologies and diverse ethnographic settings from many parts of the world. We have nevertheless identified *six major areas of study* that are central to contemporary environmental anthropology everywhere, including: Perceptions of Environmental Vulnerability and Risk; Sustainable Urban Environments; Sustainable Rural Environments and Food Security; Indigenous People and Nature Conservation; Environmental Justice and Corporate Social Responsibility; and Sustainable Resource Management. The volume is structured to reflect these key themes, as detailed below.

Environmental Vulnerability and Risk Perceptions

The first section begins with an article by Brazilian researchers Carlos Caroso, Fátima Tavares and Carlos Teles on 'The Socio-Environmental Vulnerability of Traditional Peoples and Poor Populations in Brazil.' Environmental change is identified as a major threat to the livelihoods of traditional peoples and poor populations around the Bay of Todos os Santos in the State of Bahia, Brazil. Threatened livelihoods in turn cause increased vulnerability and often also lead to territorial and sociocultural displacements. The concept and idea of vulnerability, they argue, cannot be understood simply in terms of 'acceptance' or 'resistance to change' or by evaluating certain transformations as positive *a priori*, because they have modernizing characteristics of 'social promotion' or 'social equity.' Rather, the authors define socio-environmental vulnerability in terms of the capacity for self-management among populations affected by environmental changes and other effects of economic modernization. These conclusions rest on research within a large multidisciplinary project team of specialists in anthropology, geology, ethno-biology, oceanography, geography and statistics. The project's five main axis of research focus on 1) living conditions of vulnerable populations in their complex relations with the natural

environment; 2) their territorial and legal rights; 3) the social networks of care and protection they have; 4) the cultural heritage they can draw on; and 5) the socio-environmental impact of large infrastructural construction on the essential resources of vulnerable populations.

Vulnerability to environmental change is about the measurable impact of changing objective conditions on the ability of different populations to survive and prosper. As the second paper in this section shows, however, subjective perceptions of vulnerability or risk are often at odds with what science measures or predicts, and yet such perceptions can have a profound impact on people's willingness to change their behaviour. Sophie Căcilie Elixhauser work on 'Climate Change Uncertainties in a Mountain Community in South Tyrol' shows that, while awareness of the consequences of climate change has been rising globally and mitigation and adaptation strategies are being drafted and implemented, local people have their own ideas. Following Timothy Morton, she argues that uncertainty about climate change and similar 'hyperobjects' is one of the core features of the anthropocene. Hyperobjects are characterized by an inseparability of human and nonhuman causalities and a bewildering intertwinement of the social and the natural, the local and the global. While climate scientists consider the high altitude areas of the European Alps particularly vulnerable, her case study shows that not all locals see a need to take action. To many, climate change is an abstract concept expressed in numbers and curves, taking place 'elsewhere', and the connection between local environmental and meteorological changes and global climate change remains unclear. Conflicting media reports on climate change exacerbate such uncertainties. The study focuses on the community of Moos, located in the Italian Alps.

Urban Environments

A large and ever growing percentage of the world's human population lives in urban areas, and in many ways the massive urbanisation we have witnessed over the last century is emblematic of global modernity and its disastrous environmental consequences. For many 'local people' their life's stage is thus largely a built environment. This does not mean, however, that their immediate natural environment is irrelevant for cities. Anthropologists have begun to promote the idea of the productive city, for example by studying urban food movements that contribute to urban food sovereignty (Edwards 2014). Cities are nevertheless also the centres of global consumption, and produce enormous quantities of waste.

This is illustrated by the first paper in this section on urban environments, wherein Amlan Kanti Ray, Shraboni Ray, Pramathes Das Mahapatra and Chitradip Bhattacharjee tell the fascinating tale of the ‘East Kolkata Wetland and Urbanization.’ One of the world’s most populous megacities, Kolkata has a geological advantage in that it slopes eastward into a vast swampy wetland that acts as a natural ‘sink’ for the city’s sewerage. These wetlands experience pressure from rampant growth at the urban fringe through wetland reclamation, ignoring their importance for sewage purification and rich biodiversity. A complex chemical-biological-physical process of filtering out pollutants ensures the quality of water flowing into the Bay of Bengal. Wetland dwellers are part of this process. Their detailed traditional knowledge and precision technology of wetland management converts a wastewater problem into a resource recovery system. The local population in turn benefits from wetland ecosystem goods (e.g. food) and services (e.g. waste assimilation). Locals operate a 4-level resource recovery system incorporating garbage fertilized vegetable farms, waste water-fed fishponds; paddy fields using fish pond effluent; and sewage-fed aquaculture. Many of the wetland’s environmental services go unnoticed.

Another Indian megacity is the capital, New Delhi, where water supply is becoming a major concern amidst diminishing supply and increasing demand. An innovative paper by Heather O’Leary (University of Minnesota, US), entitled ‘Producing Middle-Class Waterscapes Beyond Middle-Class Thresholds,’ shows how this is creating new markers of social stratification. Urban areas present special challenges to water allocation as myriad needs compete for the same resource in a concentrated area, especially as middle-class water values strain water supplies. Delhi absorbs hundreds of thousands of people each year, the vast majority entering informal housing with limited water access. The sheer volume of new users, despite their constrained water allocation, impacts Delhi’s urban waterscape. This ethnographic study traces the changing patterns of domestic water allocation among the ‘water-poor,’ specifically domestic workers who are exposed to affluent middle-class water values through their work. These findings show that water is now being used as a signal of class identity.

Sarbjee Singh, in his paper on ‘Sustainable Approaches to Urban Development,’ describes a very different scenario. In this case study, local people find themselves caught up in an ambitious state initiative to construct an eco-city called ‘New Chandigarh’ in the state of Punjab. The paper is based on interviews with thirty local families socially displaced by this megaproject. Locals whose agricultural land was acquired

for the construction of the eco-city lost their livelihoods, and struggle to adjust and survive in the new, high-tech city due to a lack of education. We learn from this that even transformations toward sustainability have their costs, especially for local residents, and thus raise issues of environmental justice. Moreover, the study raises questions about the wisdom of sacrificing agricultural environments for sustainable urban development. The relative sustainability of cities and rural settlements is indeed a highly contentious issue.

Rural Environments and Food Security

The processes that are leading to urban growth have also transformed rural environments. Urban migration provided the labour to fuel industrialisation, and simultaneously depleted the labour pool of rural agricultural communities around the world. Small farmers have been forced or enticed off their land by the hundreds of millions, often heralding the end of a peasant way of life that had been relatively stable for centuries or millennia. Local social patterns and cultural traditions were disrupted, and agriculture was transformed fundamentally, from a family-based livelihood activity to a corporate endeavour. Emblematic of this transformation is the so-called green revolution, which has had an enormous impact on rural environments.

In his paper entitled ‘The Struggle for Food Sovereignty: A Global Perspective,’ Thomas Reuter (University of Melbourne, Australia) provides a critical overview of the contemporary state of the global food system. Security experts predict that severe global food insecurity is likely to afflict us all within the near future (NSF 2011). Meanwhile, a corporate-controlled global food system – itself a product of the large scale industrialisation of agriculture and food processing, as well as supply chain and food retail sector monopolization – has been consolidating and continues to spread to developing countries, where sustainable traditional agriculture still prevails. This has substantial environmental, public health and social consequences. Nations, communities and the vast majority of individuals around the world have lost their food sovereignty in the process, that is, their ability to feed themselves and future generations sustainably and in perpetuity. Control of the world’s food supply is now in the hands of a few corporations that are beyond adequate public scrutiny. At the same time, our knowledge of more appropriate, sustainable ways of living on the land is eroded as agricultural development policies

destroy local communities that are the custodians of culturally diverse traditional knowledge and food biodiversity. This paper describes the struggle for food sovereignty and a new trend toward food nationalism, as well as reporting on new social movements now taking up the fight for a fairer and more resilient world food system.

In her paper on ‘Small Farmers, Food Security and Drastic Climate Change,’ Joan Mencher draws on her research in South India to illustrate the impact of ‘SRI/SCI’ – a set of new management techniques that started first with rice farming in Madagascar and has spread to more than 42 countries worldwide. Rice intensification systems are spreading in Asia through farmer-to-farmer contact, NGOs and state programs. Farmers are obtaining greater yields with less imported seed, less water, and fewer costly inputs overall compared to more established ‘green revolution’ approaches, but anthropological research on SRI/SCI’s effects on small farming communities and its wider socio-political implications are lacking. The scientific establishment initially rejected SRI-SCI. Clearly; it is not in the interest of the multinational corporations to encourage SRI/SCI, which uses traditional seeds and little or no external inputs. The new farming methods appear to be lessening social inequality in fundamental ways, while they also release less CO₂ and methane into the atmosphere. The paper explores whether these approaches, along with other resource saving methods, can turn the tide against hunger and poverty and climate change, all currently being exacerbated by industrial agriculture.

Shuichi Oyama’s paper links issues of urban waste and rural sustainability in a fascinating account of ‘Land Degradation and Ecological Knowledge-Based Land Rehabilitation: Hausa Farmers and Fulbe Herders in the Sahel Region, West Africa.’ Famines, food shortages and conflicts over land and natural resources in the Sahel region have made headlines for decades. The Hausa people in arid southern Niger cultivate exemplify many of the key issues. Population growth has meant that they had to abandon fallow periods and, as a result, now face a land degradation crisis. To ameliorate this degradation they use trash as manure. This trash mainly contains organic matter with small amounts of less degradable materials, such as rubber sandals, plastic bags, and metal objects and clay pots. The study describes land rehabilitation trials based on the ecological knowledge of local people. Experiments revealed that urban refuse input is an effective means of land rehabilitation. This illustrates that an imbalance of the organic matter cycle lies at the heart of both land degradation in rural areas and sanitary problems in urban areas, and how this imbalance can be addressed.

Indigenous People and Nature Conservation

One of the great environmental challenges of our times is the rush to protect and preserve remaining pockets of relatively intact wildlife habitat, and thus to preserve the planet’s biodiversity. As previously noted, such sustainability measures can impact on local people whose livelihood depends on wilderness resources and, conversely, such projects rarely succeed unless they involve remote local communities, which often belong indigenous minority peoples. Again, anthropologists are at the forefront of associated social impact research. Community-based forest management is one example of how local and indigenous people can and must be integrated into state-sponsored environmental protection schemes, such as national parks, wildlife or marine sanctuaries, or REDD+ forest protection schemes.

Ashok Das Gupta’s paper exemplifies this research, by exploring ‘The Role of Toto Indigenous People in Conserving Jaldapara Wildlife Sanctuary,’ located in the Himalayan foothills at the border of Bhutan and India. A small indigenous tribal group, the Toto collect fuel, yams, potatoes, fruit, medicinal plants and numerous other forest products as part of their livelihood. They now also practice swidden agriculture and terrace cultivation on steep slopes. Hilltops, rivers and other natural features are the abode of spirit beings, with whom the Toto interact through ritual; a practice that underpins their intimate relationship with nature. The region is now part of the Jaldapara Wildlife Sanctuary, and has recently been made into a National Park by the government of India. Toto generally avoid destroying the ecosystem and have an astute, traditional understanding of conservation. They are not opposed to modernity but wish to retain a degree of autonomy. Anthropological research helps to demonstrate that the Toto are no threat to this nature sanctuary, and should be integrated into the park’s management scheme.

Local anthropologist Sweta Banerjee’s paper on ‘Little Andaman Island and Indigenous Knowledge’ comes to similar conclusions about the need to empower local people toward the achievement of sustainability, focusing particularly on the role of women. Onge women, she argues, can be engaged to help save the island’s ecosystem by contributing their extensive local knowledge of the natural environment. Anthropologists are needed here to help marginalised locals articulate conservation knowledge and gain access to government. Their knowledge about land and environment and their observations on recent environmental change needs to be documented urgently. By participating in this research process, local people become empowered. Many have become day labourers on

their own land as outsiders, having already exhausted their own environment, are stripping Andaman Island of its resources. Onge cannot be returned to their traditional lifestyle but some community initiatives are now under way that would make new use of their traditional knowledge in a conservation context. These observations reverberate with the plight of indigenous people and the potential use of their local knowledge in many parts of the world.

Environmental Justice and Corporate Social responsibility

Today's environmental crises are global and no one can hope to escape their consequences for very long. In the short term, however, sustainable resource management is obstructed by the fact that some actors initiate and profit from destructive environmental change while other people suffer the greatest and most immediate adverse impacts. Moreover, perpetrators of environmental destruction are often much more politically and economically powerful than the victims. The need to achieve greater environmental justice and corporate responsibility is thus inseparable from the issue of responsible resource management.

This is illustrated by Rashmi Pramanik and Shreyasi Bhattacharya's paper on 'Global and Local Crises in the Balance of Human-Environment Relationships,' which looks at the impact of the coal industry in India and associated social justice issues. Here we find large-scale energy production and metallurgy transforming an agrarian society into an industrial one, transformation that goes hand in hand with a cultural change whereby people obtain a different attitude towards nature. The coal industry's environmental impacts include issues with land use, waste management, water pollution and air pollution. The industry produces hundreds of millions of tons of solid waste products annually, including fly ash, bottom ash, and flue-gas desulfurization sludge, containing mercury, uranium, thorium, arsenic, and other heavy metals which gradually pollute the land, water bodies, air and environment in the coal industry-affected areas. Most health problems in the mining regions are due to unchecked pollution, reducing the longevity of the miners and communities living in nearby villages. Deforestation in mining areas is posing another threat to the environment. While profits are internalized and maximized, costs are born by the public and thus minimized by the industry. Corporate responsibility, in a climate of rising corporate political influence on nation states, is thus revealed as a key issue in the struggle for environmental justice.

The following paper, '*Raising Awareness and Effecting Environmental Change in Developing Countries*,' by Khalid Younis and Jon Webber, looks directly at the state of corporate social responsibility, focusing on Liberia, Africa. Given that abuses of power by key decision makers have been and continue to be an endemic problem for environmental protection in many developing countries and beyond, the authors seek to understand the shared meaning and awareness organizational leaders have of environmental management issues and the factors that influence their decision making. Their detailed survey of 21 managers of companies operating in Liberia shows that corporate leadership believes that good environmental management is important to avoid harm, so long as it can be achieved without compromising organizational goals and profitability. The study shows that important factors influencing the decisions of corporate leaders include their perceptions, knowledge and training concerning environmental issues, the feasibility of conservation programs, the state of the economy and of available technology, ethics, and, in particular, the availability of government regulations and support.

Sustainable Resource Management

The world's environmental crisis is closely linked to the prevalence of reckless resource management practices. Promoting environmental justice is helpful here because it closes the gap between the causes and effects of inappropriate resource use. It does not, however, provide a solution to the problem of resource finitude on its own. Some resources are finite and not renewable. They cannot be used in perpetuity unless they are artificially made to circulate within a closed loop recycling system, as naturally renewable resources tend to do. Sustainable resource management is thus a matter of understanding and maintaining natural resource cycles, creating technologies that enable artificial resource cycles, and restricting demand to match the capacity of such systems of perpetual resource circulation. Given the vast diversity of resources used by human beings living in the world's many different environments, there is great need to look at local patterns of natural resource use already in place. Sooner or later, every single product we extract from nature will need to be examined and evaluated in terms of a sustainable resource management plan. This goes hand in hand with a need to document how such resources are extracted and utilised across different societies and cultures – a need to which many anthropologists are now responding.

This point is brought home by José Vargas-Hernández' paper, wherein he asks: 'Can Sustainability Be Reconciled with the Ethos of Business?' His case study to answer this question is on the increasingly commercial use of naturally occurring reeds (*tule Thypha spp*) by handicraft micro-businesses at Zapotlán Lake in Jalisco, Mexico. He argues that economic efficiency and sustainable development is often constrained by a lack of social capital in such micro-businesses. This finding has implications for the design and implementation of economic and social policies oriented towards economic growth and sustainable development. In discussions of sustainability, business organization is generally overlooked, even though there is growing evidence that material poverty or a lack of other, non-tangible resources is often a leading cause of environmental degradation. Another major issue is the lack of adequate economic policies and legal regulations to restrain reckless profiteering and encourage environment-friendly business practices, especially in developing countries.

Andréa Zhouri and Raquel Oliveira turn their attention to water, perhaps the most important of all natural resources, in their study of the Jequitinhonha Valley in Brazil, entitled 'Embodied Experiences and the Global Gaze.' Sustainable development, as a global mantra, has come to imply a set of international policies heavily based on ecological modernization strategies. These strategies rest on the belief that technology, market initiatives and consensus building processes, combined, can solve the "environmental crisis." Science and technology must be employed to prevent, as well as mitigate, the consequences of global disasters. The authors argue, following Tim Ingold, that such a global perspective is aligned with a modern conception of environment which, rather than facilitating the reintegration of humanity in the world, signals the peak of a process of separation. The study looks at some of the human consequences of such disembedded, albeit powerful and widely legitimised, perceptions of the environment. The focus is on the construction of dams, globally considered to be a sustainable source of energy and, therefore, pointed to as a form of climate change mitigation. The dire consequences of dam construction for downstream dwellers of the Jequitinhonha River dam in Brazil are explored.

Indonesian anthropologists Syaifudin Zakir and Restu Juniah conclude this section with their study of 'Natural Resource Management Policy' and sustainable development in Indonesia. Indonesia is of global importance for nature conservation as it boasts the world's third largest forest area and a wealth of terrestrial and marine biodiversity. A variety of environmental case studies on biodiversity indicate Indonesia have not been

able to preserve this diversity. Wildlife poaching and trade, illegal logging and forest conversion into residential, farming, agribusiness and mining areas are some of the main factors that threaten biodiversity. The negative impacts of poor resource protection and reckless development can be avoided if planning and management are optimized. The authors argue that collaboration between different layers of government, local communities and private companies is the key to successful biodiversity conservation.

As a whole, the author's hope these case studies will inspire and provide a road map to others who wish to explore and participate in the new field of anthropology and the environment. The volume reflects the current state of this emerging field of inquiry, and charts some of its future scope.

We are convinced also that anthropology itself stands to be renewed and transformed through the mainstreaming of an ecological perspective on the question: 'what does it mean to be human?' This is the core question that has defined anthropology from the start, and to which it owes its name.⁶ Humanity, at this historic juncture, can simply no longer afford to deny its unity with nature, which is encountered, always, as a local environment, as a place, right here.

Some of the chapters in this book do not fully conform to the conventions of expression and expository style of standard Euro-American academic English, and no apology is made for this. The global diversity of authentic academic voices presented is one of the strengths of this volume.

Notes

- 1 See: <http://www.nrdc.org/globalWarming/fcons/fcons4.asp>
- 2 See: <http://www.all-recycling-facts.com/water-pollution-facts.html>
- 3 See: http://www.globalchange.umich.edu/globalchange2/current/lectures/land_deg/land_deg.html
- 4 See: <https://ipcc.ch/report/ar5/>
- 5 For some more information on such systematisation efforts, see <http://www.agriculturesnetwork.org/magazines/global/dealing-with-climate-change/climate-field-schools-in-indonesia> Furthermore, traditional knowledge is being shared now, sometimes from global south to south, as this blog from an Indonesian university shows: <http://blog.cifor.org/19210/traditional-knowledge-fuels-climate-change-adaptation-in-ghana-study#.U7J0BBaCvGI>
- 6 Greek *anthropos*, 'man / human.'

References

- Agarwal, A. and S. Narain (eds) 1991. *Floods, Flood Plains and Environmental Myths*. New Delhi, Centre for Science and Environment.
- Baer, Hans 2008. Global warming as a by-product of the capitalist treadmill of production and consumption: the need for an alternative global system. *Australian Journal of Anthropology*, Vol.19, pp.58-62.
- Brown, Lester 2013. 'Aquifer depletion.' *The Encyclopedia of Earth*. Posted: November 21, 2013, 11:14 pm. See: <http://www.eoearth.org/view/article/150159/>
- Camilleri, Joseph and Jim Falk 2006. *Worlds in Transition: Evolving Governance Across a Stressed Planet*. Cheltenham (UK): Edward Elgar Publishing.
- Conservation International 2006. 'Global Warming Capable Of Sparking Mass Species Extinctions.' *Science Daily*, 12 April 2006. Retrieved December 13, 2013, from <http://www.sciencedaily.com/releases/2006/04/060411230548.htm>
- Crutzen, P. J. and E. F. Stoermer 2000. The Anthropocene. *IGBP Newsletter*, Vol. 41, pp. 17–18.
- Crate, Susan A. 2011. Climate and culture: anthropology in the era of contemporary climate change. *Annual Review of Anthropology*, Vol.40, pp.175-194.
- Descola, Philippe and Gisli Pálsson (eds) 1996. *Nature and Society: Anthropological Perspectives*. London, Routledge, pp. 4-5.
- Edwards, Ferne 2014. Gleaned, Grown and Gifted: The significance of non-capitalist food economies for food security, sustainability and social change towards the productive city. Australian National University, unpublished PhD Thesis.
- Hornidge, A. and C. Antweiler 2012. *Environmental Uncertainty and Local Knowledge*. Bielefeld, Transcript Verlag.
- Lazrus, Heather 2012. Sea Change: Island Communities and Climate Change. *Annual Review of Anthropology*, Vol. 41, pp. 285–301.
- Lemonick, Michael 2012. 'Sea Level Rise Accelerating Faster Than Initial Projections.' *Huffington Post*. Posted: 11/28/2012 10:42 am EST Updated: 11/28/2012 11:23 am EST. https://secure.huffingtonpost.com/2012/11/28/sea-level-rise-2012-rising_n_2204402.html
- Mercola, Joseph 2014. GMO Agriculture and Chemical Pesticides are Killing the Bees. *Global Research*, May 01, 2014. See: <http://www.globalresearch.ca/neonicotinoid-pesticides-ongoing-death-of-the-bees-epa-slapped-with-lawsuit/5334816>
- NSF 2011. 'The Global Food Crisis: Scarcity and Rising Prices.' *National Security Forum*, 27 February 2011. <http://nationalsecurityforum.org/domestic-news/the-global-food-crisis-scarcity-and-rising-prices/>
- Nuttall, Mark et al. 2004. Hunting, herding, fishing and gathering: Indigenous people and renewable resources. C. Symon, L. Arris, and B. Heal eds, *Impacts of a Warming Arctic: Arctic Climate Impact Assessment*. Cambridge (UK), Cambridge University Press, pp. 649-690.
- Pandolfi, John M. *et al* (2003); Global Trajectories of the Long-Term Decline of Coral Reefs. *Science* 301, 955. DOI: 10.1126/science.1085706
- Potts, Richard 2012. Evolution and Environmental Change in Early Human Prehistory. *Annual Review of Anthropology*, Vol. 41, pp. 151–67.
- Rayner, Steve and Elizabeth Malone (eds) 1998. *Human Choice and Climate Change, Volume One – The Societal Framework*. Columbus, Battelle Press.
- Reuter, Thomas A. 2010. Anthropological Theory and the Alleviation of Anthropogenic Climate Change: Understanding the Cultural Causes of Systemic Change Resistance. *World Anthropology Network E-Journal*, Vol. 5, pp. 5-27. http://www.ram-wan.net/documents/05_e_Journal/journal-5/2-reuter.pdf
- 2013. 'Anthropology and environmental change from a holistic and cultural perspective.' *World Social Science Report 2013: Changing Global Environments*. Paris: UNESCO and International Social Science Council.
- Roland, Denise 2012. 'World fish stocks declining faster than feared.' *The Financial Times*, Science Segment. September 28, 2012 7:54 pm. See: <http://www.ft.com/cms/s/2/73d14032-088e-11e2-b37e-00144feabdc0.html#axzz36McR6YDG>
- Rudiak-Gould, Peter 2011. Climate change and anthropology: The importance of reception studies. *Anthropology Today*, Vol. 27 (2), pp. 9-12.
- Sandweiss, D.H. and A.R. Kelley 2012. Archaeological Contributions to Climate Change Research: The Archaeological Record as a Paleoclimatic and Paleoenvironmental Archive. *Annual Review of Anthropology*, Vol. 41, pp. 371–91.
- Sayre, Nathan F. 2012. The Politics of the Anthropogenic. *Annual Review of Anthropology*, Vol. 41, pp. 57–70.
- Setälä, Outi, Vivi Fleming-Lehtinen and Maiju Lehtiniemi 2014. 'Ingestion and transfer of microplastics in the planktonic food web.' *Environmental Pollution*, 185: 77. See also: <http://www.sciencedaily.com/releases/2013/12/131203091457.htm>
- Szalay, Jessie 2013. 'Deforestation: Facts, Causes & Effects.' , *LiveScience*, posted March 06, 2013 04:20pm ET. See: <http://www.livescience.com/27692-deforestation.html>
- Warren, Kay B. 2006. Perils and promises of engaged anthropology: Historical transitions and ethnographic dilemmas. Sanford, V. and Angel-Ajani, A. eds. *Engaged Observer: Anthropology, Advocacy and Activism*. New Brunswick (NJ), Rutgers University Press, pp. 213-228.

Part I

Environmental Vulnerability and Risk Perceptions



CHAPTER TWO

THE SOCIO-ENVIRONMENTAL VULNERABILITY OF TRADITIONAL PEOPLES AND POOR POPULATIONS IN BRAZIL

Carlos Caroso, Fátima Tavares & Carlos Teles

Climate change, economic growth, urban expansion and modernization processes resulting both from exogenous and endogenous factors are, at present, a major threat to traditional peoples (indigenous and non-indigenous) and other vulnerable populations, such as artisan fishers and subsistence agriculturalists. In our understanding, based on analysis of our ethnographic data, the threat ensues from diverse aspects of social, economic, physical and biotic environments, and impacts on people's resources and ways of producing and living. All those events, be they together or in different combinations, have a high potential for increasing socio-environmental vulnerability and risks of various forms of territorial and sociocultural displacements.

The concept and idea of vulnerability that we have adopted in our research among traditional peoples and impoverished populations of the continental and insular portions of the Bay of Todos os Santos, in the State of Bahia, Brazil, cannot be understood through dualist presuppositions about the value of tradition and change. It is not our aim to evaluate people's decisions to accept or resist change or, conversely, to considering certain transformations as positive a priori because they have been framed as "social promotion" or "social equity", and the like.

We use the concept of socio-environmental vulnerability as a measure of the capacity of self-management of populations affected by environmental changes and processes of economic modernization, and as exogenous transformations turn into endogenous adaptations. Our definition of this concept is based on the research of a transdisciplinary research team composed of specialists in anthropology, geology, biology, ethno-biology, oceanography, geography and statistics. This research is supported by integrated analysis of five main axes of research:

- 1 The living conditions of traditional and/or vulnerable populations in their complex relations with the natural environment;
- 2 Their territorial and legal rights (e.g., the presence of various maroon groups who have not had their rights to land and territory recognized yet; landless subsistence agriculturalists; and traditional fishers and oysterers);
- 3 Their social networks of care and protection and how they are articulated (especially health services and religious networks);
- 4 Their cultural heritage (material and immaterial cultural elements, their recognized historical and social value, and present state of conservation);
- 5 The socio-environmental impacts of large public and private infrastructure construction works, especially on resources that those vulnerable populations depend on for their livelihood.

The present chapter will be limited to discussing the setting where we have been studying, the prevailing characteristics of socio-environmentally vulnerable peoples and populations, and the factors contributing to socio-environmental vulnerability and threatening the survival of these groups under the present circumstances. We examine this particularly from the point of view of human interventions in the natural and social environments, and the increasing social inequality that this often causes and, in turn, results from serious impacts on natural resources and economic activities, and, which often has population displacement as its ultimate consequence. In our working conception, those changes in the natural environment and changes due to human interventions can be summarized as follows:

- a) Natural phenomena: climatic changes; increased seawater temperature; erosion of beaches and reconfiguration of coast lines affecting estuaries and mangrove areas; erosion and rivers silt build-up resulting from deforestation and inappropriate interventions on the river margins; change of river courses; modified tide and marine flows; rising sea level and other less known factors.
- b) Human interventions: embankments of wetlands and water circulation areas; earthworks; land reclaiming; landfills; construction of sea ports and piers; activities of naval industry; production and processing of petroleum and gas (drilling, pumping, transporting by underwater and land pipelines, refineries and distribution); loading and unloading of in and outgoing by-products; oil spills of various

dimensions; improper disposal of industrial and domestic liquid and solid effluents; decline of availability of fresh water resources and their increasing contamination resulting from careless use.

Conceptual Question

In order to better understand the deep relationship between traditional peoples or impoverished populations and situations of socio-environmental vulnerability, we need to question the discursive usage of each of these terms. In the Brazilian context, the recognition of those peoples and populations as ethnically differentiated has produced an indiscriminate use of the term ‘traditional’ as an exclusive criterion for demanding public policies that help populations deal with vulnerability factors. The national legislation which officially recognizes the existence of traditional peoples and populations and defines them, came by means of a Presidential Decree (Number 6040) in the year of 2007, which established the National Policy for the Sustainable Development of Traditional Peoples and Communities. The text of the legal decree establishes that traditional populations are those

[...] culturally different groups and who recognize themselves as such, which have their own forms of social organization, which occupy and use territories and natural resources as a condition for their cultural, social, religious, ancestral and economic reproduction, using knowledge, innovations and practices generated and transmitted by tradition.

This definition, which is considered correct from the political point of view, has been responsible for some difficulties in characterizing who and what traditional peoples and populations are in reality. Carneiro da Cunha and Almeida (2012) suggest a cautious position on very diverse groups of characteristics that are identified as common across those groups and are as controversial as a definition of “tradition.” As the authors stress, traditional populations cannot be defined exclusively by adherence to tradition (in a world that is ever changing), by non-participation or peripheral inclusion in markets (they are not isolated) or the low impact that their activities and actions have on the environment (because reaffirming their sustainability would be tautological). Precisely because of these conceptual problems, we can understand the authors’ proposal for an extensive “program” of research on traditional populations, stressing those characteristics that reflect the empirical diversity of situations. As all our concepts

(and not only the ‘scientific’ ones) are necessarily ‘constructs’ that produce new ontologies, we should have sensitivity and exercise caution before we define them once and for all, otherwise we would impute to the world phenomena that do not have actual existence.

On the other hand, what does not exist today could come into existence tomorrow. Following in the wake of this category by the state, much has changed for ‘traditional people’ in recent years. As shown by Carneiro da Cunha & Almeida (op. cit.), those populations have been increasingly appropriating the category ‘traditional,’ among other language diacritics, to refer to themselves, transforming the empirical diversity of ways of living within these populations to claim a certain ‘way of life’ which is said to have low environmental impact, and in seeking to obtain legal recognition of their rights to the territories that they dwell in and make use of for the subsistence of the group.

The conceptual use that we make of ‘traditional peoples’ and ‘traditional populations’ in our study is inspired by this movement of extension, which corresponds to an enumeration of the diversity of their characteristics. For the present study, in addition to the category of ‘traditional peoples,’ we have to consider other socio-environmentally vulnerable populations in various local and regional contexts. The questions that arises then, is whether it is possible to evoke other contours in the characterization of these populations? The concept of ‘populations at risk’ seems excessively broad, because this category encompasses social groups and segments that are potentially at risk, in spite of their having good access to resources (economic, legal, political, psychological, etc.) that may help them reverse situations that represent a threat to them (for example, affluent residents of areas at risk of flooding may reduce or neutralize their vulnerability by way of costly preventive interventions).

The concept of ‘vulnerable peoples and populations’ points to those disadvantaged social groups and segments of society that are deprived of resources and adequate channels of access to state bodies that make the decisions. They include populations, peoples and communities that regard themselves and/or who are known as ‘traditional,’ ‘poor’ or ‘needy.’ They are people who draw their livelihood from activities that are considered economically marginal and technologically out-dated, require low capital investment and high investment of human labour, and are passed on between generations as part of the repertoire of traditional and popular knowledge of indigenous and also non-indigenous peoples and populations, such as craftsmen, artisan fishers, oysterers, food gatherers, subsistence agriculturalists and subsistence farmers. Additionally, it could

include populations with little or no professional qualifications, migrants or immigrants who may be living in poverty in terms of their financial situation, place of residence, degree of access to goods, infrastructure and services for collective consumption and ways of life.

In the following section we discuss some of the characteristics of these populations, establishing relations amongst the specificities of local situations experienced by both traditional and non-traditional populations, such as the impoverished people on the urban peripheries and in rural locations.

Social Indicators of Vulnerability

The preliminary survey we discuss in this paper covered fourteen municipalities¹ around the *Bay of Todos os Santos*, a geographically extensive region located at the intersection of the *Recôncavo Baiano* region and the Metropolitan Region of the city of Salvador. These two regions share common historical, political, economic and cultural backgrounds, and are of great relevance to the State of Bahia. Among other aspects and reasons, because it was the first area to be settled and impacted by the Portuguese colonization of Brazil, and because it is the location of the capital and largest city of the state of Bahia (Salvador), and it is experiencing an accelerated rate of local developments.

The national census of the year 2010 shows that those municipalities have a total population of 3,173,575 people. The relative size of each municipality is shown in the map below, the municipality and the city of Salvador having the highest population proportion (84.31%) and the highest population density (3,859 inhabitants per square kilometre). In the municipalities closest to the capital, such as *Simões Filho* and *Candeias*, there is also a larger and denser population share than elsewhere (586 and 321 inhabitants per square kilometre respectively). By contrast, the municipality of *Jaguaripe*, located on the other extreme has the lowest absolute population numbers and low population density (18 inhabitants per square kilometre). *Madre de Deus*, although not as populous, has a higher population density (539 inhabitants per square kilometre), second only to Salvador. It is important to notice that it has the smallest territory among all municipalities, with only 11 square kilometres. It is also worth noting that within the municipalities, the population distribution shows important variations, with large clusters in the urban centres wherein public administration and services are located.

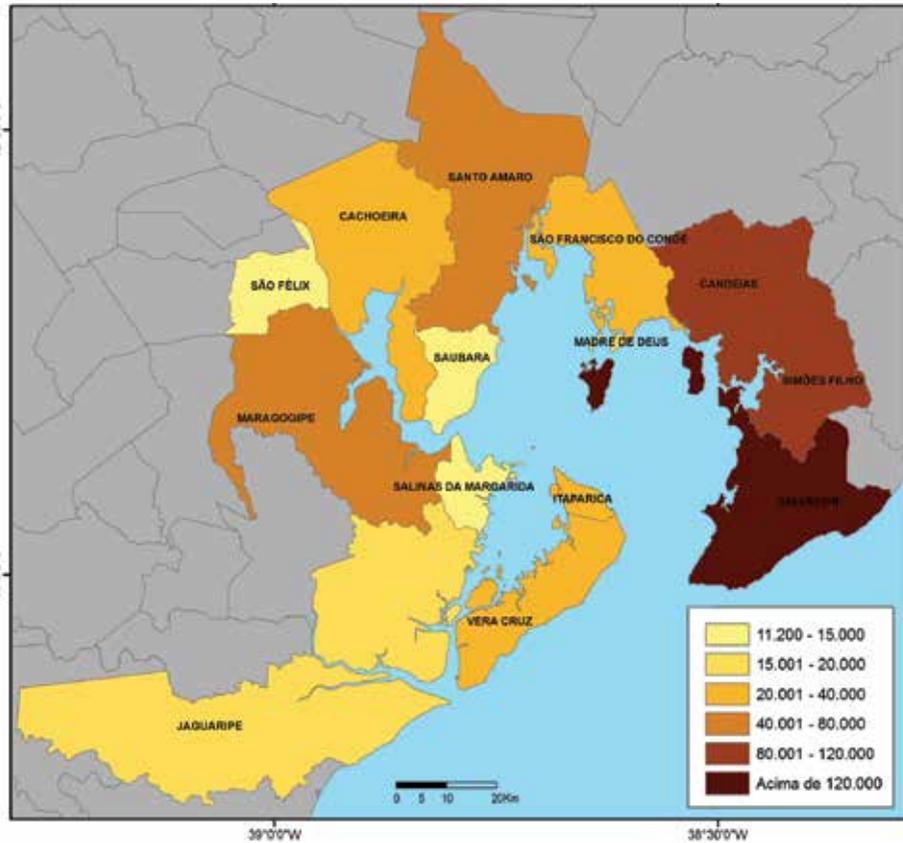


Figure 2-1: Population Distribution
 Municipalities of Bay of Todos os Santos, 2013
 Source: IBGE – Census / ObservaBaía, 2013.
 Map by Rafael Franca-Rocha.

This uneven population distribution in the Bay of Todos os Santos is a relatively recent phenomenon, one of the most visible consequences of the problems resulting from the belated modernization, which reaches more intensely the eastern part of the region. Figure 2-2, below, shows the population change since 1970. In it we see that the population is growing in almost all municipalities. The municipalities can be separated into two large groups according to the intensity of population growth in this period: the first comprises those with continued slow growth (*Maragogipe*,

Santo Amaro, São Felix, São Francisco do Conde, Cachoeira, Itaparica, Jaguaripe, Salinas da Margarida and Saubara), while the second group experienced accelerated population growth (*Salvador, Simões Filho, Candeias, Madre de Deus and Vera Cruz*). The two growth profiles indicate, firstly, the importance of cities surrounding the capital (which comprises the Metropolitan Region of Salvador), and secondly, the asymmetric development of the Bay of Todos os Santos as a whole.

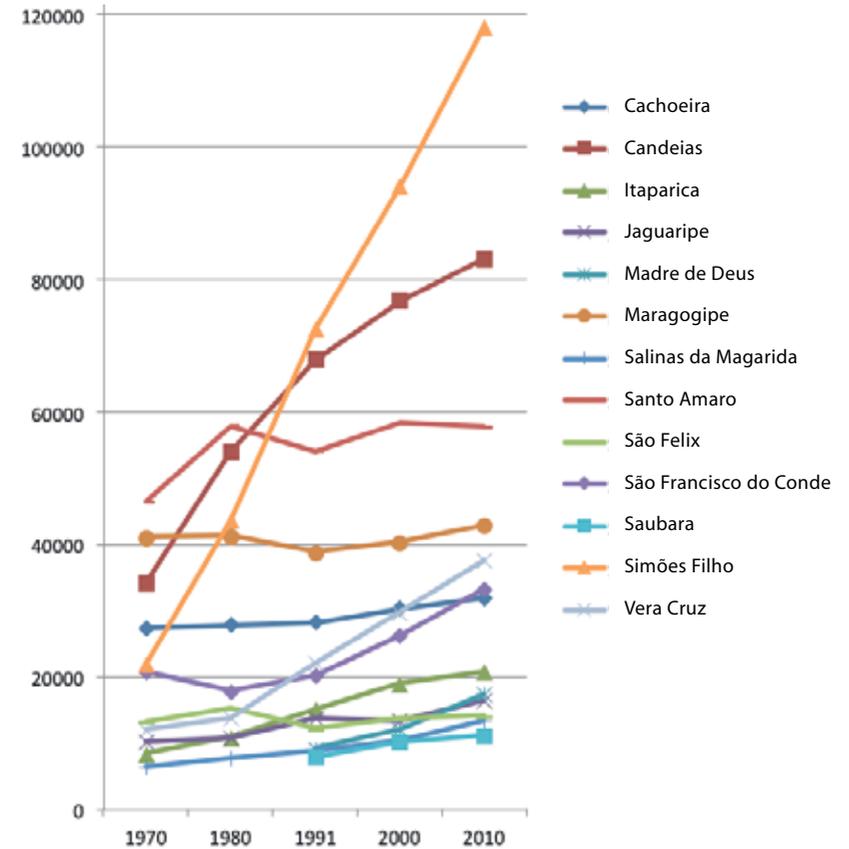


Figure 2-2: Population Growth from 1970 to 2010
 Municipalities of the Bay of Todos os Santos (excluding Salvador), 2013
 Source: IBGE, 1970, 1980, 1991, 2000 and 2010 Censuses / ObservaBaía, 2013

Among the municipalities with the largest population growth rates (Figure 2-3), Salvador² and Candeias have grown over 100%. Madre de Deus³ ranks slightly below this level, but considering the small size of its territory, shows very significant growth (from 9,183 inhabitants in 1991 to 17,376 in 2010). In Vera Cruz the growth was around 200% (from 12,003 inhabitants to 37,567), and finally, Simões Filho is the municipality of the region with the highest population growth in the period analysed, reaching a growth of over above 500%.

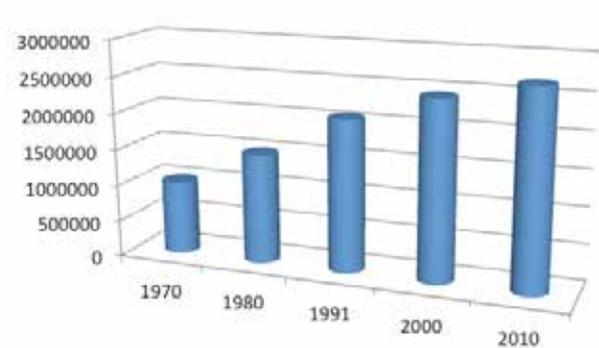


Figure 2-3: Population in Salvador between 1970 and 2010

Municipalities of the Bay of Todos os Santos, 2013

Source: IBGE, 1970, 1980, 1991, 2000 and 2010 Censuses / ObservaBaía, 2013

An important historical indicator for understanding the socio-environmental vulnerability of the population is the prevailing racial characteristics (Figure 2-4). The distribution of population by colour or race in the analysed municipalities is very different from that observed in the country as a whole and for the state of Bahia. With regard to the number of whites, for example, the break down has been 47.51% for Brazil and 21.98% for Bahia, whereas for the Bay area, in all municipalities surveyed the percentages are lower for this segment of the population. If we take Salvador as a comparative reference, only 18.9 % of the 2010 Census respondents reported to consider themselves of white race, even though the capital has the highest percentage of whites compared to other cities, such as: Maragogipe (16.67%), Simões Filho (12.12%), Madre de Deus (10.98%), Cachoeira (10.66%), São Felix (10.64%), Vera Cruz (9.98%), Candeias (9.47%), Jaguaripe (9.1%), Itaparica (9.02 %), Santo Amaro (8.23%), Saubara (6.66 %), Salinas da Margarida (6.55%), and São Francisco do Conde (5.93 %).

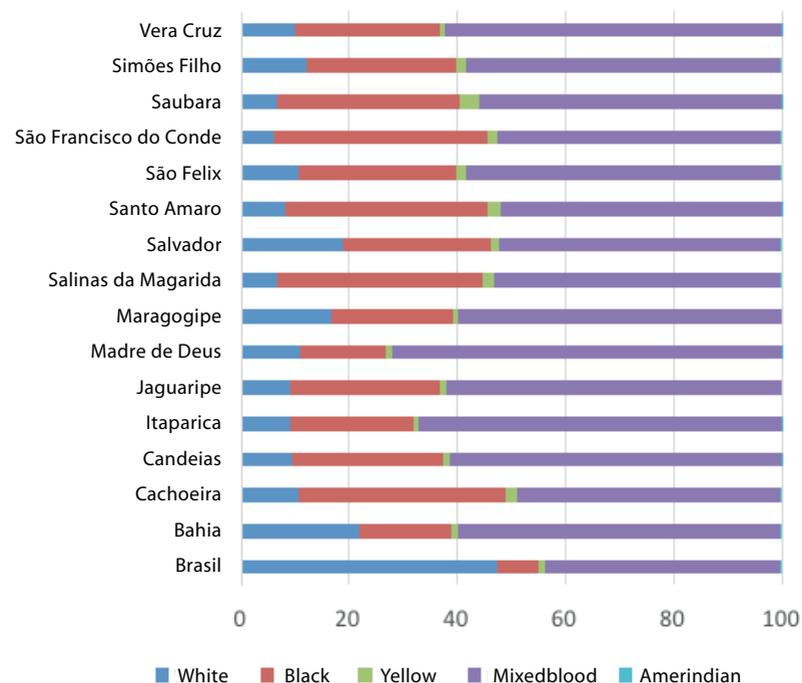


Figure 2-4: Race Breakdown

Municipalities of the Bay of Todos os Santos, 2010

Source: IBGE, Census 2010

Amongst the economic activities prevailing in the region (Figure 2-5), the services sector stands out. Exceptions are São Francisco do Conde, Madre de Deus and Candeias, which have higher activity in the industrial sector. In those cities the main activities are, respectively, the refining of petroleum (São Francisco do Conde), a seaport and petroleum terminal station (Madre de Deus), and chemical industries (Candeias). Agricultural activities have low participation in the composition of municipal GDP, being predominant in Salinas da Margarida, Jaguaripe Saubara, Maragogipe and São Felix.

The predominance of the service sector has been responsible for the emerging demographic landscape of the highly urbanized region, characterized by a very large population concentration. According to the IBGE classification for the definition of census sectors,⁴ over 50% of residents

are located in urban areas in almost all municipalities, with the exception of the municipalities of Salinas da Margarida and Jaguaripe, where farming and cattle raising activities are predominant. Itaparica is the only municipality in which all residents are located in urban areas, followed by Salvador, with only 219 domiciles located in one census tract classified as rural, which is located on one of the islands of the Bay (Frade's Island).

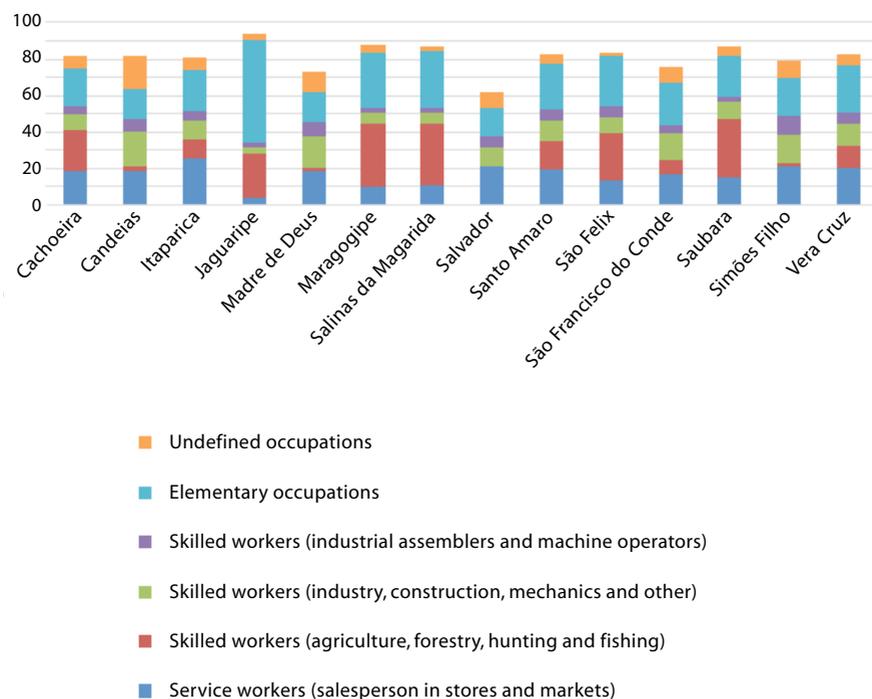


Figure 2-5: Main occupation of people aged 10 years or older

Municipalities of the Bay of Todos os Santos, 2010

Source: IBGE, Demographic Census 2010

The characteristics of the recent urbanization of the region and the predominance of the service sector can be identified in the distribution of economic activities which is responsible for the main occupational groups at the time of the 2010 Census (Figure 2-5). The two most prominent groups are the 'service workers, salespersons in stores and markets' and

of 'elementary occupations,' precisely occupations requiring low qualification. Among the group of 'skilled workers in agriculture, forestry, hunting and fishing' the highest percentages are present in the municipalities of Maragogipe (34.01%), Salinas da Margarida (33.45%), Saubara (31.99%), São Félix (25.88%) and Jaguaripe (24.36%). In these six municipalities farming and cattle raising activities are predominant.

Indicators of poverty as the country Single Registry (CadÚnico) also constitute an important reference for measuring the proportion of the population in vulnerable situations. The data available on the site of the Ministry of Social Development (MDS) provides information on the number of low-income families in each city, number of households and the total enrolled population, among other information.

Table 2-1, below,⁵ demonstrates the high prevalence of poor families in almost all districts of the BTS. Only four of them have percentages below 50%: in descending order we have Simões Filho, Madre de Deus, Candeias and Salvador. Those same municipalities have the lowest percentage of households with per capita monthly income up to half of the minimum wage.⁶

Table 2-1: Estimated number of people enrolled in CadÚnico (%)

Municipalities of the Bay of Todos os Santos, 2013

Source: IBGE – Demographic Census 2010 / MDS, CadÚnico, 2012.

Jaguaripe	81,21
Saubara	79,25
Salinas da Margarida	73,85
Itaparica	71,38
Maragogipe	71,33
Santo Amaro	70,82
Vera Cruz	69,98
São Félix	68,30
São Francisco do Conde	67,06
Cachoeira	64,86
Simões Filho	49,38
Madre de Deus	48,41
Candeias	41,45
Salvador	36,80

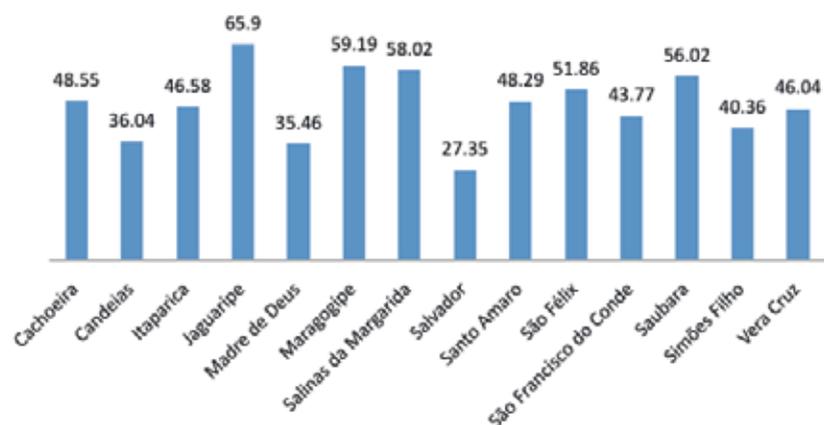


Figure 2-6 Households with monthly income per capita up to ½ minimum wage
Municipalities of the Bay of Todos os Santos, 2010
Source: IBGE-Census 2010.

The CadÚnico (MDS) also provides information on families according to their ‘traditional and specific population groups.’ It identifies sixteen family groups under one or another of these situations, which are classified into categories as follows: indigenous, maroon group, gypsy, living on the streets, rescued from slave labour, scavengers, artisanal fishers, residents in Afro-Brazilian religious communities, riverine communities, subsistence farmers, settled landless, benefiting the PNCF, camper communities, displaced by infrastructure projects, imprisoned person, and recyclable material collectors.

Except for the category ‘person rescued from slave labour’ (it does not appear in any family), there are records for all other situations in the bay area. However, the numbers of families represented in some of these categories are by far underestimated, and do not seem to reflect the seriousness and intensity of the problems which can be found in the area. This is the case, for example, with families living on the streets, the existing official records for Cachoeira and Simões Filho is only one, and for Salvador one hundred and one; furthermore, the official records for ‘residents in Afro-Brazilian religious communities’ in municipalities where their presence is well known, such as Itaparica where only five are reported; for Vera Cruz, one; for São Félix, none; and for Maragogipe, four.

In Figure 2-7, below, are highlighted only the numerically most significant situations, but even in these cases, we must be cautious about the

figures: the group of ‘artisanal fishers’ for example, is much broader than indicated. In spite of this imprecision, it is worth presenting the distribution by municipalities for major groups: families of ‘artisanal fishers’ are prominent in Salinas da Margarida (1,705) and Maragogipe (1,212); of ‘family subsistence farmers’ Maragogipe has the largest number (1,212); and ‘maroon families’ are recorded in the municipalities of Cachoeira (520), Maragogipe (480), Santo Amaro (183), Simões Filho (236), Salvador (211), and São Francisco do Conde (181).

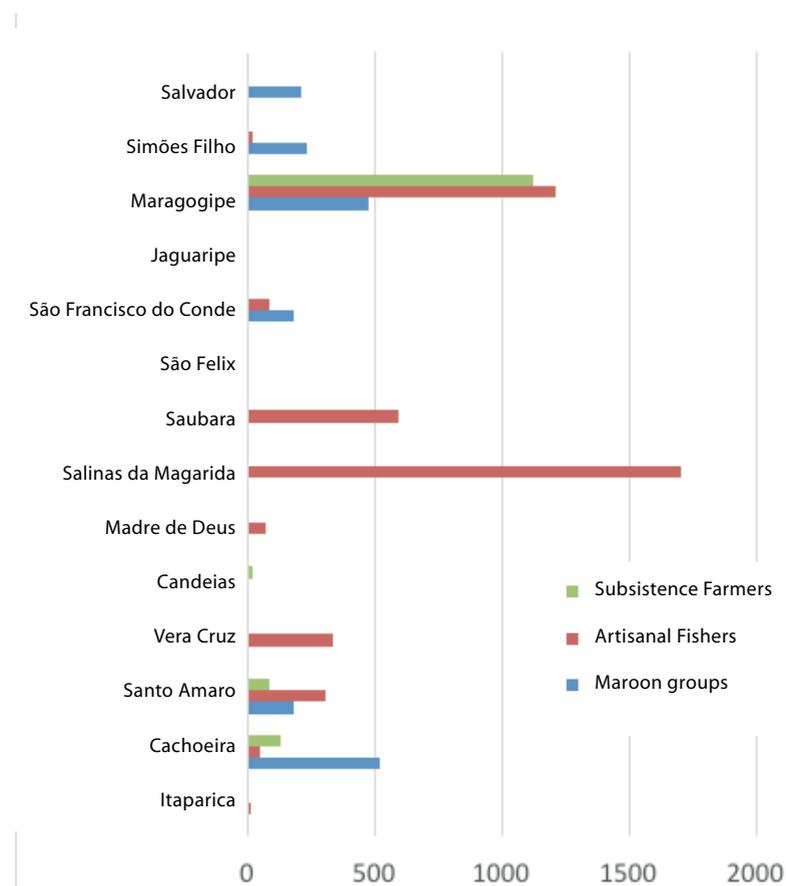


Figure 2-7: Subsistence Farmers, Artisanal Fishers and Maroon Groups
Municipalities on the Bay of Todos os Santos, 2013
Source: MDS, March 2013 / ObservaBaía, 2013

Cartography of Socio-environmental Vulnerability

According to IBGE, what are defined as subnormal census sectors are found in settlements identified by different names: slums, land invasions, valleys, flood lands, communities, villages, surfs, shacks, stilts, among others. The concept of ‘subnormal cluster,’ first used in the 1991 Census, intended to cover one or more contiguous hidden poverty census sectors, in order to produce specific information about vulnerable areas of the municipalities. In Census 2010 this concept was refined in order to obtain more detailed information about the living conditions of those populations.⁷

The fourteen municipalities in the bay area are divided into 4348 census sectors, 238 of them are considered ‘normal’, and 1125, where 30.56% of the population reside, are classified as ‘subnormal.’ Considering the large concentration of the population in the city of Salvador, this city, consequently, has the highest number of census sectors among all municipalities of the area: 3,546. On the other hand, this city also has to cope with the problems that are common to many Brazilian metropolises, accounting for the vast majority of subnormal sectors of the area: 1094 subnormal census sectors. The remaining subnormal sectors are distributed as follows: 10 in Candeias, 2 in Itaparica, forming what is classified as an agglomerate, 9 in San Francisco do Conde, and 9 in Vera Cruz. The mapping of the territory

Table 2-2: Population in Subnormal Clusters
Municipalities of the Bay of Todos os Santos, 2010
Source: IBGE – Census 2010 / ObservaBaía, 2013

Municipality	Resident Population		Numbers of subnormal census sectors	Number of subnormal agglomerates
	Total	In subnormal agglomerates (%)		
Candeias	82.984	8.76	10	4
Itaparica	20.699	5.72	2	1
Salvador	2.668.078	33.06	1094	242
São F. do Conde	33.168	14.99	9	2
Simões Filho	117.535	1.31	1	1
Vera Cruz	37.473	20.15	9	7
Total Bay Area	2.959.937	30.56	1122	257
Total State of Bahia	13.992.202	6.93	1198	280

with reference to the proportions of normal and subnormal sectors highlights the most vulnerable place of the whole area.

Table 2-2 above shows the percentage of population living in substandard clusters by municipality. It important to note that the capital city has one third of its population living under these conditions (33.06%), followed by the municipality of Vera Cruz (20.15%) and San Francisco do Conde (14.99%).

In addition to mapping subnormal sectors, we have also mapped areas of socio-environmental vulnerability based on a Vulnerability Index developed from IDV (Identification of Household Vulnerability) data provided by the Ministry of Social Development (MDS). The available database of micro data from MDS is organised by census area, comprising variables in the permanent resident population in terms of: domicile location (urban or rural), illiteracy, living conditions, per capita income, number of children and elderly members.

Table 2-3: Vulnerabilities by Census Sectors
Municipalities of the Bay of Todos os Santos, 2012
Source: IBGE – Census 2010 and ObservaBaía, 2013.

Municipality	Census Sectors						Total
	High vulnerability %	Medium vulnerability %	Low vulnerability %				
Cachoeira	41	62.1	20	30.3	5	7.67	66
Candeias	36	34.3	58	55.23	11	10.5	105
Itaparica	21	45.7	18	39.1	7	15.2	46
Jaguaripe	32	94.1	2	5.9	0	0	34
Madre de Deus	0	0	11	35.5	20	64.5	31
Maragogipe	57	72.2	11	13.9	11	13.9	79
Salinas da Margarida	9	37.5	13	54.2	2	8.3	24
Salvador	1.170	33,0	1.406	39.7	969	27.3	3.545
Santo Amaro	60	52.2	38	33.0	17	14.8	115
Saubara	10	28.6	11	31.4	14	40,0	35
Simões Filho	38	29.7	64	50,0	26	20.3	128
São Felix	15	68.2	5	22.7	2	9.1	22
São F. do Conde	16	38.1	24	57.1	2	4.8	42
Vera Cruz	26	28.9	33	36.7	31	34.4	90
Total	1.531	35.1	1.714	39.3	1.117	25.6	4.362

The IDV we use has been developed on the basis of eight variables of the official Census of Brazil, such as: monthly per capita income of up to R\$70.00 Reais;⁸ irregular domicile occupation; use of alternative forms of water supply; households without exclusive bathroom for residents use; households without electricity; illiterate head of household; number of children from 0-6 years of age; and presence of residents aged 65 years or older. Besides these variables, we have included a ninth one, 'other destination of garbage,' about irregular garbage disposal and absence of public garbage collection service. Table 2-3, above, shows the distribution of census sectors in each municipality by their degrees of vulnerability.

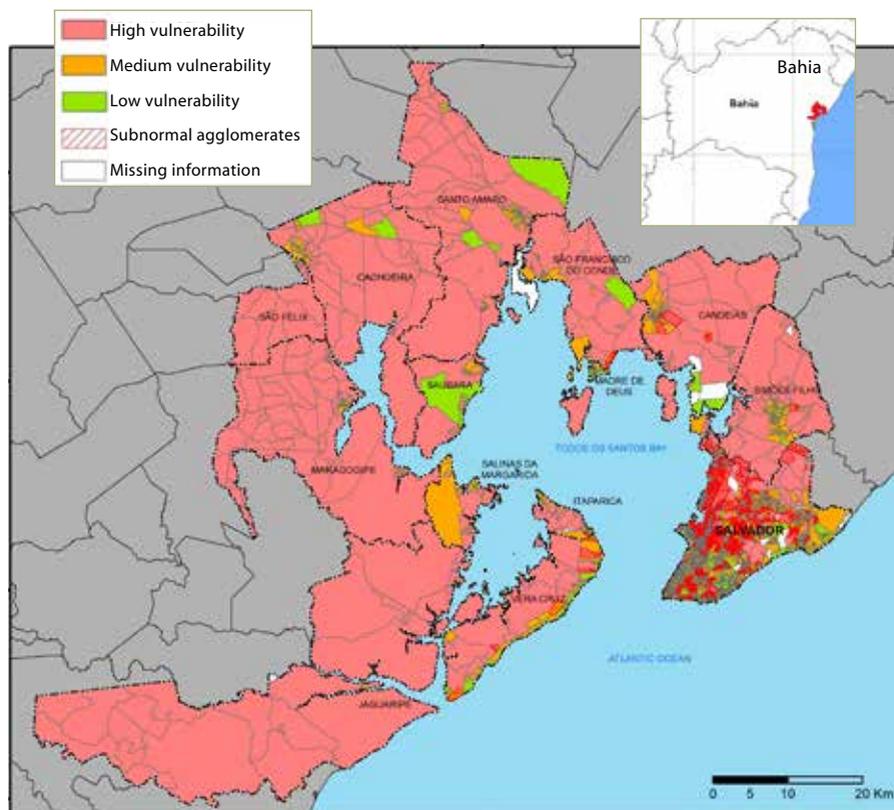


Figure 2-8: Vulnerabilities by Census Sectors¹⁰

Municipalities of the Bay of Todos os Santos, 2013

Source: IBGE – Census 2010/ MDS/ ObservaBaía 2013. Map by Rafael Franca-Rocha.

The percentage of the population under high vulnerability is very significant in all municipalities, with the exception Madre de Deus, which does not present any census sectors in this situation, and has the lowest vulnerability indicator (64.5%). The municipality Jaguaripe occupies the other end of the range, with 94.1% of its population under high vulnerability, and there is no census sector of low vulnerability in this municipality. The distribution of census sectors according to the classification of IBGE for subnormal sectors and our Vulnerability Index (IDV) is shown in the Figure 2-8 above.⁹

Mapping of vulnerability by census sector of municipalities on the Bay of Todos os Santos, as indicated on Figure 2-8, can be compared with data on the distribution of vulnerabilities considering the resident population. Thus, we can refine our analysis, measuring the socio-environmental inequalities, as shown in the Table 2-4, below.

Table 2-4: Socio-environmental Vulnerabilities

Municipalities of the Bay of Todos os Santos, 2013

Source: IBGE – Census 2010 / ObservaBaía, 2013.

Municipality	High vulnerability	Medium vulnerability	Low vulnerability
Cachoeira	58%	37%	5%
Candeias	29,60%	61,80%	8,60%
Itaparica	49%	43%	8%
Jaguaripe	93%	7%	0%
Madre de Deus	0%	44%	56%
Maragogipe	71%	18%	11%
Salinas da Margarida	37%	57%	6%
Salvador	37,46%	41,36%	21,18%
Santo Amaro	46%	39%	15%
São Felix	73%	20%	7%
São Francisco do Conde	34%	63%	3%
Saubara	26%	60%	14%
Simões Filho	28,60%	52,70%	18,70%
Vera Cruz	41,90%	41,60%	16,50%

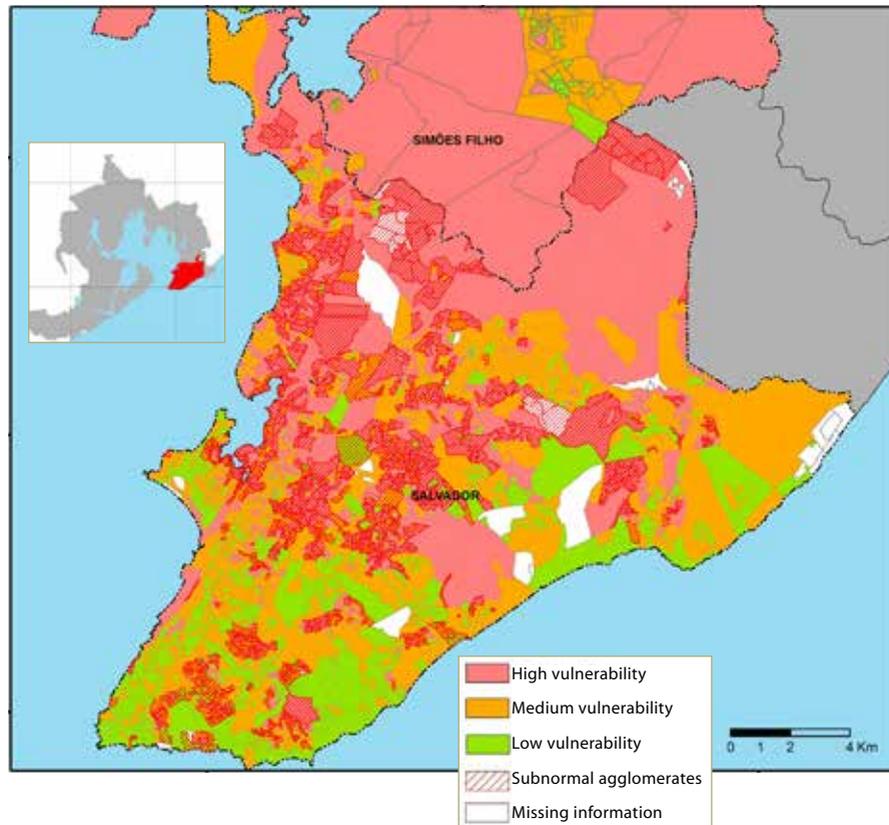


Figure 2-9: Vulnerability in Salvador

Source: IBGE – Census 2010/ MDS/ ObservaBaía 2013. Map by Rafael Franca-Rocha.

For the total population of the Bay Area, the percentages of socio-environmental vulnerability are: 38.02% under conditions of high vulnerability, 42.03% under medium conditions of vulnerability, and 19.95% under low condition of vulnerability.

Considering the percentage specific to each municipality, we notice deep differences in this distribution. The municipalities on the West and Southwest side of the Bay presents the largest population groups under high vulnerability – Jaguaripe (93%), São Felix (73%), Maragogipe (71%) and Cachoeira (58%). However, their profiles contrast to the lower ones of

the North and East side of the Bay – Madre de Deus (0%), Simões Filho (28.60%), Candeias (29.60%) and Salvador (37.46%). Despite Salvador being among the municipalities where high vulnerability is less prevalent, having the highest urban area and highest population among all municipalities, it concentrates more extensive areas and people living in conditions of high vulnerability.

Even considering these contrasts, a significant portion of the population in almost all municipalities is under very high socio-environmental vulnerability (with the exception of Madre de Deus). The low percentage of the population living under conditions of low vulnerability is a clear evidence of the harshness of living conditions shared by traditional peoples and impoverished population living on the Bay of Todos os Santos, which deeply contrasts to its natural beauties and rich historic and cultural heritage, and the way that official government agencies and the media promotes it for tourism.

Concluding Comments

The way we understand it, the concept of socio-environmental vulnerability allows for a careful analysis and understanding of the living conditions of traditional peoples and other impoverished populations for three main reasons:

- 1 It requires that the researcher to look carefully at the structure of the territory, its human occupation in synchronic and diachronic perspectives, and its uses for the production and reproduction of groups;
- 2 It allows us to understand and explain people's activities and their relation to the natural and social environment surrounding them, from which they eke out a living, be it in the urban sector or in rural or maritime areas.
- 3 It provides researchers with early indicators of environmental risks, as well as native knowledge and wisdom on how to offset them.

Notes

- 1 The *município* is the smaller territorial, political and administrative unity in Brazil.
- 2 For better visualization of the data, Salvador is presented in separate Graphic.

- 3 Madre de Deus became an independent municipality in 1989, this is the reason why it only appears in the population censuses in years beyond 1989.
- 4 The computing unit for the Brazilian Census Bureau is the “census sector”, which is classified under broad “types”: “normal” and “subnormal” (for areas with housing shortages). Besides this classification, census sectors are also defined according to their “situation” that can be “urbanized area of the city or town”, “urban area isolated”, “rural cluster of urban extension”, “isolated rural settlement (village) and “rural area, excluding rural community.” According to the 2010 Census, the domicile situation varies by their location in a census tract of urban or rural area. On the issue of classification see Garcia, 2010.
- 5 The Table 2 shows the percentage of the population of the CadÚnico from two databases: MDS information, collected in December 2012, collated with the total population from the 2010 Census. As there is a two years gap between the two records that the percentages may have changed, but still, can be taken as a reliable indication to assess the number of “low income population”.
- 6 The monthly minimum wage is early established by federal law, and is now R\$720,00 Reais, which corresponds to about \$310.00 US Dollars.
- 7 IBGE defines a subnormal cluster as “a group consisting of at least 51 housing units (shacks, houses, etc..) lacking, mostly of essential public services, occupying, or having occupied until recently, land owned by third parties (public or private) and generally having irregular and high density of population.” (IBGE, 2011).
- 8 The Real is the official currency of Brazil. As of March 7, 2014 the exchange rate was R\$2.3382 per US Dollar.
- 9 The distribution of census tracts was organized in three levels of vulnerability: high, moderate and low, through the “latent class analysis”. Latent class analysis is a statistical method which is based on a model construct that are deemed likely to identify groups of individuals that are similar with regard to the observed variables. To determine the number of classes (groups) has been proposed combining a variety of statistical criteria, among them are: Akaike information criterion (CIA) (Akaike, 1983), Bayesian information criterion (BIC) (Schwarz, 1978), likelihood ratio test of Lo-Mendell-Rubin (LMR) (Lo-Mendell-Rubin, 2001) and the bootstrap likelihood ratio test (McLachlan, 1987). The Akaike and Bayesian criteria are the most used.
- 10 The darker red areas result from the overlapping of two categories: High vulnerability and Subnormal agglomerates.

References

Adeola, F. O. 2007. ‘Nativity and environmental risk perception: an empirical study of native-born and foreign-born residents of the USA.’ *Human Ecology Review*, Vol. 14, No. 1, 13-25.

- Akaike, H., 1983. ‘Information measures and model selection.’ *Bulletin of the International Statistical Institute*. No. 44, 277-291.
- Akaike, H. 1983. ‘Statistical inference and measurement of entropy.’ G.E.P. Box, T. Leonard, and C. F. Wu Eds. *Scientific Inference, Data Analysis, and Robustness*, 165–189. Academic Press, London.
- Brandão, M. A. 2007. ‘Os vários recôncavos e seus riscos.’ *Revista do Centro de Artes, Humanidades e Letras* Vol. 1, No. 1, 53-56.
- Brasil – MDS. 2013. *Relatórios de Informações Sociais de Cachoeira, Candeias, Itaparica, Jaguaripe, Madre de Deus, Maragogipe, Salinas da Margarida, Salvador, Santo Amaro, São Félix, São Francisco do Conde, Simões Filho, Saubara e Vera Cruz*. Available: <<http://aplicacoes.mds.gov.br/sagi/Riv3/geral/index.php>> January.
- Brasil. 2013. Presidência da República. Lei Complementar nº 93, de 04 de fevereiro de 1998. http://www.mds.gov.br/cgsgrupos_populacionais/textos/beneficiarios_do_prog_nac_de_cred_fund.pdf>. June, 13.
- Brasil. 2010. *Decreto n. 6.040 de 07 de fevereiro de 2007*. http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2007/Decreto/D6040.htm. June 10.
- Brito, R. 2001. ‘A gestão da Baía de Todos os Santos.’ *Bahia: Análise & Dados*. Vol. 11 No. 2, 98-100.
- Carneiro da Cunha, M. e Almeida, M. 2012. *Quem são as populações tradicionais?* Available: <<http://uc.socioambiental.org/territ%C3%B3rios-de-ocupa%C3%A7%C3%A3o-tradicional/quem-s%C3%A3o-as-popula%C3%A7%C3%B5es-tradicionais>> December 16, 2012.
- Caroso, C; Tavares, F; Pereira, C. 2010. ‘Os contornos da Baía de Todos os Santos.’ In, Caroso, C; Tavares, F; Pereira, C. Orgs. *Baía de Todos os Santos: Aspectos Humanos* – Tomo II. Salvador: EDUFBA, Vol. 1, 13-26.
- Castro, C. M; Peixoto, M. N. O; Rio, G.A.P. 2005. ‘Riscos ambientais e geografia: conceituações, abordagens e escalas.’ *Anuário do Instituto de Geociências*. Vol. 28-2 / 2005 p. 11-30
- Crosta, A. P. 1999. *Processamento digital de imagens de sensoriamento remoto*. Campinas, IG/Unicamp.
- Descola, P. 1996. ‘Constructing Nature: Symbolic Ecology and Social Practice.’ In *Nature and Society*. Descola, P. & Palsson, G. Eds. *Anthropological Perspectives*. 1st. Editon. Routledge, London.
- Douglas, M. & Wildavsky, A. B. 1982. *Risk and Culture: An essay on the selection of technical and environmental dangers*. Berkeley: University of California Press.
- Garcia, A. F. 2010 ‘Rural e Urbano. Tentando entender as responsabilidades legais e definições.’ *Anais do XVI Encontro Nacional dos Geógrafos*. Porto Alegre.. IBGE. 2010. *Censo 2010*. Brasília: Ministério do Planejamento, Orçamento e Gestão. Available: <http://www.ibge.gov.br/home/estatistica/populacao/censo2010/default.shtm>, December 2010.
- Langdon, E. J. & Garnelo, L. Orgs. 2004. *Saúde dos Povos Indígenas: reflexões sobre antropologia participativa*. Rio de Janeiro: Contra Capa/ABA.

- Lawrence, A.; Phillips, O. L.; Ismodes, A. R.; Lopez, M.; Rose, S.; Wood, D. & Farfan, A. J. 2005. 'Local values for harvested forest plants in Madre de Dios, Peru: towards a more contextualized interpretation of quantitative ethnobotanical data.' *Biodiversity and Conservation*, 14:45-79.
- Leite, I. B. 2006. *Os quilombos no Brasil: questões conceituais e normativas*. Florianópolis: NUER.
- Lo Y, Mendell N, Rubin D. 2001. 'Testing the number of components in a normal mixture.' *Oxford Journals Science & Mathematics Biometrika*. Vol. 88, Issue 3, 767-778.
- McLachlan, G. J. (1987) 'On Bootstrapping the Likelihood Ratio Test Statistic for the Number of Components in a Normal Mixture.' *Applied Statistics-Journal of the Royal Statistical Society Series C*, 36(3:) 318-324. Palsson, G. (Ed.) 1996. *Anthropological Perspectives*. 1st Edition. London: Routledge, PNUD 2013. *Atlas do desenvolvimento humanos no Brasil 2013*. Belo Horizonte: IPEA.
- Schwarz G. 1978. Estimating the dimension of a model. *Annual Statistics*, Vol. 6 No. 2, 461-464.
- Wang J, Wang X. Structural equation modeling: applications using Mplus. Wiley series in probability and statistic, 2012, p. 207- 390.

CHAPTER THREE

CLIMATE CHANGE UNCERTAINTIES IN A
MOUNTAIN COMMUNITY IN SOUTH TYROL

Sophie Căcilie Elixhauser

Introduction¹

The last few decades have shown an increasing awareness of the dramatic consequences of global climate change. Vanishing glaciers, rising sea levels and an increase in extreme weather events are just some examples of the climatic changes already affecting our world (IPCC 2013). The present geological time period has been termed Anthropocene, reflecting the strong and often dominant influence of humanity on Earth's ecosystem.² Climate change is central to these developments (Sayre 2012, Hastrup 2013). It is widely agreed that climate change is to a smaller or larger extent due to anthropogenic influence, though definitions slightly differ in this respect.³ Manifold climate-related policies have emerged over recent years, and on different political levels climate mitigation and adaptation strategies were and are being drafted and implemented. Among local people, however, one finds a variety of perceptions of climate change, not always giving centre stage to climate change risk (cf., Crate and Nuttall 2009, Strauss and Orlove 2004).

Literary scholar Timothy Morton has recently argued that uncertainty about whether, and how, to deal with climate change and similar complex phenomena is one of the core features of the Anthropocene. He contends that in today's world, we are increasingly surrounded by so-called hyperobjects, global warming⁴ or nuclear radiation for example; entities of such vast temporal and spatial dimension that they cause stress on our normal way of reasoning. Hyperobjects are characterized by an inseparability of human and nonhuman causalities and the close intertwinement of the social and the natural, the local and the global. Accordingly, the world has become less knowable, yet its challenges have to be handled in one way or another (Morton 2013). At the same time, our knowledge of the world and its risks has greatly expanded, as sociologist Ulrich Beck (2007) argues.

This increase in scientific knowledge did not lead to fewer or reduced risks but has reinforced their visibility and created more uncertainty.

At the regional and local level the uncertainty with respect to what Morton calls hyperobjects is particularly evident. The high altitude areas of the European Alps, for instance, are often considered particularly vulnerable to a changing climate due to their physical exposure (Bätzing 2003, CIPRA 2006). But despite the increase in climate change strategies and activities,⁵ not all inhabitants of Alpine communities see an immediate necessity to counter global climate change. For many local people, climate change is as an abstract concept expressed in numbers and curves, taking place ‘elsewhere’, and the connection between local environmental and meteorological changes and global climate change remains unclear to them. Conflicting media accounts of climate change exacerbate these uncertainties.

In this chapter, I focus on perceptions of and uncertainty associated with climate change among inhabitants of the South Tyrolean community of Moos, located in the Italian Alps. After some general comments about the range of uncertainty involved in the concept of climate change, I will introduce the framework of my research. Then I will take a closer look at the situation in the community of Moos, and local people’s manifold perceptions, observations and doubts with regard to climate change.

The Uncertainty Associated with Climate Change

The complex and multifaceted phenomenon of climate change brings along different forms of uncertainty. In outlining these uncertainties, I do not wish to cast dispersions on the existence of anthropogenic climate change as such. Rather, I argue that knowing and reflecting about such uncertainties is of utmost importance for being able to better understand why and how local people respond or do not respond to climate change.

Various researchers have explored the uncertainties involved in the concept of climate change. Anthropologist Kirsten Hastrup (2013) and geographer and climatologist Mike Hulme (2013), for instance, have explicated how the projections and future scenarios of climate change models always imply fundamental uncertainty, as future processes and reactions of the Earth’s ecosystem and human behaviour can never be predicted with absolute certainty.⁶ Various sources from the natural and the social sciences have shown that climate change uncertainty relates to a full understanding of the environmental system, to the future consequences of a changing environment as well as to future human responses

(Cubasch et al. 2013, Hastrup and Skrydstrup 2013, Hawkins and Sutton 2009, Mearns 2010, Pechlaner et al. 2011). As geographer and climatologist Linda Mearns explains, many climate models provide information at an overly broad spatial resolution, and the application of downscaling methods to obtain regional (or even local) climate models presents another source of uncertainty (2010: 79, cf. Mitchell and Hulme 1999). Mearns argues that there has been much progress in characterizing and identifying the uncertainty in assessing climate change but that there is little progress in reducing it (*ibid*). Other authors have underlined either the general limits of narrowing uncertainty or the potentials for doing so (e.g., Hawkins and Sutton 2009).

While there are many different possibilities to engage with climate uncertainty, in this chapter I will focus on the uncertainties and climate change risks experienced by people on the ground. Beck has shown that when speaking about risk we always are dealing with *perceptions of risk*, which are culturally determined (Beck 1986). Many of today’s risks have reached global proportions, and Beck therefore speaks of a ‘world risk society’ wherein we have to deal with global dangers, such as climate change, that are invisible and often hard to measure (Beck 2007). Hence, the local uncertainties with regard to climate change are influenced substantially by the abstractness of global climate change models.

Many local inhabitants see climate change first and foremost as a global phenomenon, whereas its immediate effects in their environment are less tangible. As various anthropologists have pointed out, people perceive changes in weather, but they do not perceive the effects of climate change (e.g., Strauss and Orlove 2004, Elixhauser et al. 2014). At the same time, people’s uncertainties are increased by the ambiguous and sometimes conflicting messages they get about climate change, which are then interpreted selectively in keeping with their personal, cultural and social background (Hulme 2009). A focus on local people’s climate uncertainties thus requires us to consider the role of media reporting on climate change and climate change risk (Smith 2005). Before I present findings from my research in the community of Moos, I will briefly introduce the project frame and the approach of my research.

Research in South Tyrol

Between 2011 and 2013 I conducted ethnographic research in the high alpine community of Moos in Passeier, located in the Autonomous

Province of Bolzano, South Tyrol, in Italy. My research formed part of the cooperative project *Regional Climates: Social Transformation Processes on Climate Protection and Climate Adaptation*, involving three teams of German researchers based at the University of Augsburg, the Ludwig-Maximilians-University of Munich and the University of Applied Sciences Munich).⁷ By means of different social science methods we explored the perceptions of climate change in different Alpine communities of Bavaria (Germany) and South Tyrol (Italy), what mitigation measures that are being undertaken, and what barriers and opportunities exist for climate-friendly activities on a local and regional level.

As part of this team, I embarked on an ethnographic study in the community of Moos, with several field trips over a period of three years. My research was led by the question of whether and in which ways the idea of climate change appears in the community, and how community members act upon it. I paid attention to the ways in which inhabitants themselves talk about climate change and associate it with local environmental and meteorological changes, and how they perceive climate change risk. I explored local adaptation and mitigation strategies, and how (inter-) national and regional laws, guidelines and initiatives on climate change appear in the community and are translated into action. In addition, I followed themes not explicitly mentioned in connection to climate change by my informants, but which are generally associated with it, such as issues related to sustainability, consumption, mobility, building, and renewable energies.

In speaking to various different residents, I explored a multitude of voices in the community. These include young and elderly, female and male people, persons particularly knowledgeable about the theme of climate change or related topics and others not specifically concerned with it. I spoke to individuals with specific functions such as local politicians, persons engaged in the different economic sectors (tourism, energy, crafts), people living in remote locations as well as residents of the centre of Moos village. In addition to fieldwork in the community itself, I undertook multi-sited research on institutions in regional and national centres, during political events, scientific conferences and workshops. In doing so, I tried to take into account the complexity of the phenomenon of climate change, which is co-produced by manifold actors, entities and discourses on different levels (Elixhauser et al. 2014). The end of my research in Moos was marked by a community workshop, which included presentations and interactive elements involving community members.



Figures 3-1 and 3-2: Moos in Passeier, 2011 (Photo: SE)

Moos in Passeier

The community of Moos is located at the very northern edge of the Passeier valley in South Tyrol, Italy, just across the border from Austria. Moos has 2169 inhabitants, 99.1% of whom are German speaking (0.9% speak Italian). The high alpine environment is characterised by large differences in altitude, extending from the lowest point at 774m up to the summit of Mt. Hohe Wilde at 3480m. The centre of Moos village lies at 1007m altitude (see Figures 3-1 and 3-2, www.comune.mosoinpassiria.bz.it, 11.12.2013). There are several smaller glaciers on community grounds leading into the large glacier area of the Ötztal Alps on the Austrian side of the mountains. Large parts of the community are part of the Nature Park Texel Group covering the entire Texel mountain chain. Being the northernmost municipality in the Passeiertal, Moos can be reached either via the Jaufenpass (2094m) from Sterzing and the Brennero Alpine corridor, or through the Passeier valley along the river Passer from Meran. During snow-free times, the Timmelsjoch (2509m) connects Moos with the Ötztal in Austria.

Like many other alpine communities, over the centuries Moos has experienced various environmental disasters and hazards, such as flooding, rock and mudslides, and avalanches. Landslides and avalanches continue to happen quite regularly and form part of everyday life in this region. The Passeiertal did not experience any major flooding throughout the last decades – due to flood control measures along the river Passer – but in the past this had been a major issue. Since the Middle Ages, a glacial lake fed by the river Passer repeatedly overflowed causing disastrous floods. The so-called *Kummersee* ('lake of sorrow') completely dried up by the late 18th century, but stories of the distress it caused remain part of the individual and collective memory of the people.

These negative experiences with water contrast with the current, positive use of water in the production of hydropower. In the community there is plenty of water available for hydropower production, and the high differences in altitude support a strong and continuous flow of water. Accordingly, at the turn of the millennium, plans for several larger river power plants were drawn and implemented in the following years. Due to the initiative of a number of committed community members, involvement of external actors could be largely prevented. An energy and environmental cooperative was initiated, which constructed its own energy distribution network. Today, almost all households are members of the cooperative. Energy prices for members are low, amounting to less than half than the former price. Surplus energy is being fed into the national system, yielding

substantial financial gains. Thanks to hydropower, the community has become the largest producer of 'green' electricity in the Passeiertal, having undergone a development from an economically poor to a rapidly progressing and affluent place.

In addition to energy and some handicraft industry, tourism forms an important economic sector, as it does in most of South Tyrol. Due to its remote location, tourism in Moos is mostly small-scale featuring family-based hotels. Tourists are attracted to Moos both in summer and winter due to the beautiful mountain environment and the many hiking possibilities. There is a small ski resort in the Pfelderer valley featuring three ski lifts.

Climate-related Activities in Moos

Climate change issues hardly appeared in local politics, but the topic started to receive somewhat more attention over the last few years. This is related in part to increased regional and international awareness of the issue, and associated political activities. Today a rising number of initiatives and activities in Moos entail climate change as a component. Some of these projects are initiated 'bottom up' by community members whereas others are instigated 'top down' from a pan-alpine, national or provincial level.

A few years ago, the Province of Bolzano / South Tyrol started to put the theme of climate change centre stage and formulated the aim of becoming a true 'Klimaland'. A comprehensive climate strategy for South Tyrol was presented and followed up by implementation efforts throughout the province (Autonomous Province of Bolzano South Tyrol 2011). Slowly, these provincial politics become noticeable in Moos, and the community council is sometimes asked to participate in workshops and in the launching of climate projects. One example for a larger project Moos takes part in is a climate initiative recently launched by the EURAC Academy of Bolzano in cooperation with the European Union, aiming for the reduction of carbon emissions in the municipalities of the Passeiertal. The community of Moos has reached some degree of popularity in the frame of the 'Klimaland' initiative due to its hydropower enterprise and the sustainable tourism initiative 'sanft-mobil Pfelders' presented as prime examples of climate protection (Karweger 2012: 52- 53).

The tourism initiative 'sanft-mobil Pfelders' was launched a number of years ago in the village of Pfelders featuring the highest tourist numbers in Moos. The project meant that cars are no longer allowed to enter the

village, apart from some exemptions such as residents' cars. Local public transport was expanded and additional hiking buses were introduced. In connection to this project, Moos became a member of the pan-alpine marketing group 'Alpine Pearls' promoting ecological and climate-friendly tourism. Today, Pfelders is advertised as a quiet and sustainable holiday destination; it attracts many families and nature lovers. Despite its success in the field of tourism, the project has not been without conflict, especially during its initial years. Some villagers and inhabitants from neighbouring villages complained about the car prohibit restricting the ability to drive directly to the local restaurants and pubs, to friends' and families' houses, or to the ski lift. Due to efforts from the community council, the level of complaint seems to have declined and according to a recent telephone survey of the community the majority of the villagers nowadays value the advantages of a quiet 'village without cars'.

This soft mobility initiative contributes to climate protection through reductions in traffic and carbon emissions. When speaking to community members, the initiative nevertheless is mainly understood as a tourism and marketing strategy and rarely as a response to climate change. Likewise, hydropower production in Moos, which in political circles and in the media is sometimes advertised as a climate protection strategy, is first and foremost considered as a profitable development strategy among the inhabitants. Among different social groups, one thus finds different interpretations of existing initiatives, and diverging uses of the climate change discourse.

An important provincial institution forwarding climate protection measures is the Climate House Agency of South Tyrol developing certification standards and regulations on climate-friendly building. Today, throughout the province all new and renovated buildings have to meet certain climate standards. Reactions to these new regulations among the inhabitants of Moos are twofold. Some community members consider the new climate houses a modern and future-oriented solution with low heating costs whereas other voices are more critical. For instance, I have heard several people complaining about the changed lifestyle in the energy efficient houses that stands in marked contrast with life in classical South Tyrolean buildings. The cosy atmosphere of the traditional tiled stove heating only single rooms is particularly liked as well as a low-tempered bedroom without heating. The modern climate-houses, however, feature a different heating system with even temperatures in all rooms throughout the seasons. Fears were mentioned, moreover, about their non-breathable walls and the airing system.

In addition to these activities, one finds some smaller climate-related initiatives in the realm of environmental education in Moos, such as guided

nature walks in the Nature Park Texel Group providing information on the effects of climate change, and a summer holiday program for children in the Passeiertal offering environmental education including the topic of climate change.

All in all, most of the named climate-related projects mention climate change merely as a small component, or have been framed as explicit climate measures only recently (e.g. hydropower). Climate change often serves as 'add on' explanation supplementing broader themes such as sustainable tourism, building or environmental conservation, and many residents are not greatly aware of these 'climate components' and do not regard the respective initiatives as a response to climate change.

Perceptions of Climate Change in Moos

My research has shown that for most community members the topic of climate change is not very present in their everyday lives. Extreme weather events, such as the very hot autumn of 2011, lead to occasional speculations whether these occurrences may be caused by global climate change. Likewise, catchy media reports sometimes lead to controversial discussions in local pubs. Apart from that, the topic seems to be almost absent from everyday conversations. When I explicitly asked community members about the effects of climate change in their community or broader region I received very mixed replies. Many people experience changes in weather and their surrounding environments, and are able to explain these in considerable detail. But few inhabitants are convinced that they are caused by global climate change, whereas others argue that whether fluctuations are quite normal, explaining "the elders say it was always like this".⁸

The changes in weather experienced by community members include a prolonged summer season, generally warmer summers, and a different type of 'scorching heat' ('stechende Hitze') as compared to the past. The winters tend to start later in the year and there is less snow nowadays, several people remarked. Not all community members, however, experience a general trend towards warmer weather. Many inhabitants spoke of more rapid changes in extreme weather conditions and a lack of long-term weather reliability. This can be a problem for agriculture, a local farmer explained to me, especially when it comes to doing the harvesting, which requires stable weather. Sudden changes in weather also affect the alpine pastoral system. For instance, early snowfall may require an early return of the animals from the high pastures back to the valleys, where pastures are already

depleted. Nevertheless, up to now, changes in weather have not impacted substantially on community life. The tourist seasons are shifting slightly (yet varying from year to year), but due to the wide range of possible tourist activities in both summer and winter, the industry has so far been able to adjust. In the village of Pfelders, located at a relatively high altitude and featuring the only skiing area in the community and the highest tourist numbers, snow conditions have so far remained reliable.

Apart from changes in weather, several residents reported on the new arrival or disappearance of particular plant and animal species, a rising tree line and decreasing permafrost. The latter causes landslides, mud flows and falling rocks, leading to roadway damage and mountain paths becoming impassable. In this high mountain environment, however, hazards and disasters such as rock slides, avalanches and extreme weather events are not unusual, and many informants mentioned doubts as to whether these occurrences are really becoming more frequent or severe. While some informants spoke of an increase in these occurrences and explained this by reference to climate change, others found it difficult to detect substantial changes in their frequency and strength that would clearly mark them as part of an overall change in climate.

For most inhabitants the clearest sign of global climate change are the retreating glaciers (cf. Vogel and Elixhauser in press). The community's glaciers are all rather slow and are exploited economically to a very limited extent. The glacial melt waters feeding the local creeks and the river Passer are used for the hydropower plants, and some of the local glaciers are now and again visited – and experienced materially – by mountaineers, both locals and tourists. Most community members, however, experience the glaciers above all visually and aesthetically as part of their surrounding landscape.

Many elderly people recall the massive decline in glaciers since their childhood, which they often explained by means of personal stories. According to a mountain guide from Pfelders, the nearby glaciers formerly led down to an altitude of 2000m whereas today they finish at around 3000m. One elderly man narrated how some decades ago he regularly hiked along the smugglers' paths leading from the Pfelderer valley via the glaciers across the border to the Ötztal in Austria. Along with the vanishing glaciers, these glacial paths have nowadays disappeared. Another informant explained that during his childhood he used to play football on a glacier near the Zwickauer mountain hut, an area where today there is only rock. In former times, the local skiing club used to train on this glacier, as a skiing teacher pointed out to me during my visit at the Zwickauer hut. The



Figure 3-3: The retreating glacier Seeberferner, 2012 (Photo: SE)

retreat of the glacier Seeberferner located near the Timmelsjoch (the road connection to Austria in the summer) provides another, particularly striking example of glacial retreat, as observed by various community members (see Figure 3-3). Along with the vanishing glaciers some inhabitants mentioned their worry that missing water resources might cause problems with hydropower production in the future. These worries were formulated rather cautiously, and I had the feeling that these persons did not want to reflect in detail on such a negative scenario. This seemed to be connected to a general insecurity as to whether one should believe in the future scenarios of global climate change modelling.

Several community members reflected on the general difficulties to perceive climate change, sometimes referring to its long temporal perspective. I was often asked, “How can one know that these observations are climate change?” A local teacher and nature park guide emphasized that climate change is “such a slow and creeping phenomenon” that it is difficult to observe. A young man working in his parents' restaurant compared the community members' situation regarding climate change with a frog in the water: “If you are immersed in it, you don't really notice.”

Some people expressed their general doubts about climate change, such as a waitress from Pfelders in her early thirties:

Also in the past we sometimes had snow in October and we had disastrous storms. My father in law thinks so, too. We just don't know if this is climate change or if things were similar in the past. I doubt the whole talk about climate change.

A mountain guide noted, "Climate change, this is somewhat vague. The climate has always been changing. In the 1950s, there was also a time when it was warmer." Then he referred to the former ice ages and warming periods, during which the glaciers were even smaller than today. For him it therefore seems plausible that today's changes are part of 'natural cycles.' The phrasing 'natural cycles' appeared in various conversations and interviews, underlining the insecurity among many inhabitants whether the changes of today are due to natural variability or anthropogenic climate change. This uncertainty has been reported from various other Alpine communities, such as the Ortler Region in South Tyrol (Brugger et al. 2013: 9), the Dalatal/Wallis region in Switzerland (Strauss 2009), and the Pfitztal region in Tyrol, Austria (Herta Nöbauer, personal communication, 18.2.2014).

These responses clearly demonstrate that people perceive weather but do not perceive climate (Strauss and Orlove 2004). Climate change is an abstract concept based on means and averages drawn from statistical data covering a comparably long stretch of time and large spatial entities. It does not emerge from lived experience. Accordingly, for many inhabitants climate change is difficult to grasp. Similar to what Pechlaner et al. (2011) found in their study about climate change uncertainties in two tourism destinations in South Tyrol, I experienced that differences between long-term meteorological changes and short term variations in weather are often not considered. Changes in weather are remembered in relation to particular events, which are interpreted on the basis of individual and social knowledge. For some people, an individual event such as a very cold winter can therefore proof that climate change does not exist (cf. Burger-Scheidlin et al. 2010).

Local discussions about climate change further show the co-existence of different types of knowledge, which are sometimes perceived as competing viewpoints (Agrawal 1995). In my talks with community members, I was regularly told that I should better approach the 'experts' who would have the 'proper' knowledge. A gamekeeper argued, "Climate change – everyone has a different opinion about it. I cannot say anything about it, everyone thinks differently. It has to be accurately measured." At the same time, statements of experts, such as geologists or climatologists, were

sometimes criticized by local people. Locals argue that these experts lack the proper long-term knowledge of the region and tend to misinterpret observations. A local politician said, "The geologists, they come to the region for one day, take a brief look at a mountain and see that the rocks are coming down. But they fail to consider the long-term experiences." A mountain guide from Pfelders argued quite similarly:

If once a rock falls down, right away they say this is climate change. But it is not like this. We have always had rockslides. The geologists immediately have an explanation, but they don't know our mountains.

These statements show that, while some people strive for more scientific information on climate change, others are doubtful about the accuracy of this knowledge, as it not always matches their local knowledge and long-term experience.

Apart from occasional contact with scientists coming to (or living in) the region, inhabitants' views of climate change and climate science are substantially shaped by the media. While on the one hand media reports lead to an increased awareness of the superregional and global connections of climate change, on the other hand the multiple and sometimes polarizing information about climate change – ranging from catastrophe reporting to climate scepticism – causes further uncertainty. For instance, during a field trip in February 2012, I talked to two men at the bar of a local pub in Moos village. They explained to me, "You know, there are so many media report. We no longer know what to believe. We better believe nothing." While saying so they pointed out to me the headline of a popular German newspaper lying at the counter, entitled *The CO2 Lie: Renowned Researchers claim that the climate catastrophe is political panic mongering* (Weber 2012). In a rather polarizing way, this newspaper article criticized the Intergovernmental Panel on Climate Change for allegedly making severe mistakes in their projections of global climate change. Quite similarly to the men at the bar, the above cited mountain guide from Pfelders criticized climate change communication:

You don't really know what exactly climate change is. I do not believe in these exaggerated media accounts. I have guided many people in the mountains, adventurers, researchers, and so forth. They often talk about it, but most of them just don't know by themselves.

Quite similar to Moos, a study on farmer's perceptions of climate change in two communities of the Austrian Alps, Burger-Scheidlin,

Christanell and Vogl (2010) describes how uncertainties triggered by increasing catastrophe reporting are reinforced by a broad range of opinions and commentaries about climate change and its effects. Among the farmers in these communities, current weather conditions and media information are merged with local knowledge and personal experiences providing the basis for interpretations of and opinions about climate change (*ibid*: 264). Though sometimes local and expert knowledge are understood as competing viewpoints, in Moos, quite similarly, different types of knowledge and information are merged to provide the basis for people's viewpoints. For example, individuals who have received more information about scientific climate change research, sometimes combined with a specific professional or personal interest and respective local knowledge, tend to reflect more strongly on the link between climate change and local environmental changes, though uncertainty about this association often remains. The above cited teacher and nature park guide speaking of climate change as a "slow and creeping phenomenon," for example, makes regular and detailed observations of the environment in the Passeiertal. In our long conversation, he had many details to tell about local environmental changes, some of which, as he said, might be caused by climate change. He explained his knowledge of climate change and its larger contexts with information he had received from the Alpine Research Centre in the neighbouring Ötztal in relation to his activities as a nature park guide.

Hence, in addition to those community members being rather sceptical about climate change, there are a number of people – often but not exclusively local academics – who are convinced that more climate measures are needed along with a respective change in lifestyle. A number of these people pointed out that a main barrier for more and better climate measures is that most community members prioritise activities related to their immediate everyday concerns and are not greatly interested in tackling a global problem detached from their everyday life – as climate change appears to them. The community workshop marking the end of my fieldwork in autumn 2013 showed that various participants indeed strive for more concrete and reliable information about 'what to believe'. It also demonstrated that there are manifold visions for climate-friendly living in the future, such as degrowth and greater environmental awareness. Environmental education was noted as particularly important in order to reach this goal.

For many inhabitants of Moos climate change thus seems to be a matter of belief. A certain number of people say that they 'believe in climate change', usually meaning that they believe in climate change affecting their immediate surroundings; some of these call for more and better

climate measures and climate change education. Others contend they that they 'don't believe in climate change' arguing that 'it was always like this.' Some of these people localize climate change somewhere else, such as in the Arctic or the South Pacific, influenced by catastrophe reports from climate change in these regions, whereas others say they don't believe in the existence of climate change as such. The majority of the people I talked to communicated a certain degree of uncertainty about 'what to believe.'

Discussion

I have shown that perceptions of climate change among inhabitants of Moos are marked by various degrees of uncertainty. Whether global climate change affects Moos and the Passeiertal now, and what its effects will look like in the future, appears very uncertain for many inhabitants – despite the great amount of literature and media reports underlining the drastic consequences of climate change predicted for the European Alps. Various community members explained to me that for them, climate change either occurs in other regions of the world, might happen in the future but does not take place now, or that they do not believe in its existence at all. The environmental and meteorological changes in people's surroundings are rarely associated with climate change, apart from the changing glaciers, which for many inhabitants provide the most visible sign of climate change.

Hence, only a small number of inhabitants perceive climate change to be a risk that needs to be countered now, and the majority do not see an immediate need for action. Similar to what researchers found in other regions of South Tyrol, climate protection efforts in Moos, such as climate-friendly building, a reduction in traffic or the use of renewable energies are widely considered as forming part of sustainable development and environmental protection more generally, but not as a direct response to climate change (cf. Pechlaner et al. 2011: 312).⁹

The climate uncertainties of inhabitants of Moos are situated on different levels. First, they relate to the fact that climate as such is not directly perceivable. Accordingly, for many local people the association of local environmental and meteorological change with global climate change remains uncertain. This is supported by the fact that even climate scientists often cannot say with absolute certainty whether an individual weather event is caused by climate change. Second, people's insecurities are influenced by scientific uncertainties about the precise future

consequences of climate change. These scientific uncertainties are amplified by the diverse and conflicting information about climate change communicated via the media.

With regard to the latter, one popular argument is that better and more precise information on the impacts of climate change will result in more awareness and more successful climate strategies. This argument rests on a model of science communication termed the ‘deficit model,’ presupposing a one-way flow of information between scientists and the public (Dessai et al. 2009, Hulme 2009: chapter 7). Following this line of argument, local uncertainty about climate change needs to be combated by more accurate information. This rational-actor model of human behaviour received much criticism, however, especially from the social sciences (Mearns 2010: 82). Various studies have demonstrated that more or clearer information about climate change from scientists is not sufficient to produce greater public engagement with the issue. They further show that successful climate protection and adaptation strategies can be developed in the face of the deep uncertainties involved in climate predictions (e.g. Dessai et al. 2009). As science communication often takes place via the media, one needs to take into account that news and information – as for example the German newspaper article mentioned above – are always entangled with ideological standpoints (Carvalho 2007). Scientific uncertainty thus may become a rhetorical resource which can be and is employed by different actors for their own strategic purposes (Hastrup 2013: 20-21). Hulme therefore stresses the need to understand the complex ‘cultural circuits’ of science communication. He explains:

There are barriers other than lack of scientific knowledge to changing the status of climate change in the minds of citizens – psychological, emotional and behavioural barriers. We need to understand the complex “cultural circuits” of science communication in which framing, language, imagery, marketing devices, media norms and agendas all play their part in the construction, mediation and deception of messages. (2009: 215-216)

I therefore argue that people’s scepticism and uncertainty about climate change will not be overcome by clearer and better scientific information about climate change. Instead I believe that more *critical* information and exchange about the processes of climate science and their inherent uncertainties is needed. This has been aptly described by Dessai et al., arguing “that society will benefit much more from a greater understanding of the vulnerability of climate-influenced decisions to large irreducible uncertainties than in seeking to increase the accuracy and precision of the

next generation of climate models” (2009: 76). Among several community members of Moos, I experienced an interest in an increased dialogue about climate change issues. They wanted opportunities both to voice their own perspectives and to get to know more about how the findings of climate science and how to apply it to their surrounding environments. Accordingly, I believe that an increased dialogue about climate change issues involving climate scientists, local actors and the policy community would help to create more awareness about the local *and* global effects of climate change – both today and in the future – and the need to counter these. Moreover, science and policy communities need to be more active critics and sources of news (Smith 2005), just as local people possessing long-term knowledge of their environments should be taken seriously and be integrated into climate research to a greater extent.

Finally, I want to return to what Morton’s has written about hyperobjects, as briefly mentioned in the beginning of this chapter. He explains that it is not possible to fully learn about hyperobjects but that “we have to handle them anyway” (Morton 2013: 67). This handling, however, “causes ripples upon ripples” (*ibid*). In this chapter I have exemplified some of these ‘ripples’ by means of the example of the community of Moos from the South Tyrolean Alps. I hope that reflecting on these ripples and the uncertainties the hyperobject climate change entails and creates can support a more successfully adaptation to and mitigation of climate change.

Notes

- 1 This paper draws from various discussions with the project team Regional Climates. I thank Stefan Bösch and Herta Nöbauer for helpful comments on earlier drafts of this paper. I acknowledge funding for this research provided by the German Federal Ministry of Education and Research.
- 2 The term Anthropocene was coined by atmospheric chemist Paul Crutzen at the turn of the millennium (Crutzen and Stoermer 2000).
- 3 According to the Intergovernmental Panel of Climate Change (IPCC) taking a leading role in channelling research and providing information, climate change subsumes changes due to human activity and natural variability (IPCC 2013). The United Nations Framework Convention on Climate Change, on the other hand, forwards a definition encompassing only those climatic changes caused directly or indirectly by humans (UNFCCC 1994). In speaking about climate change, I refer to the IPCC definition arguing that it is impossible to clearly distinguish between human and nonhuman causalities.
- 4 Morton prefers the term global warming over climate change since the latter,

as he argues, “enable cynical reason to say that the ‘climate has always been changing’” (2013: 8-9). While seeing this dilemma, I still prefer to speak of climate change as it encompasses a much broader field of climatic changes than merely those related directly to a rise in temperature, and the term is widely used among my informants in the European Alps and beyond.

- 5 For Alpine climate mitigation and adaptation reports and strategies see e.g., AdaptAlp 2011, Autonomous Province of Bolzano South Tyrol 2011, EEA 2009.
- 6 As part of the scientific uncertainties associated with climate change, the latest IPCC report lists scenario uncertainty, model uncertainty, internal variability and initial condition uncertainty, and forcing and boundary uncertainty for the assessment of historical and paleoclimate simulations (Cubasch et al. 2013: 138).
- 7 The project *Regional Climates* (German: *Klima Regional*) was funded by the German Federal Ministry of Education and Research (2010-2013). For some project results, see Böschen et al. (forthcoming).
- 8 All quotations from interviews and conversations in this chapter are translated from German (South Tyrolean dialect) into English by the author.
- 9 Attention should be drawn here to the fact that discourses about environmental protection and sustainable development are indeed much older than discourses about climate change.

References

- AdaptAlp. 2011. *Climate adaptation and natural hazard management in the alpine space – final report*. Funded by the Bavarian State Ministry of the Environment and Public Health and the Alpine Space Programme. Adaptation to climate change in the Alps (AdaptAlp), www.adaptalp.org (10.06.2013).
- Agrawal, A. 1995. Dismantling the divide between indigenous and scientific knowledge. *Development and Change* 26:413-439.
- Autonomous Province of Bolzano South Tyrol 2011. *KLIMA-Strategie. Energie-Südtirol-2050. Südtirol auf dem Weg zum KlimaLand*. Südtiroler Landesregierung, Ressort für Raumordnung, Umwelt und Energie, Autonome Provinz Bozen-Südtirol, http://www.provinz.bz.it/umweltagentur/download/Klimaplan_EnergieSuedtirol2050_Ansicht%281%29.pdf (13.08.2013).
- Bätzing, W. 2003. *Die Alpen. Geschichte und Zukunft einer europäischen Kulturlandschaft*. München: C. H. Beck.
- Beck, U. 1986. *Risikogesellschaft. Auf dem Weg in eine andere Moderne*. Frankfurt a. Main: Suhrkamp.
- Beck, U. 2007. *Weltrisikogesellschaft. Auf der Suche nach der verlorenen Sicherheit*. Frankfurt am Main: Suhrkamp.
- Böschen, S., B. Gill, C. Kropp, and K. Vogel. Editors. (forthcoming). *Klima von unten. Klimawandel und Transformation*. Frankfurt/Main: Campus.
- Brugger, J., K. W. Dunbar, C. Jurt, and B. Orlove. 2013. *Climates of anxiety: comparing experience of glacier retreat across three mountain regions. Emotion, Space and Society* 6:4-13.
- Burger-Scheidlin, A. Christanell, and C. R. Vogl. 2010. “Wetter – Wahrnehmung – Wissen. Bäuerliche Perspektiven auf Klima und Klimawandel,” in *Landwirtschaft im Klimawandel*. Edited by Agrarbündnis e.V., pp. 261-265. Hamm: ABL Verlag, http://www.kritischer-agrarbericht.de/fileadmin/Daten-KAB/KAB-2009/Burger-Scheidlin_et_al.pdf (17.05.2011).
- Carvalho, A. 2007. Ideological cultures and media discourses on scientific knowledge: rereading news on climate change. *Public Understanding of Science* 16:223-243.
- CIPRA. 2006. *Klima – Wandel – Alpen. Tourismus und Raumplanung im Wetterstress*. Tagungsband der CIPRA Jahresfachtagung 2006 vom 18.-20. Mai 2006 in Bad Hindelang/Deutschland. München: Oekom Verlag.
- Crate, S. A., and M. Nuttall. Editors. 2009. *Anthropology and climate change. From encounters to actions*. Walnut Creek, California: Left Coast Press.
- Crutzen, P., and E. Stoermer. 2000. *Global Change Newsletter* 41:17-18.
- Cubasch, U., D. Wuebbles, D. Chen, M. C. Facchini, D. Frame, N. Mahowald, and J.-G. Winther. 2013. “Introduction,” in *Climate Change 2013: The physical science basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Edited by Stocker, T. F., D. Qin, G.-K. Plattner, M. Tignor, S. K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, and P. M. Midgley. Cambridge, UK; New York, USA: Cambridge University Press.
- Dessai, S., M. Hulme, R. Lempert, and R. J. Pielke. 2009. “Climate prediction: a limit to adaptation?,” in *Adapting to climate change: thresholds, values, governance*. Edited by Adger, N. W., I. Lorenzno, and K. L. O’Brien, pp. 64-78. Cambridge: Cambridge University Press.
- EEA. 2009. *Regional climate change and adaptation. The Alps facing the challenge of changing water resources*. Copenhagen: European Environment Agency, Technical Report No. 9.
- Elixhauser, S., K. Vogel, and S. Böschen. 2014. Meshworks and the making of climate places. A framework for research on the local dimensions of climate change. Draft paper, *Nature & Culture* (under revision).
- Hastrup, K. 2013. “Anticipating nature: the productive uncertainty of climate models,” in *The social life of climate change models: anticipating nature*. Edited by Hastrup, K. and M. Skrydstrup, pp. 1-29. London: Routledge.
- Hastrup, K., and M. Skrydstrup. 2013. *The social life of climate change models: anticipating nature*. London: Routledge.
- Hawkins, E., and R. Sutton. 2009. The potential to narrow uncertainty in regional climate predictions. *Bulletin of the American Meteorological Society* 90:1095-1107.
- Hulme, M. 2009. *Why we disagree about climate change: understanding controversy, inaction and opportunity*. Cambridge, UK; New York: Cambridge University Press.

- Hulme, M. 2013. "How climate models gain and exercise authority," in *The social life of climate change models: anticipating nature*. Edited by Hastrup, K. and M. Skrydstrup, pp. 30-44. London: Routledge.
- IPCC. 2013. *Climate Change 2013: The physical science basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, UK; New York, USA: Cambridge University Press.
- Karweger, A. Editor. 2012. *Klimaland Südtirol – Alto Adige – South Tyrol*. München: Verlagshaus Böhner.
- Mearns, L. O. 2010. The drama of uncertainty. *Climatic Change* 100:77-85.
- Mitchell, T. D., and M. Hulme. 1999. Predicting regional climate change: living with uncertainty. *Progress in Physical Geography* 23 (1):57-78.
- Morton, T. 2013. *Hyperobjects: philosophy and ecology after the end of the world*. Posthumanities. Minnesota: University of Minnesota Press.
- Pechlaner, H., M. Elmi, and M. Herntrei. 2011. "Uncertainty regarding climate change and strategic planning in two tourism destinations in South Tyrol," in *Coping with global climate change. Strategies, policies and measures for the tourism industry*. Edited by Weiermair, K., H. Pechlaner, A. Strobl, M. Elmi, and M. Schuckert, pp. 295-317. Innsbruck: Innsbruck University Press.
- Sayre, N. F. 2012. The politics of the anthropogenic. *Annual Review of Anthropology* 41:57-70.
- Smith, J. 2005. Dangerous news: media decision-making about climate change risk. *Risk Analysis* 25:1471-1482.
- Strauss, S. 2009. "Global models, local risks: responding to climate change in the Swiss Alps," in *Anthropology and climate change. From encounters to actions*. Edited by Crate, S. A. and M. Nuttall, pp. 166-174. Walnut Creek, California: Left Coast Press.
- Strauss, S., and B. S. Orlove. 2004. *Weather, climate, culture*. Oxford, New York: Berg.
- UNFCCC. 1994. *United Nations Framework Convention on Climate Change*. Available from <http://unfccc.int> (05.02.2014).
- Vogel, K., and S. Elixhauser. in press. "Wasserwandel im Klimawandel: Mensch-Wasser-Beziehungen in zwei Gemeinden im Alpenraum," in *Klima von unten. Klimawandel und Transformation*. Edited by Böschen, S., B. Gill, C. Kropp, and K. Vogel. Frankfurt/Main: Campus.
- Weber, W. 2012. "Globale Erwärmung. Die CO2-Lüge. Renommiertes Forscher-Team behauptet: Die Klima-Katastrophe ist Panik-Mache der Politik." BILD, 6 Febr 2012, p. 2, <http://www.bild.de/politik/inland/globale-erwaermung/die-co2-luege-klima-katastrophe-ist-panik-mache-der-politik-22467268.bild.html> (10.02.2012).

Part II

Sustainable Urban Environments



CHAPTER FOUR

EAST KOLKATA WETLAND AND URBANIZATION: USING LOCAL KNOWLEDGE IN THE PURIFICATION OF SEWAGE BY AN INTEGRATED SINGLE POND SYSTEM

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Introduction

The Kolkata metropolitan area has a natural geological advantage in that its terrain slopes toward the east. This facilitates the city's drainage system carrying sewage and wastewater into a vast swampy, marshy land in the eastern part of Kolkata, which acts as a 'sink.' This sink, however, is now under continuous pressure from rampant growth of the urban built environment and infrastructure development. Wetlands reclamation is also taking place, ignoring the importance of drainage and sewage purification services to the city and the rich biodiversity of the wetlands. Many of the functions performed by the wetlands go unnoticed because it entails a slow mechanism of chemical-biological-physical processes whereby pollutants are filtered out, ensuring that water quality is restored before it drains into the distributaries of the Bay of Bengal.

Wetland dwellers have extensive knowledge of precision technology, inherited from the older generation, on how to convert a wastewater stream into a resource recovery system (for example, knowledge on how to link solid waste and compost manure, animal waste and fish feed, plant waste and cattle or fish feed). Despite recent interferences, this knowledge is still reflected in their aqua-cultural and agricultural cultivation system. Local and urban populations directly or indirectly benefit from wetland ecosystem goods (e.g. food) and services (e.g. waste assimilation). This is achieved by utilizing the flow of waste water from the outfall channel in a four-stage resource recovery systems incorporating garbage fertilized

vegetable farms; waste water-fed fish ponds; paddy fields using fish pond effluent; and sewage-fed brackish water aquaculture. To describe and evaluate this system is the main aim of our study.

The East Kolkata Wetland (EKW) (22°29'51"-22°38'05" N; 88°16'22"-88°24'43" E; see Figure 4-1) is currently undergoing a major political metamorphosis due to sprawling urban development on the one hand,

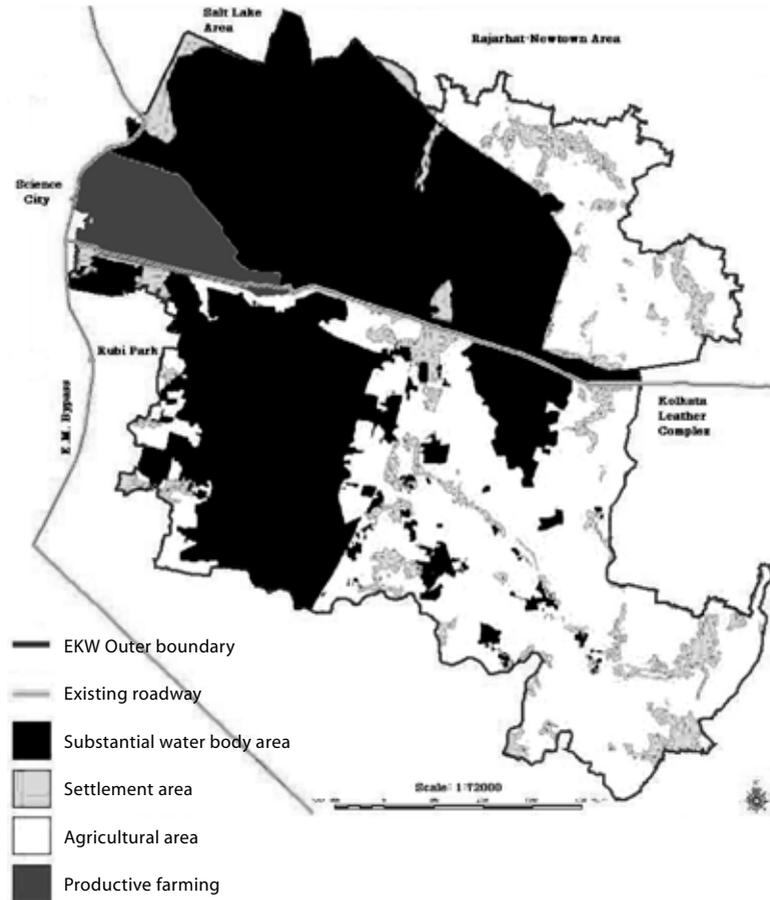


Figure 4-1: Map of East Kolkata Wetland (EKW), showing Ramsar Site No. 1208
 Present land use pattern of EKW
 Source: IKONOS (2003)

and calls for conservation of the wetland and their on-going utilization as a resource recovery system on the other (Hasse et al 2003, Matthews 2013, Sahu and Sikdar 2011). Like other port cities, the Kolkata metropolis has limited options for accommodating growth. It has expanded into the eastern region to accommodate its ever-increasing population. Clusters of urban development after wetland reclamation include Salt Lake City, Chingrighata, Mathpukur and Kalikapur, to name but a few (Ruddle 1987). This filling up of low-lying lands with the help of flood fortification has been going on for over forty years, adding to the city’s enormous volume of sewage and solid waste discharge, and causing concern about its proper disposal. Nevertheless, after continuous lesson learnt from the indigenous form of waste utilization by the wetland dwellers, and following evidence of the system’s ability to meet the scientific disposal of the metropolis’ voluminous waste in the form of economically viable fish and vegetable production with the help of their indigenous knowledge, has prompted the government to conserve what is left of the vast wetland area as a receptacle for sewage and solid waste.

According to the ‘Ramsar list’ of 2002, the EKW comprises 12,500 hectares and consists of 37 moujas (Prasad et. al. 2002).² Establishment of this conservation area is the first and bold step toward arresting urban encroachment and to encourage the traditional economy as a Waste Recycling Region (WRR). The topography of Kolkata metropolis thus hopes to maintain the advantage of the natural flow of sewage water down into the waterlogged areas on the eastern side of the city.

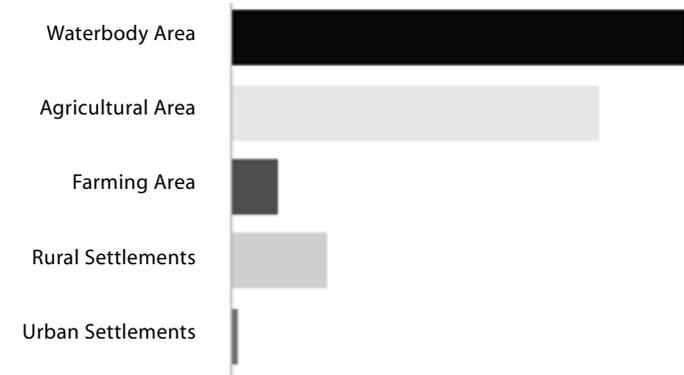


Table 4-1: Showing land distribution of Ramsar Site No. 1028
 Source: Kundu et al 2008:869

This natural phenomenon perennially fills up the entire waterlogged areas with a constant flow of sewage water. This sewage effluent is purified through several stages in different oxidation ponds releasing finally into the Kulti Gong distributor through a Storm Weather Flow (SWF) canal, after traversing some 32 kilometres. Meanwhile, the purification process of the sewage is monitored and maintained by the wetland dwellers by means of four levels of recovery systems: garbage farming, waste water fed fish ponds, paddy fields using fish ponds effluent, and sewage-fed brackish water aquaculture (Kundu et al 2007).

Indigenous knowledge vested in the wetland ecology and wisdom of EKW dwellers has become a primary focus of attention over the last few decades (Turner et al 2000). Indigenous knowledge is already a widely known factor here because it has much relevance to the management of local resources, preservation of the EKW's rich biodiversity, and to the maintenance of local, sustainable livelihoods. The objective of the present study is to examine the characteristics of this indigenous knowledge system, based on data collected from October 2012 to July 2013. We affirm that this knowledge could help inform a comprehensive resource management plan to strengthen conservation of the EKW and its surrounding areas, supported by a scientific rationale. How sewage treatment in association with sewage fed fishery is done with a low cost traditional practice is also an interesting subject to investigate. This age old and time-tested technology provides much evidence of its own efficacy and the quality of its produce, and further provides opportunities to streamline pond based fish production.

The Study Area: Samity Ltd Cooperative

Sprawling urbanization along with conversion of wetland areas has become a global issue. The EKW is invariably a case of such transformation. The specific study area we chose includes the oxidation ponds of EKW dwellers of the Nonadanga, Madurdaha and Naskarhat moujas. They manage the oxidation pond situated in the eastern end of the Eastern Metropolitan Bypass and opposite Fortis Hospital. The locals involved in this are all members of *Purba Kalikata Matsyajibi Samabay Samity Limited* (PKMSSL), which is located at the southern end of this oxidation pond (Figure 2). Members of Samity Ltd professionally run the indigenous fishing cultivation.



Figure 4-2: Map of the study area, showing oxidation pond and Purba Kalikata Matsyajibi Samabay Samity Limited

Source: Google Wikimapia.

More than sixty years ago, the area of the present oxidation pond near Adarsh Nagar (Figure 4-2) remained a vast open land of paddy fields. Ancestors of the present residents according to our informants took possession of this land by paying a tax to the then landlord. But in the 1970's, the West Bengal state government acquired the land from the people, including our informants, for an urban development project. A vast area of this land was excavated to fill up low-lying land elsewhere, leaving a number of enormous holes and ditches that eventually were transformed into the present day oxidation pond and filled up with sewage water. In the process, farmers have shifted their livelihood from agriculture to aquaculture. We are also told that government had helped to train them about fishery through workshops, and supported them to establish Samity Ltd (PKMSSL). The government allowed them to practice fishing in these ponds with a lease agreement up to 2014.

PKMSSL is located on the premises of the oxidation pond within Naskarhat mouja of Tiljala Police Station, South 24-Parganas, Kolkata -700039. The Samity Ltd is run by 120 families who live in Nonadanga, Madurdaha and Naskarhat. The head of each family is assigned for 15 consecutive days mainly to monitoring and maintaining the fish growth. Daily accounting work, purchase of fish eggs and fishing utensils is also the part of the assignment. It is however a pluralistic performance and there is a clear understanding among the members of how to professionally handle the administrative work of the PKMSSL. Whatever daily expenditure is incurred is reimbursed from the income generated during the harvesting period. Members are flexible in giving permission to visitors, who can come here to enjoy the scenic beauty with merely a caution not to do any harm to the fishing ponds.

The Oxidation pond is also known as stabilizing pond, where sewage water is thoroughly treated by periodic removal of sludge to maintain the standard level of oxygen content. At the outset, these ponds were 20 to 25 feet deep in early 1970s. After two years they were only 2 to 4 feet deep due to continuous silt deposition primarily during rainy season. There are 108 ponds present altogether in this premises. Among them, 28 ponds are served as nursery pond. This is further divided into 12 Adarpukur (for nursing fish eggs) and 16 ponds are to rear spawns. Large and medium size fishes are stalked in the rest of 80 ponds. However, not all ponds are used at a time; some ponds are reserved for cleaning and preparing for fish to feed. In shallow ponds, natural process facilitates the algal and bacterial growth. Supply of oxygen in these ponds is maintained from atmospheric aeration and algal photosynthesis. Bacteria in the sewage water use the oxygen to feed on organic substances and breaking it further to nutrients and carbon dioxide (CO₂). Other form of bacteria removes underwater substance to clear the effluent.

After having approached the honourable councillor of ward number 108 of Kolkata Municipal Corporation (KMC), Mr Partha Roy Chowdhury, we were introduced to the members of PKMSSL Naskarhat mouja. We worked with 120 families who are involved in fishery outside the boundary of EKW. These families live in three moujas: Naskarhat, Madurdaha and Nonadanga. Our study pertains to the sewage treated fisheries of these people. Our fieldwork has focused on the impact of indigenous knowledge in fish farming, involving 108 oxidation ponds.

We conducted informal interviews, group discussions, observations and had number of interactions with KMC officials involved with wetland management issues. Literature search of secondary data has enriched our study.

The Wetlands in retrospect

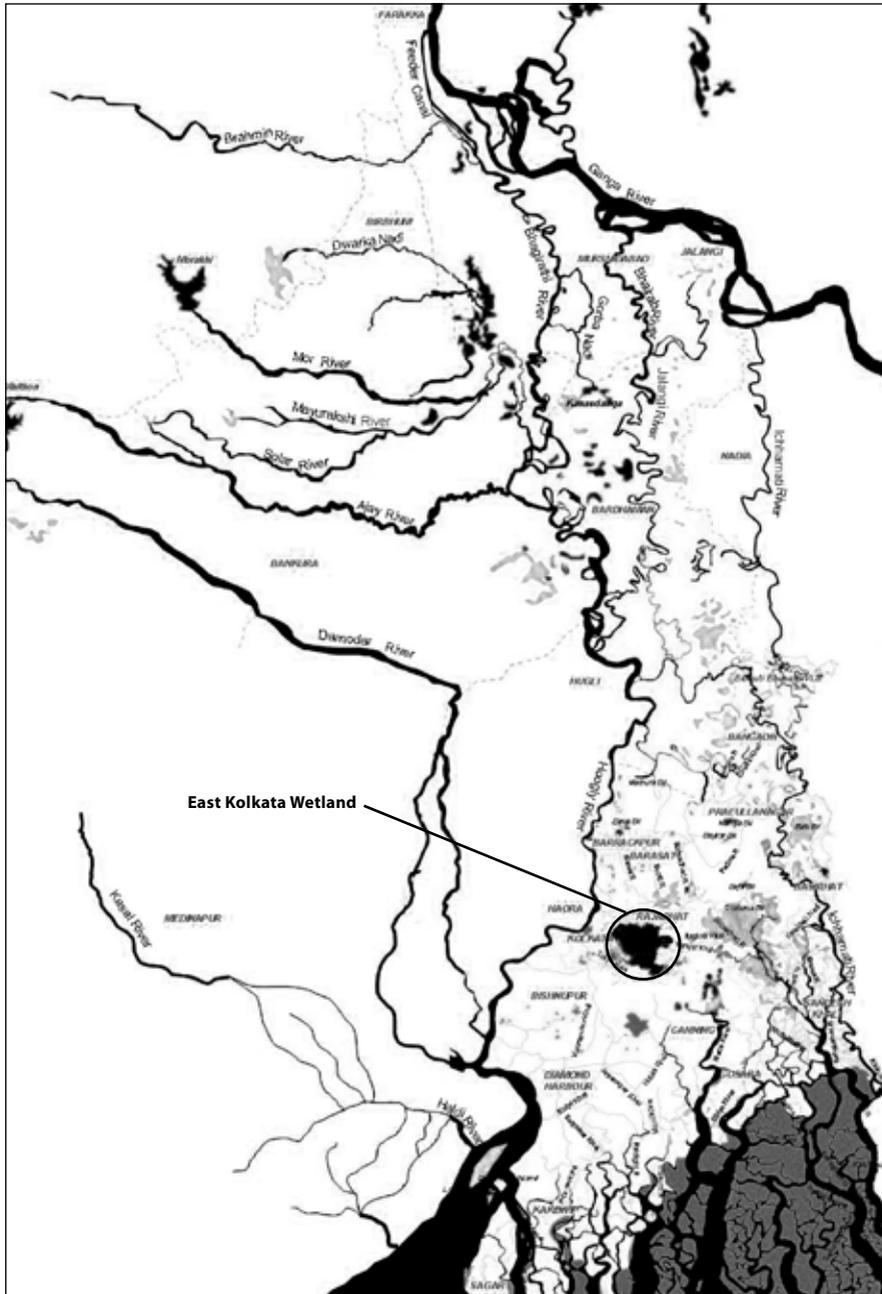
The current wetland area is a remnant of series of brackish water lakes connected to fresh water as well as marine environments in the category of alluvial formations (Hartig et. al. 1997, Mathews & Fung 1987) found in riverine deltaic wetlands (Figure 4-3) belonging to the broader category of Indo-Gangetic wetlands (Prasad et al 2002) as per GISS (Goddard Institute of Space Study). The wetland system technically acted as a vast spill area for the flood and tidal flows of the Bidyadhari River, one of the distributaries of the Jamuna River. The wetlands gradually lost their connectivity to freshwater and tidal environments in the delta. Human interference primarily has taken the form of channelization of the Bidyadhari River. Water drains from one pond to another or to different paddy fields precipitating the silt, which gets deposited in the bed of the channel. As a result, the river lost its flow at the end of the 18th century, leading to the complete blockage of the tidal water flow, which damages brackish water aquaculture.

As an alternative to the river, local people since that period came to depend on the sewage water coming from Kolkata city, the only basic substance needed for fish cultivation. Since then, EKW and surrounding areas remain a region of sewage-fed fish farms, associated agricultural activities and a place of settlements for local people. ResultsThe EKW and the premises of oxidation pond described herein (Ramsar site 1208) is at once a waste recycling region (WRR) and an aquaculture project, delivering the best of two world: treatment of sewage water and sewage treated fishery (Sarkar et al 2009). This is a multi-stage process (Table 4-2).

Table 4-2: The STF technique. Source: Edelman 1997:7

Phase	Preparation
Pond management	Draining, drying, desilting, tilling and repairing dykes
Prim. Fertilisation	Sewage filling, facultative and stirring
Fish stocking	Test fish and proper stocking
Secondary	Sewage filling, fertilisation
Fish harvest	Net selection, team work, haul disposal

Sewage is released from a canal into the facultative pond (shallow pond) for a definite period for making bacteria free (Figure.4). Sewage water contains organic and inorganic materials are not conducive for fish



growth. Sewage water is allowed in the facultative pond for settling down the suspended pollutants. People allow the algae to grow in this pond assists bacteria in breaking down the inorganic particles at ION level and decreases Biochemical Oxygen Demand (BOD) demand with the help of symbiosis between algae and bacteria.

This polluted water is further drained into a stabilizing pond in specific quantities at fixed intervals and the same is repeated. Fish eggs are nurtured and reared in a nursery pond (*adarpukur*) to develop into spawn, which is allowed to grow further in a secondary nursery pond. From the nursery ponds, fish are transferred and raised in the larger ponds for harvesting at the appropriate time. Members of PKMJSSL involved in aquaculture abide by a monthly schedule the whole year (Table 4-3).

They have divided the year's activities into five seasons namely Summer: Mid-April to Mid-June, Monsoon: Mid-June to Mid-August, Autumn: Mid-August to Mid-December, Winter: Mid-December to Mid-February, and Spring: Mid-February to Mid-April, which includes egg procurement from the Bankura (district) nursery and other necessary raw materials for e.g. cattle faecal wastes. People do not produce eggs (*Macher Dim*) as this is time consuming and expensive one. It is convenient them to procure eggs from egg producing fish farms in Bankura district (West Bengal). Sometimes they purchase from Sealdah market is situated in north Kolkata during this time. Before that, they fully prepare nursery ponds in such a way as to minimise damage to eggs. Cattle manure is not available as in the past due to the scarcity of cattle farms near the city. It is brought in from the distant places to serve as raw material for fish feed.

Eggs are brought to the specific ponds as mentioned earlier. These nursery ponds are thoroughly ploughed to take out all snails that otherwise feed on the sewage and deplete the nutrient level. After transforming into fingerlings, young fish (now called *Chara Pona*) are transferred to stocking ponds where they are allowed to grow further.

Figure 4-3: Wetlands of the Gangetic Delta (opposite)

NB: EKW constitutes one large system of marshes, located at the peri-urban interface of Kolkata City.

Source: Conservation and Management Plan of East Kolkata Wetlands Management Authority, Dept. of Environment, Govt. of West Bengal (Draft).
http://www.ekwma.com/uploads/cmp_ekw.pdf

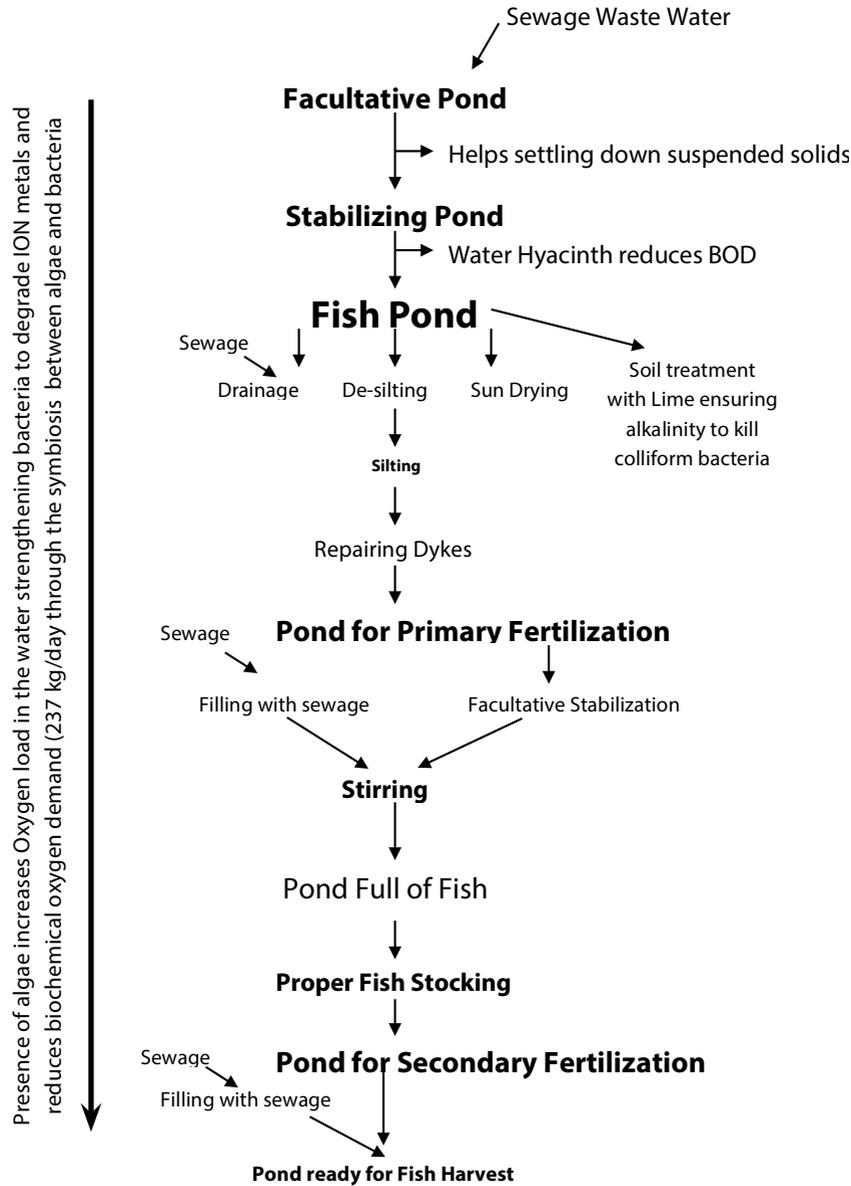


Figure 4-4: Flow Chart of Pond-based Pisciculture

Table 4-3: Yearly activity of a STF. Source: Ghosh 2005:68.

Season	Month	Activity
Summer	Mid April-Mid May	Maturing period of fish
Summer	Mid May-Mid June	Maturing period of fish
Monsoon	Mid June-Mid July	Onset of harvesting , stocking eggs in adarpukur
Monsoon	Mid July-Mid Aug	Harvesting contd., stock transfer from adarpukur to rearing & stocking ponds
Autumn	Mid Aug-Mid Sept	Harvesting contd., stock transfer from adarpukur to rearing & stocking ponds
Autumn	Mid Sept.-Mid Oct	Harvesting contd., stock transfer from adarpukur to rearing & stocking ponds
Retreating Autumn	Mid Oct-Mid Nov	Harvesting
Retreating Autumn	Mid Nov-Mid Dec	Harvesting
Winter	Mid Dec-Mid Jan	Draining out water and preparation for the pond bed begins
Winter	Mid Jan-Mid Feb	Preparation for the pond bed completed with the intake of sewage
Spring	Mid Feb-Mid Mar	Intake of sewage contd. Till the middle of the month after beginning of stocking
Spring	Mid-Mar-Mid April	Growing period

This integrated single-pond system in this area is a reasonably efficient low cost and low carbon emission system for treating wastewater from the SWF channel (Ghosh et al 1985, Edelman ed. 1997). This procedure does support to a large extent the families who are directly or indirectly involved in sewage-fed fisheries. It is interesting to note that the ponds produce a treated effluent with low BOD (Biological Oxygen Demand), low bacterial numbers, reduced ammonia concentration and highly dissolved oxygen concentrations (Roy et al 2011).

The ingenuity of these people in sewage fed fishery has been shown

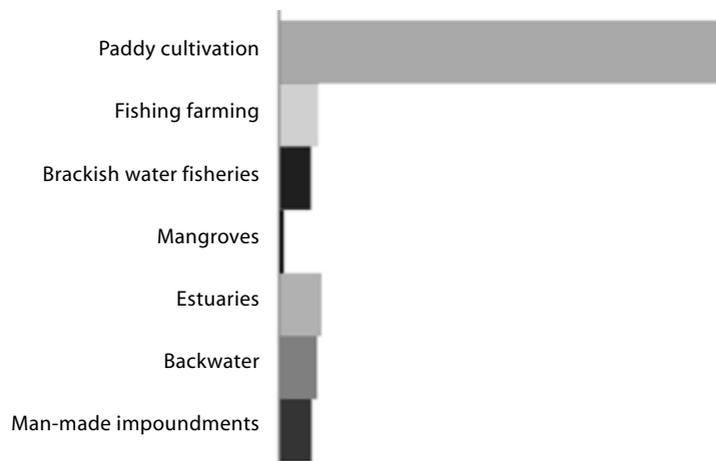
in Figure 4-4, depicting the sequential purification of sewage. Sewage treated water is stalked in some ponds, which steadily dilutes the incoming sewage water and for availing the finish product faster. Published evidence has brought the insight that vegetable farming near fish ponds tends to be totally dependent on the products from the natural purification of sewage. On the whole, the key understanding to the nature of local knowledge driven livelihoods supported by an economy such as aquaculture and vegetable cultivation lies in understanding people's various roles and duties centring on 108 oxidation ponds, which are being executed through pluralistic cooperation.

Discussion

Wetlands used to be drained by farmers with the use of channels, and reclaimed land was used for crop production on rice paddies. A seminal study (Cowardin 1979) reveals the loss of wetland over the last two centuries has been massive and at an increasing rate, a trend that still continues in India and around the world. Where wetlands are retained, there is thus a highly positive conservation effect, to do with preserving the diversity of wetland biota (Bhattacharyya 2007). This is true of the entire zone of wetlands, including Ramsar site, which has strengthened significantly in recent decades.

Table 4-4: Wetlands of India (in million ha)

Source: Directory of Asian Wetlands, IUCN, 1989



The current distribution is shown in Table 4-4. Despite enormous population pressure in Kolkata and the perpetual search for greater economic opportunities, there is a growing awareness that human well being in the EKW area depends on the richness of wetland biodiversity. A dual approach – encouraging indigenous knowledge for aquaculture but understanding also that aquaculture operates in concert with agricultural practice – is necessary, especially at a time of widespread wetland degradation due to anthropogenic causes. Sewage fed wetlands should no longer to be ignored. Local residents of this region, and members of PKMSSL in particular, speak of waste-water and solid waste as basic requirements for increased economic prosperity. After being separated from plastics and polythene, this waste material becomes an effective means to increase economic activity.

Figure 4-5 (overleaf) provides further information on sewage fed fish ponds, which serve the dual purpose of providing a regular yield of fish and purifying the entire volume of water from toxic substances and sediments. We observed that not all of the 108 ponds are used. Whether fish farming is economically viable in the opinion of the informants depends on the supply of sewage and cattle faecal wastes to strengthen the nutritious value of the water. At present, the supply is insufficient to use all ponds as fish farms.

Our investigation of PKMSSL reveals three main issues: the conservation of wetland, the expansion of Kolkata's urban built environment, and the natural treatment of sewage through a traditional resource recovery system. Further afield, assuming 12,500 ha can be kept aside from the expansion of Kolkata metropolis in general and East Kolkata in particular, it will be a challenge for Ramsar site 1028 and other such areas to treat the ever-increasing volume of sewage and solid waste (for a report see: <http://www.indianrealtynews.com> 2013). While local dwellers suggest a greater volume would be useful to them, it will require in-depth study to make the best possible policy decision.

The application of indigenous knowledge in STF (Edelman 1997) has been the main focus of the present study. Such knowledge has importance for biodiversity conservation and for providing the means to sustain wetland biota as well as humans – by and large as an embodiment of a whole system. Aquaculture is practiced in another 264 oxidation ponds (*bharris*) at the Ramsar site (Kundu et. al. 2007). Land management and regulatory activities are needed for the Ramsar protected area to ensure the rich biota are preserved (Bhattacharyya et al 2007), given that anthropogenic ecosystem change is now central to the whole of

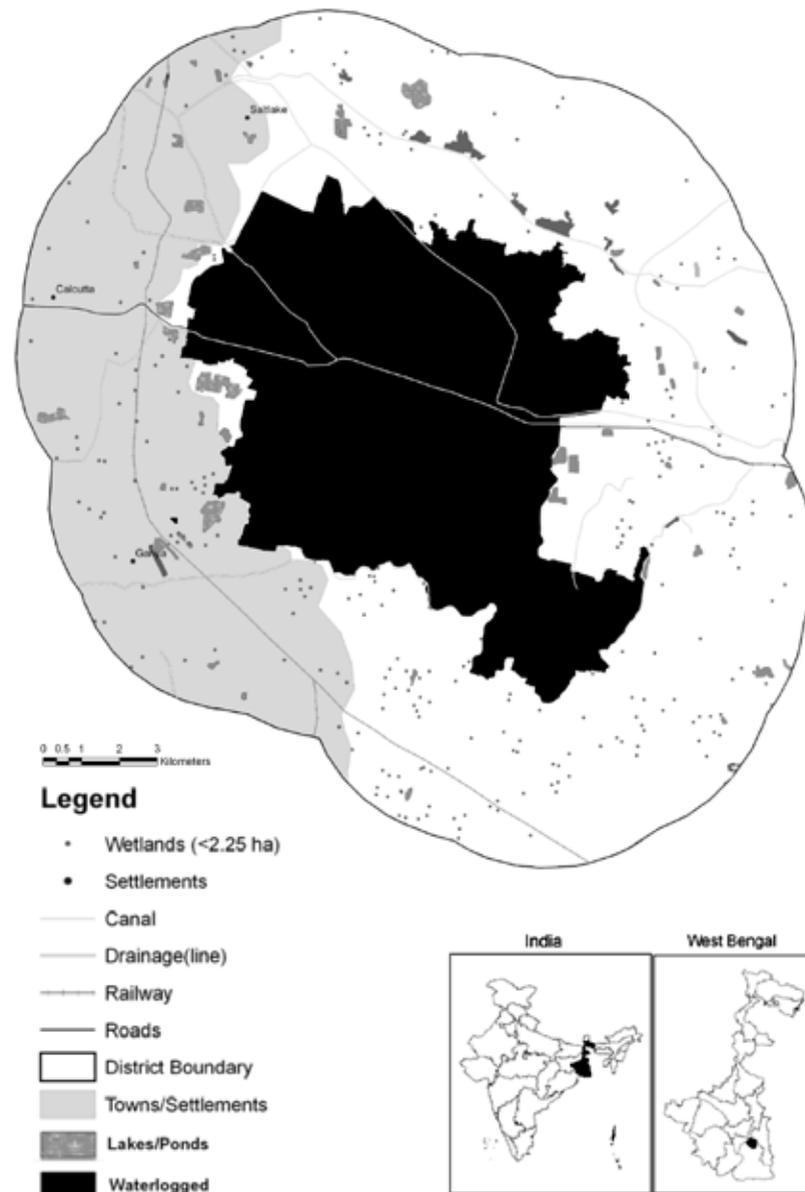


Figure 4-5: East Kolkata wetlands.

Source: National Wetland Atlas, West Bengal Ministry of Environment and Forests Government of India.³

wetland morphology. For example, the impact of toxic tannery effluents in the sewage may cause food contamination and health injuries and significant damage to ecological resources.

Conclusion

Land acquisition that is taking place in the name of urban development presents a political dilemma. To prevent the loss of EKW biota and maintain fish and vegetable production using treated sewage, it is imperative for policy makers and all concerned to fully appreciate the function of EKW as an integrated, holistic system, which is of course very much subject to human involvement. For the time being, the life of traditional residents and the effect of their indigenous knowledge uphold this system, despite so many contrary political decisions and physical transformations in the EKW and surrounding areas. Meanwhile, Kolkata's urban dwellers are still benefiting in many respects from their fish and vegetable production and their dual assignment waste recycling and resource recovery system, for which the local people deserve respect and recognition. Practicing indigenous knowledge and applying appropriate inputs at every stage of aquaculture allows for the simultaneous function of treated sewage fed fishery. Their integral insights enable them to ecologically manage wetland biogeography comprehensively over time, while also managing a waste disposal and resource recovery system, feeding the people of Kolkata and keeping this region habitable for a diversity of plants and animals.⁴

Notes

- 1 Amlan Ray and Dr P. Das Mahapatra are located at the Spectrum Clinic and ERI, Kolkata. Amlan Ray also works with Shraboni Ray at the School of Human Genetics and Population Health, Kolkata. C. Bhattacharjee is located at the Department of Anthropology, W.B. State University, Barasat, North 24-Parganas, West Bengal.
- 2 Mouza (or mouja) was a unit of land for the purpose of revenue collection during the Mughal period. In the 20th century the term mouza was used to identify clusters of seven villages for administration within the panchayat system along with other geographical areas. Today the unit mouza is being used by the Land and Revenue Department in conjunction with a proper Juridical Number (J.L. No.) for land identification, selling and buying.

- 3 This map was produced as a part of the project 'National Wetland Inventory and Assessment (NWIA).'
- 4 We acknowledge with sincere thanks and appreciation the many people of Naskarhat, Madurdaha and Nonadanga who have shared their knowledge and feelings with us during the course of our field work. We are grateful to the honourable counsellor of Kolkata Municipal Corporation, Ward Number 108, Shree Partha Roy, Chowdhury for introducing us to the people. Thanks are also extended to Mr. Harsha Datta Ray, Manager SRAC, KMC for his guidance and prompt cooperation.

References

- Bhattacharyya, A. S. P. K., Sen, Roy and A. Mazumdar 2008. 'A Critical Study on Status of East Kolkata Wetlands with Special Emphasis on Water Birds as Bio-Indicator.' In Sengupta M. and Dalwani R. (Eds.) 2008. *Proceedings of Taal 2007: The 12th World Lake Conference*. Pp. 1561-1570.
- Cowardin M. et. al. December 1979. *Classification of Wetlands as Deepwater Habitats of the United States*. FWS/OBS-79/31, Fish & Wildlife Service, Washington, D.C.
- Conservation and Management plan of East Kolkata Wetlands* (Draft), East Kolkata Wetlands Management Authority 1991, Dept. of Environment and Forest, S.O. number 114 (E), Kolkata. Source: http://www.ekwma.com/uploads/cmp_ekw.pdf, Govt. of West Bengal. Edelman D.J. (ed.). 1997. *Integrated Study on Wetland Conservation and Urban Growth: A Case of Calcutta's Wetland by Institute of Wetlands management and Ecological Design, Calcutta*. Project Paper No. 8., Institute for Housing and Urban Development Studies, Rotterdam, The Netherlands. Pp.1-35.
- Ghosh A., S.K. Saha, A.K Roy and P.K. Chakraborti 1985. 'Carp Production using domestic sewage.' *Aquaculture Extension Manual*, New Series No. 8, December 1985. Barrackpore-743101, West Bengal: Central Inland Fisheries Research Institute (Indian Council of Agricultural Research)..Ghosh D. 1999. *Wastewater Utilisation in East Calcutta Wetlands*. UWEP Occasional Paper. Pp. 1-15.
- Ghosh D. 2005. *Ecology and Traditional Wetland Practice*. Kolkata: Worldview. Pp- 60-65.
- Hartig E.K., O. Grozev & C. Rosenzweig 1997. 'Climate Change, Agriculture and Wetlands in Eastern Europe: Vulnerability, Adaptation and Policy.' *Climatic Change* 36:107-121.
- John E., J. E. Hasse and G.L. Richard 2003. 'Land resource impact indicators of urban sprawl.' *Applied Geography* 23:159-175.
- Kundu N., M. Pal and S. Saha 2007. 'East Kolkata Wetlands: A Resource Recovery System Through Productive Activities'. In Sengupta M. and Dalwani R. (eds.) 2008. *Proceedings of Taal 2007: The 12th World Lake Conference*. Pp. 868-881.
- Matthews, E. and I. Fung, :1987. 'Methane Emission from Natural Wetlands: Global Distribution, Area, and Environmental Characteristics and Sources', *Biogeochemical Cycles* 1 (1): 61-86.
- Matthews, G. V. T. 2013 *Wetlands: Its History and Development*. Re-issued Ramsar Convention Secretariat. Pp. 1-86.
- National Wetland Atlas: West Bengal 2010. Sponsored by the Ministry of Environment and Forests, Government of India. As a part of the project on National Wetland Inventory and Assessment (NWIA) Space Applications Centre, Indian Space Research Organisation. Ahmedabad and Institute of Environmental Studies and Wetland Management, Kolkata. *Nature's own sewage system under threat*. 2013 <http://www.indianrealtynews.com/real-estate-india/kolkata/natures-own-sewage-system-under-threat.html>
- Prasad S.N., T.V. Ramachandra, N. Ahalya, T. Sengupta, A. Kumar, A. K. Tiwari, V. S. Vijayan and L. Vijayan 2002. 'Conservation of wetlands of India – a review.' *Tropical Ecology* 43(1):173-186.
- Roy P.K, A. Majumder, A. Mazumdar, M. Majumder and M. B. Roy 2011. 'Impact of enhanced flow on the flow system and wastewater characteristics of sewage-fed fisheries in India.' *African Journal of Environmental Science and Technology* 5(7): 512-521.
- Ruddle K. 1987. 'The impact of Wetland Reclamation.' in *eLand Transformation in Agriculture*. Scope: John Wiley & Sons Ltd. Pp:171-201.
- Sahu P. and P.K. Sikdar 2011. 'Threat of land subsidence in and around Kolkata City and East Kolkata Wetlands, West Bengal, India.' *Journal of Earth System Science* 120(3, June 2011):435-446.
- Sarkar S, P. B. Ghosh, K. Mukherjee, A. K. Sil, T. Saha 2009. 'Sewage treatment in a single pond system at East Kolkata Wetland, India.' *Water Science Technology* 60(9):2309-17.
- Turner N. J, M. Boelscher and R. Lowice 2000. 'Traditional Ecological Knowledge and Wisdom of Aboriginal Peoples in British Columbia.' *Ecological Applications* 10(5):1275-1287.

CHAPTER FIVE

PRODUCING MIDDLE-CLASS WATERSCAPES
 BEYOND MIDDLE-CLASS THRESHOLDS:
 DOMESTIC WORKERS AND IDENTITY EXPRESSION
 THROUGH WATER ALLOCATION
 IN LOWER-CLASS DELHI, INDIA

Heather O'Leary

Concern over sustainable development and urban water allocation is growing worldwide. Within the context of climate change, socially marginalized populations often are at greatest risk for future water crisis (Bakker 2010; IPCC 2007). It is critically important to understand not only the current water practices of marginalized populations, but also how their social status affects their longitudinal relationship to water (Thomas and Twyman 2006). Urban areas present special challenges to water allocation as myriad needs compete for the same resource in a concentrated area. The negotiation of competing water needs leads to the development of rhetoric about the value of water. Competition grows ever more dire as the increasing adoption of middle-class consumption patterns and water values puts additional strain on water supply (Hoekstra and Chapagain 2007).¹ Megacities, especially those in developing countries, experience unprecedented increase to water demand and, as such, provide a rich context for understanding the negotiation of urban water values and allocation (Richter 2014; NIC 2012). New Delhi, the subject of this study, is a pertinent example. As 1,000 people in-migrate to Delhi, India each day, the vast majority to informal housing with limited water access, the urban waterscape is overwhelmed by the sheer volume of users, regardless of their small proportion of allocation. This study traces the changing patterns of water allocation and water ethos of the water-poor, specifically domestic workers who are exposed to very different water values in the middle-class household where they work every day. This chapter asserts that water-poverty does not dictate the ways in which urban domestic

workers attempt to integrate middle-class water values into their lives and homes, as a means to signal upward mobility and class identity. The adoption of new water allocation patterns is not universal – there is both resistance to and unevenness in the adoption of middle-class urban water practices, which underscores the interpretive role of domestic workers in applying these practices. The significance of the interpretive work domestic workers do in producing middle-class waterscapes beyond middle-class spaces directly counters the tendency to understand the urban water-poor as a passive, homogeneous unit concerned solely with the functional value of water, and sheds light on the agency with which this population shapes the urban waterscape.

While the overall ratio of urban water that marginal, lower-class communities receive is fractional in comparison to middle-class industries and homes (Narain 2012), the water choices this burgeoning population makes in the pursuit of its social aspirations will indeed determine the sustainability of the urban water future. The adoption of new water values, such as those championed by development campaigns, recommended by NGOs, and insisted upon by middle-class employers simply are not viable when adopted by entire cities. This is to say that while middle-class governments, institutions, and individuals strive for imperforate adoption of “developed” or “modern” water allocation, current water supplies, infrastructures, and technologies are unable to meet this water demand.

This leads to a bind wherein lower-class urban citizens are pushed to use more water but are constrained by a system that does not support their increased water use. In transitional areas like slums and tenements where new in-migrants are being exposed to urban water values, conflict is rife over the legitimacy of water allocations. Scarcity and irregular availability have led to vigilance during common collection. Neighbours vie to increase their own water access, often creating legitimacy of use arguments that accuse others of wasting water. Legitimacy of use is often coterminous with forced conservation allocation patterns that are inflected with values of water poverty. This is in contrast to arguments of illegitimate water use, which are grounded in accusations of middle-class water wastage. In short, within water-poor communities, while middle-class water values are aspirational, they are also condemned and as such can ultimately lead to constrained access.

Imagining urban water use as coterminous with middle-class water use is grounded in a trajectory of water development that has a deep history in cities like Delhi. Colonial structures of social and infrastructural water disparities carry through to contemporary hegemonic systems (Guha 2006;

Gupta 1986). As a result, water governance systems still often imagine urban waterscapes as a system of dynamic flows that reach middle-class consumers. These imagined flows are controlled by policies that support urban development as a civilizing mission. They construct ideal policies for flows at multiple scales, beginning at the largest scale with international river basin allocation, moving into national rural-urban allocation policies, and finally decisions of when to open pipes or send water tankers into neighbourhoods. While these ideals are evident throughout all scales, they become most poignant when they encroach on the everyday experiences of the private moments and practices that occur in spaces like homes and shower stalls.

The data presented in this chapter was generated through eighteen months of ethnographic fieldwork conducted between 2011-2012 in two water-poor communities in Delhi. The two communities were selected for their close proximity to hyper-developed middle-class areas of the city and their similarity to one another in most aspects except for the nature of their housing, which affected financial and hydrological flows. One community comprised a neighbourhood of formal tenement buildings that housed 10-20 families per floor in one-room residences. The other community comprised an informal “slum” settlement, locally called a *basti*, which housed families in similar densities. These two communities were characterized by their water poverty, the former receiving timed water deliveries via communal pipes and the latter by daily water tanker deliveries. These communities were also similar in sharing inadequate commonly held latrines and bathing stalls. Informants were recruited at sites of water collection to participate in survey data collection as well as open-ended conversations about domestic water allocation. Special attention was given to record informants’ interaction levels with middle-class water rhetoric – whether from NGO involvement or employment in middle-class spaces. What resulted were extremely forthright discussions about water values.

In the summer of 2012, as Delhi’s seasonal dry spell reached an alarming new low, the flow of water talk reached record high. The neighbouring state, Haryana, was exceeding its threshold of comfort for water exportation and its water resources were unable to meet the needs of its residents. In response, government officials sought to prevent further water reduction by placing an active ban on its contribution to Delhi’s water supply. Haryana officials needed not only to protect the flows of water to its major city in the National Capitol Region, Gurgaon, but also its largely rural, agrarian constituency. In a balance that at once represented the nationwide negotiations between centralized and decentralized authority over

the control of natural resources, Haryana officials defied the National Capitol Region’s demands. This *ludai*, or fight, as it was called on the streets, was comparable to the fights the water-poor saw every day. In this *ludai*, an unambiguous message came through about the spread of a middle-class water ethos both inside of and beyond its traditional middle-class threshold.

At a press conference about Haryana’s water ban against Delhi, the Chief Minister of Haryana suggested that the city of Delhi was experiencing scarcity because of the residents’ negligent use of water. He was adamant that the residents of Delhi needed to conserve water. His prescription for water conservation was succinct. He did not suggest that the city should limit its industrial use. Nor did he cite the 40% of water that is lost due to leaky infrastructure, which includes Raj-era pipes. Instead, he suggested that Delhi conserve water by asking its residents to bathe only once per day. This request was repeated over and over in the city’s back-lanes, on news stations, over chai, at the *dhobi*, in five-star hotels – all of Delhi was abuzz. This comment, though hydrologically weak, became salient in the minds of all of Delhi’s residents because it challenged hegemonic discourse about domestic water values in the world-class city. This comment moved people interacting in every level of Delhi society to words. The first city-wide water topic was not a multi-*crore* project somewhere in the periphery, nor a protest about the rampant water disparity within city limits, but instead it was about the freedom to do with one’s two to thirty litres what one chooses to in the privacy of one’s own bathroom.

This brought the abstract issue of national urban water allocations literally close to home for Delhi and Haryana residents. It highlighted the tensions around making domestic and personal changes to fit in to the development narrative of Delhi’s sixteen million-strong middle class (local adaptation of Mazzarella 2003: 215). To live in the city, and in so doing accept world-class aesthetics for water use, was to have the ability to alter regional water supplies simply by the small act of bathing. The ascription of the problem as a specifically urban problem neither recognized the millions of Delhi residents who practice forced conservation nor acknowledged the over-use of water in Delhi’s famous world-class satellite city, Gurgaon, which belongs to Haryana. The blame of water exhaustion was foisted on the people of Delhi without discrimination from a position outside of the city.

The Chief Minister of Haryana was not the only person who imagined the water life of Delhi’s residents from the outside. Neelaja in-migrated to Delhi about three months before her cousin was able to come to visit her.

The two of them had always imagined the city to be a dirty place, though a place where workers would not get as dirty in their work, as they compared the physical differences between working outdoors in agrarian labour versus the indoor work of the city. Neelaja, wide-eyed, said that when she began domestic service, she was told to bathe before her morning and afternoon shifts, and again in the evening. She was also asked to change her sari before the morning and afternoon shifts to be fresh for employers. When she told this to her cousin, then living in nearby Haryana, her cousin could not believe it. “How could life in the city require that?” they wondered aloud together.

Prominent officials at the Ministry of Water Resources in Delhi say that “the average *Dilliwallah*,” or Delhi resident, “is not conscious of water problems;” “does not conserve water;” and “does not think about guarding [it] as a sustainable resource” (personal interviews May 15th, 2012). It is true; at the average juice stall not many people can quote figures about the changes in output of the Tehri dam. However, there is a vast disconnect between the ministry’s conception of what constitutes an average Delhi resident and their experience of water crisis. Through understanding the intersections of these broader water issues with daily life, what comes to be a significant and growing percentage of Delhi’s population has first-hand expertise on water issues. Neelaja’s everyday negotiations of water allocation, like those of other domestic workers, are experiences that articulate how transnational discourse, processes of urbanization, and aesthetics are making an impact on the speed at which Delhi, and cities like it, are reaching water scarcity. Without perhaps fully knowing it, the Chief Minister of Haryana chose an exemplary practice to underscore the significance of these micro changes in water consciousness and their ability to add up.

Sitting together after these months apart, the two women reflected on their impressions of urban domestic water. Neelaja recounted, “she used to think of my *basti* as a very dirty place, but we are cleaner here than at our family home in the village.” Though Neelaja’s job as a domestic worker causes her to sweat and come into direct contact with household grime, it is not too long before she bathes again. She stressed that it is important for her to clean and straighten herself for her job, which was not so in the village. Neelaja noted that she comes home tired, but enjoys straightening out her *jhuggi*, her handmade dwelling, in ways similar to her employers’ even without being able to increase the amount of water that she uses to clean. For now, her increase of water allocation is relegated to grooming her body and appearance, to make her transition over her employers’ thresholds smoother.

Neelaja’s experience essentially confirms that a cost of employment in the middle-class city is one or two more buckets of bathing water a day, even if they are small. Her desire to use her water to full capacity – to one day wash her floors with a ratio similar to her employers’ – represents the aspirations of many of Delhi’s in-migrants. In this way, Neelaja has integrated the aesthetic of water-wealth as a form of conspicuous consumption rather than purely for its functional use. Because of water constraints in her neighbourhood, Neelaja measured the proper threshold for water consumption for the water-poor in a world-class city to prioritize public presentation. In this environment of transition from urban poor to world-class, signs of water wealth are important markers of being integrated in the modern, developing economy of Delhi. As domestic workers use water to present themselves properly, they overtly show their communities their proximity to middle-class Delhi and the systems of power and hierarchy that come with it. This proximity is in part identified by conspicuous consumption of world-class items, some requiring an excess of water to maintain, and also by a changing recognition of the categories of dirty and clean.

Neelaja and her cousin talked about the difficulty of getting water from the *basti* tanker each day – a process that can take up to four hours of waiting, followed by arguments and heavy lifting, often ending in disappointment – but they also admitted that the tanker water has its advantages. Primarily they both insisted that tanker water was the cleanest water with which they have ever come into contact. Neelaja noted that her skin felt soft and slippery under the *basti* tanker water, and that even when she sneaked-in a wash with the brand-name soaps at her employers’ homes, that her hands did not feel as smooth. Neelaja’s cousin laughed about her misconception of the *jhuggis*, “I thought I would feel so dirty coming here, but all [of me] feels clean and soft. My hair is so beautiful here.” Neelaja’s cousin wished that Haryana’s water could feel as soft as the *jhuggi*’s water. Their discussion emphasized that the conspicuous consumption of water was not just about quantity, but also about the quality, or the cleanliness, of the water. Clean water also, in Neelaja’s example, was able to trump the cleanliness ascribed by luxury cleaning products that are out of her financial reach.

It is pertinent to note that Neelaja and her cousin divorce the feeling of the soft water delivered to the *basti* from the inherent ability of Haryana’s water to be so soft. Since Delhi receives water from tankers coming from Haryana, Haryana’s water does, in fact, feel this soft. The significance of this comment is that it highlights the imagined, qualitative transformation

that takes place as water crosses the threshold from the rural periphery into the world-class city through processes of incorporation and purification. Neelaja, with a few months of urban participation under her belt was able to further differentiate the water quality in comparison to middle-class water through not only projections, but also experience. While the ascription of the cleanliness of the tanker water to urban purveyance is in part socially constructed, it is also physically evident in the measurement of the quality of the water.

The belief of the cleanliness of tanker water was not unfounded. The water being delivered by the tanker was cleaner than the water that came to middle-class homes. Middle-class water passes through pipes whose intermittent flows and motor-driven extraction create suction that leaches contaminants through the pipe system's cracks, inefficient seals, and deteriorating walls (Anand 2012). In contrast, the tanker-distributed water was purified and softened at one of the city's facilities and directly pumped into the tankers, leaving the only sources of contamination to be the tank and the pipes that residents drop into it for water extraction. The water that was distributed via tanker was some of the cleanest water, according to world-class standards, in all of the public distribution in Delhi. In this way, technologies and infrastructures that existed beyond the widespread distribution of planned middle-class neighbourhoods were transported into the areas that seemed least modern, least developed, and least middle-class. The refusal to allocate funds toward the development of piped infrastructure to illegal *bastis* had given rise to some of the highest quality of water being delivered to the "lowest" strata of Delhi's population.

The informal *bastis* and tenements of Delhi often exist in a state of apparent contradiction in their patchy abilities to embrace a middle-class way of life. The separation of these disparate worlds, middle-class affluent Delhi and the illegal *bastis* with thousands of rural in-migrants living hand-to-mouth, is not as stark as it is often depicted. To be clear, the disparity of quality of life, including the ease and ability to access life-essential resources, is vast and cannot be dismissed by an argument that the cultural vessels, from ethos to material goods, which flow through impoverished neighbourhoods, erase the disparity. But to dismiss these flows would be to deny evidence of heterogeneity within the urban poor, effectively imagining the poor as a static, unified object of study. In truth, this group is composed of multitudinous variety. The dreams, abilities, material culture, and economic flows are different from family to family. And as such, the way they interpret water, cleanliness, and their role in the modern urban community is by no means uniform.

Marina took a strong stance on what it meant to construct a middle-class identity in Delhi's lower-class neighbourhoods. She rested on a cast-off charpoy that had been rethreaded with a re-purposed ream of misprinted food packaging labels rolled into rope. It sat in the shade of a billowy blue tarp under one of the trees in her courtyard. She was still damp from collecting water at the tanker and her daughter, Jenni, also wet, squatted by a half-filled vessel at her feet. Marina's family was known around the *basti* for as close an approximation of middle-class life within the slum as conceived possible. Partly because of this, Marina's home was used every few weeks to host some of the women's group meetings of a local NGO when a large turnout was expected, and also for hosting foreign dignitaries when embassies organized humanitarian visits to the city's slums. Their home's prominent location and uncharacteristically large square-footage made it ideal for hosting events.

Many of her neighbours considered Marina's family to be middle class because of the possessions they owned. However, Marina believed that middle-classness was much more. "What do they know of being middle-class?" she asked, "Merely buying things only shows they are not." Marina's standard for middle-classness, like some domestic workers, was a commitment to a cleanliness that revolved around both a distance from dirt and the ability to access water for cleaning. Her values for personal hygiene and modern or middle-class self-presentation distinguished not only her body, but also her home. Marina's larger *jhuggi* compound had been modified to include separate enclosures for separate water-related chores. Marina used some of her disposable income from being a domestic cook to construct a standalone kitchen with modified basin and pitcher sink, a bathing stall, and an area to house her washing machine. To Marina, the distance created between the different areas of domestic cleaning was important and necessary to the construction of a middle-class home, even if it was built in the illegal slum. Marina raised the question, "How can they think of [a/c, washing machines and such] when they cook on the ground? A television does not make you a member of the middle-class, it is only washing properly that does." In Marina's perspective, the expression of a middle-class identity required a household that was defined by a middle-class relationship with water that rested on cleanliness and was rooted in proper water use.

Marina's testimony helps to establish that the delineation of a "middle-class" identity in Delhi is neither solely overlapped with formal housing nor the consumption of middle-class goods. It was not her refrigerator, but her makeshift sink that made her kitchen a middle-class one, just as it

was not her bathing stall, but her consistency and commitment to bathing which necessitated the private stall that made her bathroom a middle-class one. Hence, a middle-class lifestyle requires the development of a cleaning regime for the everyday practices of domestic life. The value of specific cleaning regimes to enhance class status and demonstrate one's civility has historical roots that came to the fore in colonial domestic development literature (Walsh 2004). Adapted for the postmodern era, contemporary values still rest on a changed ethos surrounding the use of water and the importance of cleanliness. In both of these eras, class values resonate with ideas of citizenship and legitimacy of lifestyle, and the link between purity and water, previously the domain of caste, becomes central to the growing contemporary identity of class. To Marina, middle-class domestic water values meant at the very least a distance between one's freshly washed body and the ground, the bodies encountered in the communal bathing hall, and the rush that would preclude proper cleaning. As Veblen might argue, developing a middle-class aesthetic involves the conspicuous consumption of middle-class water values, technologies, and behaviours, in total to demonstrate distance from resource-poverty (Veblen 2009). In this way, the construction of a middle-class identity through a specific relationship with water must extend beyond corporeal uses into homes.

India's development discourse relies on the production of not only middle-class bodies but also middle-class households. The developmental project hinges on moving people along the continuum of development through the ability to consume middle-class goods (Fernandes 2006). The ability to produce a middle-class majority, according to Mankekar, has consisted of systematically prioritizing the inculcation of middle-class aesthetics, consumption, and values (1999). The typical unit used to measure the adoption of these values is not individuals, rather, households. As the values permeate every household of India (ibid; Brosius 2010), the decision to reject, embrace or ignore the values is built into a myriad of choices every day. And yet, some think that there is no choice at all. Rajagopal argues, "as consumer society has become coterminous with [Indian society], the alternative is not resistance but death" (2001, p. 317). As families struggle to remain relevant in hydrological systems that straightforwardly prioritize middle-class water services, they often cope by attempting to express their middle-classness, or citizenship, in terms of the very resources from which they are alienated. This brings middle-class water practices deeper into people's lives and homes even in environments of scarcity.

Across the city from the *basti*, Nandika took her afternoon bath in her tenement room before returning to her employer's home to wash floors.

Like Marina in the *basti*, Nandika also eschewed bathing in the common stalls located next to each floor's common latrines because of the lack of privacy and control. Instead, she waited until a time of day between shifts when she was not expected to cook or be interrupted by family members. When she has finished bathing, she carefully dresses and opens her door a crack to see who is outside before she opens the door entirely. She sweeps puddles from her mid-day bath with her grass-broom held together by a few tight coils of string. Afterwards, she places her empty bucket in the growing serpentine line of vessels gathered near her floor's common tap in wait for the hour or two of intermittent water pressure. When finished, she stands erect and braids her hair looking into the old hand-mirror that is fixed into the plaster wall with a nail. Her fingers deftly braid, over, under, over, under while her eyes dart between her wet strands and the new outlying hairs protruding from of her partially maintained eyebrows. She allows trusted guests in to talk only in this last step. "*Theek hai*," she said slowly, still concentrating on her reflection, "*abhi main aapko bat ker-oongi*," "alright, I am ready to talk [about water]."

She stared at a honeycomb of drawings on a sheet of paper in her hands. The paper was divided into six hand-drawn representations of Delhi homes. There were two drawings of a *jhuggi* in a *basti* – the roofs' edges wobbled up and down and there was a narrow lane separating the homes. Another two drawings showed a tenement building a few stories high, with the stairwells zigzagging on the outside of the building as if the tenements were bisected and one could see into the interior halls. The other two drawings represented private family homes, each behind an iron gate, with potted plants flanking the walkway, and the hint of curtains behind architectural windows. One of each in these three pairs depicted a woman on the walkway, with an arrow indicating her gait poised away from the house, accompanied by the verbal explanation that she works outside the home. In the corresponding three, the woman was seen inside the home, and it was explained that she did not work outside of the home; she was a housewife. This survey was meant to begin discussions about the creation of middle-class waterscapes beyond middle-class domestic thresholds.

Illiterate, so leery when presented with a survey to measure domestic water use and cleanliness, Nandika considered the drawings of homes carefully and responded tentatively at first, but gained confidence with the medium as she explained her perspective. "*Yeh*," she gestured with a pointed finger to one of the homes, "this one." Nandika chose the home that she thought was the cleanest. "*Iska ghr sub se saf hai*," she nodded, "her house is the cleanest." As she thought about it more, she changed her

mind, “*nahi...yeh.*” She paused, thought for another moment, and then changed it back again. The two homes that she oscillated between were the ones representing middle-class neighbourhoods, and Nandika’s inability to choose exemplified the same patterns in her neighbours and in the *basti* residents. As more people were asked to rank the homes, some were consistently at the top or bottom for water use or cleanliness, and yet, another more interesting pattern emerged, one of uncertainty about the way certain homes ranked in relation to the others.

The act of delineating the divisions between who is successful at maintaining middle-class levels of cleanliness and water consumption is an indication of the perceived penetration of middle-class domestic aesthetics into the homes beyond the borders of the middle-class neighbourhoods themselves. This is to say that by understanding the imagined consumption patterns of middle-class behaviours, a clearer conception of the imagined bounds of middle-classness and its spill over can emerge. With water use and cleanliness as a measure for internalized modernization and integration in Delhi as a world-city, a map of the city can be drawn that does not just reflect standard conspicuous consumption patterns, but reflects the quieter maintenance that shows a deeper commitment to the aesthetic. This map can be read to understand the general ideas about how modern domestic management is trickling down to those beyond middle-class families and neighbourhoods.

Nandika finally settled on the middle-class employed woman’s home. She said that a working woman would be acclimated to high standards for cleanliness and work-ethic, thus would not tolerate employing domestic workers that did not keep the home in top condition. According to Nandika, a working woman also would be trained and experienced in leadership and would know how to be a stricter boss. One of Nandika’s neighbours reinforced the conception of increased standards for cleanliness that correspond with a higher level of modernization of the matriarch; Nandika’s neighbour’s employer would often directly compare the domestic worker’s inability to complete satisfactorily chores with the success or failures of the office cleaners’ ability to do similar chores. “Madam compares us,” she said – and with this ability to compare comes her employer’s shrewder discernment of what qualifies as “clean.”

The assumption that increased exposure to the aesthetics of modern life outside of the home inevitably leads to increased cleanliness does not only apply to the middle-class women who held middle-class office jobs. Rather, the idea that a woman’s exposure to any type of work outside of the home was extrapolated by others who evaluated the working women’s

households to indicate directly higher levels of domestic cleanliness. This was repeatedly shown when working-class women ranked the homes in terms of cleanliness. First, both of the middle-class homes were named as most clean, followed by (in either one order or the other) the tenement and the *basti* working women’s homes. Part of the reason that these middle-class homes broke a common pattern of ranking all working women’s homes in either the top half of cleanliness or the bottom is that the women who worked were able to outsource the job of domestic cleaning and domestic water management.

While some domestic workers agreed with Nandika’s neighbour that working women’s households directly indicated higher levels of domestic cleanliness, other domestic workers purported that regardless of class, a working woman would be less able to maintain a clean home. These workers, often pressed for time themselves, conjectured that working women of all classes sacrifice so much time and energy to their employment that they are unable to properly manage the cleanliness of their own homes and often also bodies. This point is reinforced even more when discussing water management. Neelaja said, “working women don’t have time to take care of water or other household problems [...]. Worry over each cup [of water]? How can you when you are late for work or for cooking food [for your family]?” Neelaja and others perceived a long-standing argument about working women and domestic work (Sassen 2002); they explained that the constraints on middle-class working women were assuaged by hiring outsiders to do their housework for them, but that their absence would ultimately impact their water use and cleanliness. However, not a single domestic worker argued that a middle-class working woman’s home would be less clean because of a deficiency in lower-class women domestic workers’ ability to reproduce a middle-class domestic relationship with water. This confirms that a middle-class water relationship, and hence household, could be replicated by lower-class domestic workers.

But most surprisingly, despite having little time and little water, working women of the lower classes often were named as having the cleanest homes. Domestic workers and their working-class neighbours acknowledged that they were able to bring the aesthetics of middle-class Delhi into developing informal slums. Many domestic workers argued that homes from the *basti* were perhaps the cleanest of all, even middle-class homes. This represented a major break in the dominant narratives that suggest that informal, working-class “slum” neighbourhoods like the *basti* are the dirtiest places in all of Delhi. The assertion that cleanliness does not have to follow class lines, formal construction or access to a relatively reliable

private piped water supply indicates working-class women's agency in the ability to keep house. This recognition by domestic workers shows that the urban water-poor are aware of their status as contributors to the world-class city – as formally making the middle-class in middle-class spaces, and as personally trumping the standards of the middle-class through greater care and commitment in their own homes. To reiterate, many domestic workers acknowledge that as producers of middle-class waterscapes in middle-class homes, they are able to bring this knowledge beyond their employers' thresholds and into the lower-class neighbourhoods where they live, where there is an even higher commitment to water use and cleaning.

To domestic workers like Rithika, the *basti* was much cleaner than the homes of the middle-class and more modern than the tenements. Despite her evaluation that the *basti* had the most limited water access of the three, to Rithika, the *basti* was the cleanest. "We are always fighting dirt," she says, "so our homes are cleanest." Rithika also thought that the *basti*'s homes were more modern than the formal tenements because their informal, illegally-built home required no monthly payments of rent or utility fees, freeing up income for the purchase of middle-class items. Her family's self-maintenance of their *jhuggi* and their consumption of middle-class objects made the *basti* aesthetically middle-class, though foundationally it was not. In Rithika's perspective, domestic workers from the *basti* were able to bring the middle-class aesthetic home more capably than any other home because of their determination to counter the "backwardness" associated with the dirtier environment and their ability to divert funds that would have been invested in formal housing to modern material culture. Rithika considered the *basti*'s inconsistent water flow a limiting factor to her ability to clean, but she accepted the infrastructure as a condition of her financial flexibility. Rithika and domestic workers like her often sacrificed water in one realm of domestic work in order to support water use in other realms to cope with the lack of water. This often involved allocating water to behaviours and belongings that were considered "modern."

Rithika explained that she saw modernization happening all over Delhi, and that it was more advanced in the *basti* than it is in the tenements. Although domestic formalization and slum clearing are on the top of the minds of many government officials as two of the most important milestones of modern development into a world-class city, Rithika and her neighbours challenged this by explaining how the middle-class elements in their lives would not be possible with their relocation to a proper tenement despite its formal water access. Rithika said that she thought she was able to own a greater number of modern possessions by living in the *basti* than

those who had to pay rent in the tenements. These modern possessions and their upkeep are, in Rithika's perspective, one of the most important signs of upward mobility toward becoming an integrated part of the middle-class. The upkeep of these possessions in the *basti* meant an active cleaning agenda that prioritizes water allocation to these modern possessions. In her opinion, although *basti* families had more of these possessions, the families in the tenements used more water because of their better access.

The association between middle-class aesthetics, modern possessions, an active cleaning regime, and water allocation took many forms. Contrary to Marina's perspective, for Rithika the ability to amass and maintain objects of modern, middle-class consumption was more salient as a marker of upward mobility than access to middle-class infrastructures, including piped water. Nonetheless, Marina, Rithika, and other women strove to build their own middle-class domestic water infrastructures and improvements. Marina and Rithika believed that the appropriation of middle-class cleaning aesthetics was possible, but there were some who thought that the values of water and cleaning were inherent to people, and thus unchangeable.

The problem of dirt was habitually projected onto Delhi's developing areas like the tenements and the *basti* by middle-class rhetoric. Many of Delhi's "improvement" plans targeted the urban poor for their unhygienic practices and plan interventions that sought to inculcate the urban poor to move away from "dirty" habits. Programs targeted specific enclaves or particular issues, such as hand-washing and food preparation, across multiple neighbourhoods. When the *basti*'s NGO workers collaborated with an NGO in a *basti* that was located in an industrial neighbourhood, their reactions included references to the dirt they found there. They contrasted this *basti* with their own, which, because of its location in the Embassy district and its higher employment flows into middle-class homes, had integrated the middle-class aesthetic to a higher degree. "They don't know how to properly wash," the workers agreed. This complaint was repeated in discussing the hands, hair, bodies, clothes, material possessions, homes, and footpaths. These specific instances were followed by contrasting statements about their own successful programs that triggered the integration of proper washing habits. In this way, the middle-class aesthetic could be seen evident through middle-class instructional intervention not unlike the initial training of a domestic worker.

But with the benefit that NGO workers and domestic workers' employers think comes from exposing Delhi's urban poor to the middle-class, there is also the danger that the exchange will, as the NGO workers

expressed, pollute the middle-class. This is not a direct appropriation of inter-caste pollution beliefs, rather, the modification and emulation of colonial-era contagion models that draw from other social markers. The middle-class aesthetic of distancing oneself from contamination by dirt and pollution leads to an intense effort to maintain a distinction between dirty and clean, between proper and improper, and between official and unofficial (Bourdieu 1984; Douglas 1966; Latour 1993). This process manifests itself in the Indian home (Dickey 2000; Ray and Qayum 2009; Walsh 2004). The evaluation of the cleanliness of the homes reflects a parallel between social and infrastructural hierarchy that maintains the distance between objects of pollution and what is considered clean. Water has a fluidity over these categories and can be considered dirty, clean, or a cleaning agent itself. The middle-class aesthetic requires a belief in the centrality of domestic water ritual. The constant washing is not to counter a body that becomes dirty within a day or half-day time, nor is cleaning employers' middle-class homes about cleaning perceptible dirt. In so many words, the domestic workers' perspectives on middle-class cleaning objectives emphasize that cleaning with water is an urban ritual, which is a part of an aesthetic of a conspicuous middle-class lifestyle. Neelaja devoted any surplus resources to developing this ritual – initially it was just money, but as soon as more water becomes available, she said she will devote that, too. As such, practices of domestic water use are sometimes performed only for their ritual value, which is true for domestic workers and identity expression through water allocation in Delhi.

In Delhi, water has become a signifier that transcends its functional value even in the context of relationships defined by its scarcity. Through discussions about domestic water as a cleaning agent, deeper perspectives about processes of modernization in Delhi come to the surface. As families searching for their version of the middle-class world-city, this means having access to critical resources, including water, to reify this identity. Domestic water can be used to signify upward mobility and class status, which is why the Chief Minister of Haryana's accusation resonated so widely. The question becomes how and where a middle-class city is made. Is middle-class Delhi made through the grooming of bodies into middle-class world-citizens, with multiple baths each day using the proper quality and quantity of water or clothing that takes extra resources to buy, wear, and wash? Or is it made in the homes the bodies occupy, with small changes like a sink-basin for washing on an elevated kitchen counter top or a private shower stall? These changes all necessitate a commitment to an aesthetic which champions increased domestic water use as an indicator of upward mobility.

These practices of ascription shape the domestic sphere but also have ramifications far beyond it. The degree to which middle-class domestic water values and allocations are absorbed beyond the middle-class will be indicative of the prognosis of Delhi's water future. As Delhi's citizens are urged to adopt middle-class water values politically, economically, and socially, there is a greater threat to Delhi's water stability and sustainability. This is certainly not to say that the lower-classes should not be entitled to pursue water rights and water allocation freedom to the same degree as the middle-class. Rather, it brings light to the problematic dynamic of favouring support for middle-class water use through policy, economy, and rhetoric, but without developing more inclusive structures of water justice and rights in tandem with infrastructures to sustainably supply the unprecedented amount of water that will be required to support it.

Notes

- 1 I use Shridharan's concept of the middle-class based on income in concert with Deshpande's classification by consumption patterns (2004; 2006).

References

- Bakker, Karen 2010. *Privatizing Water: Governance failure and the world's water crisis*. Ithaca: Cornell University Press.
- Bourdieu, Pierre 1984. *Distinction: A social critique of the judgment of taste*. Cambridge, Mass.: Harvard University Press.
- Brosius, Christiane 2010. *India's Middle Class: New forms of urban leisure, consumption and prosperity*. New Delhi; Routledge India.
- Deshpande, S. 2006. 'Mapping the 'Middle''. Issues in Analysis of the 'Non-Poor' Classes in India.' In M. E. John, P.V. Jha and S.S. Jodhka (Eds), *Contested Transformations. Changing Economies and Identities in Contemporary India*. Delhi: Tulika.
- Dickey, Sara 2000. 'Permeable Homes: Domestic service, household space, and the vulnerability of class boundaries in urban India.' *American Ethnologist*, 27(2):462-489.
- Douglas, Mary 1966. *Purity and danger; an analysis of concepts of pollution and taboo*. New York, Praeger.
- Fernandes, Leela 2006. *India's new middle class democratic politics in an era of economic reform*. Minneapolis : University of Minnesota Press.
- Guha, Ramachandra 2006. *How Much should a Person Consume? :*

- Environmentalism in India and the United States*. Berkeley: University of California Press.
- Gupta, Narayani 1981. *Delhi Between Two Empires, 1803-1931: Society, Government and Urban Growth*. Oxford University Press.
- Gandy, Matthew 2008. 'Landscapes of disaster: water, modernity, and urban fragmentation in Mumbai.' *Environment & Planning*, 40(1):108-130
- Hoekstra, Arjen Y and Ashok K Chapagain 2007. 'Water footprints of nations: water use by people as a function of their consumption pattern.' *Water Resources Management*, 21(1):35-48.
- Intergovernmental Panel on Climate Change (IPCC) 2007. 'Climate change 2007: impacts, adaptation and vulnerability.' In M. Parry, O. Canziani, J. Palutikof, P. van der Linden, and C. Hanson (Eds). *Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, UK.
- Latour, Bruno 1993. *We have never been modern*. Cambridge, Mass.: Harvard University Press.
- Mankekar, Purnima 1999. *Screening Culture, Viewing Politics : An Ethnography of Television, Womanhood, and Nation in Postcolonial India*. Durham, N.C.: Duke University Press.
- Mazzarella, William 2003. *Shoveling smoke : advertising and globalization in contemporary India*. Durham : Duke University Press
- Narain, Sunita 2012. *Excreta Matters: Volume I*. Delhi, India: Centre for Science and Environment.
- National Intelligence Council (NIC) 2012. *Global water security: intelligence community assessment ICA-2012-08*. Office of the Director of National Intelligence.
- Rajagopal, Arvind 2001. *Politics after television: religious nationalism and the reshaping of the Indian public*. New York: Cambridge University Press.
- Ray, Raka, and Seemin Qayum 2009. *Cultures of servitude : modernity, domesticity, and class in India* Stanford, Calif. : Stanford University Press.
- Sassen Saskia 2002. 'Global Cities and Survival Circuits.' *Global woman : nannies, maids, and sex workers in the new economy*. New York : Metropolitan Books
- Shridarhan, E. 2004. 'The Growth and Sectoral Composition of India's Middle Class: Its Impact on the Politics of Economic Liberalization.' *India Review*, 3(4):405-428.
- Thomas, David SG and Chasca Twyman 2006. 'Adaptation and equity in resource dependent societies.' *Fairness in adaption to climate change*. Cambridge, Mass.: MIT Press. p223-228.
- Walsh, Judith 2004. *Domesticity in colonial India: what women learned when men gave them advice*. Lanham, Md. : Rowman & Littlefield Publishers.
- Veblen, Thorstein 2009[1899]. *The Theory of the Leisure Class*. New York: Oxford University Press.

SUSTAINABLE APPROACHES TO URBAN DEVELOPMENT: LOCAL PEOPLE'S PERSPECTIVE ON A NEWLY CONSTRUCTED ECO-CITY

Sarbjee Singh

Introduction

For developing countries to engage in sustainable urban development is imperative because they have to manage with very limited resources, and yet such development is also needed to satisfy the perpetual needs of future generations. In India, the need for urban development has become immense due to a rapid demographic shift. Many small-scale agriculturists seek employment in the modern industrial and technological sectors, causing a massive relocation of labour from rural area to cities. The need for sustainable cities is thus quickly becoming a major policy debate.

The paper is based on narratives collected from 30 respondents of Mullanpur-Garibdass, now called 'New Chandigarh,' in the northern state of Punjab, where construction of a new 'eco-city' through sustainable development is taking place. The aim is to investigate the capacity of local people to balance their needs against the principle of sustainability as applied in the context of this mega project. Locals were agriculturist who depended on their land for their survival before the development. Most of the respondents, whose land has been acquired for constructing the eco-city, were found to be struggling to survive now, in this new, high tech city, due to a lack of education and support.

In this fast growing and ever more mobile world India is also on move. The main destination is the city. Urbanization is defined by the United Nations as a movement of people from rural to urban areas (UN 2004). It is envisaged that the world, particularly developing countries such as China and India, will witness another massive increase in urbanization in the immediate future, with these two countries alone accounting for about

one-third of the global increase in urban population in the coming decades (United Nations 2008). It is thus all the more important and difficult and to ensure that urban development is made sustainable.

Urbanization proceeds at an alarming rate in newly industrializing cities, creating major problems at every level (Kenworthy 2006). A main problem for constructing a well-planned city is that there are so many quantifiable aspects of city planning, such as energy, lighting, air flow simulations, efficiency of materials, resource use and reuse. To manage these data green design implementation now makes use of computational tools (Biswas, Wang 2009). Ecological networks are increasingly being considered as a suitable approach to improve the ecological value of urban open space systems (Cook 1991; Cook and van Lier 1994).

This view did not become dominant until 1987, when the report of the World Commission on Environment and Development was published (WCED 1987; Pearce et al. 1989; Tisdell 1991; Turner et. al. 1994; Shechter 1995; Callan and Thomas 2000; Field 2001). Richard Register, a California based architect, had demonstrated an eco-city concept by which input (resource) and output (waste) are minimized. Eco-cities demonstrate that urban growth and development can be a sustainable process and hence that the concept of sustainable development can be applied in an urban setting. The number of high-tech cities is thus likely to increase, especially at this time of rapid urbanization. The eco-city, however, is more than a practical application of knowledge about ecology. I argue that ecological knowledge must be combined with in-depth knowledge of the socio-economic conditions prevailing in the context of different cities if we are to succeed in addressing the sustainability challenge.

The Idea of the Ecological City in India and Beyond

According to Joss (2011) there are several dozen major ‘eco-city’ initiatives underway worldwide, primarily in response to global climate change and growing urbanization. Among these, two have been in the making since the early 2000s in California, USA, from where the eco-city movement originated: Treasure Island in San Francisco and Sonoma Mountain Village in Rohnert Park (Sonoma County). Joss analysed these urban sustainability initiatives in terms of emerging hybrid governance relations and interactions, and how these inform the planning, coordination and implementation of the initiatives. Among the key governance aspects discussed are the partial privatization through elaborate public–private arrangements,

the role of international partners in shaping the urban sustainability agenda and the project-based approach used to affect the initiatives. The findings suggest a prevailing mode of ‘governance at a distance’ and related innovations in governance mechanisms, which, in turn, impacts on how urban sustainability is conceptualized and put into practice.

Naess (2000) in his study draws inspiration from the Brundtland Commission’s report and believes that for effective sustainable development more policy initiatives by both national and international agencies are required. There is an urgent need to curb existing pollution levels and the extent of energy consumption. The reluctance of industrially developed countries to sign international protocols setting controls on their respective energy consumption clearly explains the magnitude of the problem. However, continuous growth in non-sustainable building stock will make it increasingly difficult to bring urban development in wealthy countries within the frames of what is ecologically sustainable and equitable from a global perspective. Planning for a sustainable urban development must be oriented towards long-term goals and utilize knowledge about the environmental consequences of different solutions, but should not be based solely on means-ends rationality. Rather than aiming at a consensus including all stakeholder groups, he argues that planning for sustainability should facilitate alliance building among those population groups that can support the basic equity and environmental values of a sustainable development.

Roseland (2000) studied the role of community in sustainable development and broadens our understanding of opportunities for sustainable community development. He questions a focus on poverty as a major source of environmental degradation, and suggested instead that both poverty and environmental degradation result largely from the accumulation of wealth. He examines the concepts of natural capital and social capital, and asks whether and how they are linked, and explore the implications thereof for sustainable development at the community level. He finds that while planning theory is, *or should be*, relevant to sustainable development, planners concerned with key aspects of sustainable development will have to look to “greener” pastures for relevant theoretical guidance. Roseland also provides a framework for sustainable community development and associated questions of governance. He argues we should focus on public participation in decision-making, the role of local government, and planning for action.

Sustainable development is a normative framework within which trade-offs between social, ecological and economic objectives are required to sustain the integrity of the overall system, according to Hadiger (2000). He

examines what he calls the 'sustainability-based social value function' and proposes to integrate these issues by going beyond traditional conceptions of sustainability, which have been based on a value principle of either maintaining some aggregate of capital ('weak sustainability') or maintaining a stationary-state where social, ecological and economic assets remain constant over time ('strong sustainability'). Along with individual preferences and macroeconomic objectives, the proposed welfare function integrates principles of basic human needs ('critical economic capital'), integrity of the ecosystem ('critical ecological capital') and the socio-cultural system ('critical social capital'). This implies restrictions of the social opportunity space within which sustainable development can proceed and a new value function is defined.

Camagni (et. al. 2002) also raised the question of the environmental or social costs of urban development increasingly attracting attention in discussions on spatial policy. He makes the very important point that the scientific debate in this field is often marred by prejudices and abstract visions rather than solid arguments built on facts and empirical analyses. Their empirical study examines different patterns of urban expansion in the city of Milan and the environmental cost incurred as a consequence of that expansion. Different typologies of urban expansion are defined, and an 'impact index weighting,' measuring journey-to-work trips, is built at the municipality level. Their statistical analysis confirms the 'wasteful' character of sprawling development in terms of land consumption, though it is suggested that recent urban development is becoming relatively 'virtuous' compared to the past. With reference to the mobility generated, higher environmental impacts were proven to be associated with low densities and sprawling development, more recent urbanisation processes and residential specialisation of the single municipalities. Public transport seems to be strongly influenced, both in terms of efficiency and competitiveness, by the structural organisation of an urban area: the more dispersed and less structured the development, the lower its level of efficiency and competitiveness and consequently its share of the mobility market. On the other hand, trip times for private transport are correlated not so much to urban density as to the presence of recent housing developments, indicating the emergence of new lifestyle and mobility pattern that are very different from those of the past.

Datta (2006) in another study says that urbanization is an index of transformation from traditional rural economies to modern industrial one. The study takes a historical scan of urbanization in India over a century, with emphasis on the level and tempo of urbanization and urban morphology

using Indian Census data from 1901-2001. It attempts to summarize urban problems and related policy. Over the years there has been continuous concentration of population in Class-I towns, while medium and small town populations either fluctuated or declined. This has resulted in a concentration of urban populations in certain pockets. India's urbanization is often termed as over urbanisation, or pseudo-urbanization. The big cities attained inordinately large populations leading to a virtual collapse in urban services and basic problems in the field of housing, slums, water supply, infrastructure, quality of life etc. Urbanisation is a product of demographic explosion and poverty induced rural-urban migration. Urbanisation, Datta argues, is occurring not due to urban pull but due to rural push.

Sridhar, Reddy and Srinath (2010) discuss the question further. They first note the 65% contribution made by Indian urban areas to India's GDP. Urban areas thus have made a disproportionate contribution to India's rapid 8%-9% GDP (formal economy) growth in the last decade. With migration being one of the important factors contributing to the growth of the urban population, the study asks whether it is rural push or urban-pull that explains migration in India. The authors examine the case of Bangalore, which has one of the largest proportions of immigrants to its total population. They conducted a survey to examine factors that motivated migrants to move to Bangalore. They found that the lower the level of education of the migrant, the greater the importance of the push factors whereas with increasing level of education, pull factors become more important in migration. Women are also more likely to be 'pulled' toward urban areas. They found migrants from within Karnataka are 'pushed' and suggested that to curb urbanization, local non-farm employment opportunities have to be increased, rural infrastructure improved and the development of small and medium towns encouraged.¹

Chatterjee (2010) illustrates that the eco-city idea is not entirely new in India; the only recent innovation is that it was formally conceptualized as such. Open recognition of the need for developing more and more eco-cities began to emerge a few years back. The present study adopts a holistic approach to study this more recent development, paying attention to all critical factors, including economics, infrastructure, social impact and ecological sustainability. The fundamental argument is that ecological sustainability runs contrary to the first two considerations, if development projects are not planned with utmost care.

In India, about twelve cities were selected for transformation into eco-cities, of which six were selected for the first phase. The Central Pollution Control Board, under the Ministry of the Environment and

Forest, Government of India, undertook the initiative. The selected cities are mainly existing cities and specifically historic cities with a religious nucleus representing a pilgrimage or tourism attraction. One of the first on this list of proposals was Raniganj in the mineral rich South Bihar. The city was under tremendous pressure because of unplanned mining activities in the region. The project proposal initiated technological innovations along with integrated sustainable planning and civic empowerment to prevent further degradation of land and underground water resources. The idea was that a transformation would be achieved through technological innovation, integrated sustainability planning and civic empowerment. The Raniganj coal-belt is an area of western part of the West Bengal. Coal mining started in the mid-nineteenth century under colonial initiative. And the area also becomes a centre for the growing railway network. Taking advantage of its proximity to the mineral-rich South Bihar, steel and other ancillary industries grew. But presently, unplanned mining and centuries of urban sprawl have taken their toll and this has become an ecologically damaged region with regular subsidence of land and underground coal mine fires.

Urban trends in India

India has the second largest population in the world, and is projected to soon become the most populous country on the planet. Urban population is increasing at a rapid rate. Yet the rate of urbanization, as defined by the census of India, remains one of the lowest in the world (28% for 2001), while the population growth rate for the country remains relatively high (+1.6 p.a.). Surprisingly, India's rate of urbanization is lower than that of Western Africa, which was 30% in 2000 (Denis and Moriconi-Ebrard 2009). It is therefore generally agreed that India is the country that presents the highest future potential for urban growth among world economies.

Urbanization scenarios in the federal political system of India are dealt with at different levels, the federal government is the highest and most central level where national policies are devised, the state government is the middle level, and local government manages the administration and governance of cities.

However, local level governments do not have a well-defined power structure with clearly defined functional and fiscal domains, and overall fiscal capacity is much less than it is at higher levels of government. Historically, the state governments have controlled the local, urban self-government, and have not devolved adequate powers and responsibility to

them. The capacity of urban governments has not been strengthened to cope with the growing challenges of urbanization, poverty, environmental degradation, and the lack of infrastructure and services.

Urbanization trends in India (Table 6-1) are reflected in the growth of urban populations and the number of urban centres (Gupta and Teotia 2006).

Table 6-1: Urbanization trends in India

Source: Census of India 2001, 2011

Census	No of Towns	Total urban population (million)	Level of urbanization (Per cent)	Decadal growth of urban population (%)
1901	1811	25.6	11.00	--
1911	1754	25.6	10.4	0.0
1921	1894	27.7	11.3	8.2
1931	2017	33.0	12.2	19.1
1941	2190	43.6	14.1	32.1
1951	2795	61.6	17.6	41.3
1961	2270	77.6	18.3	26.0
1971	2476	107.0	20.2	37.9
1981	3245	156.2	23.7	46.0
1991	3609	212.9	26.1	36.3
2001	5161	286.1	27.8	34.4
2011	7935	3771	37.7	32.7

The state of Punjab, where this study was conducted, is in the midst of an urban transition. At the dawn of the twentieth century, only 12.46 per cent of the total population of the (pre-partition) Punjab was urban. At the beginning of the twenty-first century, the urban population of Punjab has increased by 37.49 per cent, compared to 32.7 per cent growth for the country as a whole over the last decade. Punjab is now the fifth most urbanized state of India after Tamil Nadu (48.04%), Maharashtra

(45.23%), Gujarat (43.00%) and Karnataka (38.07%). The proportion of urban population has increased from 23.73 % in 1971 to 39.00 % (Census 2011). Table 6-2 shows these urbanization trends in Punjab.

Table 6-2: Level of urbanization in five most urbanized states in India (% of total population) Source: Census of India

State	1951	1961	1971	1981	1991	2001	2011
Tamil Nadu	24.4	26.7	30.3	33.0	34.2	43.86	48.04
Maharashtra	28.8	28.2	31.2	35.0	38.7	42.40	45.23
Gujarat	27.2	25.8	28.1	31.1	41.0	37.35	43.00
Karnataka	22.9	22.3	24.3	28.9	30.9	33.98	38.07
Punjab	21.7	23.1	23.7	27.2	9.7	33.95	37.49

Punjab’s urban population growth has been concentrated around major developed cities like Chandigarh and Mohali. Due to this rapid population growth, there is a phenomenal increase in the slum population. This has put stress on infrastructure and has created problems of safe living due to lack of essential services like sanitation, drinking water, primary health care and educational facilities. Ironically, migration to urban areas from rural hinterlands is primarily in search of employment, good health and education facilities in the cities. Table 6-3 show the growth of urban population in Punjab.

Table 6-3: Growth of urban population in Punjab
Source census of India 1951 to 2011

Year	Total Population	Urban population	Percentage of urban population	Total no of towns
1951	9,160,500	1,989,267	21.72	110
1961	11,135,069	2,567,306	23.06	106
1971	13,551,060	3,21,6179	23.73	106
1981	16,788,915	4,647,757	27.68	134
1991	20,281,969	5,993,566	29.55	120
2001	24,289,294	11,344,249	33.95	157
2011	1,210,193,422	37,71,05,760	39.00	476

Urban population in Punjab has been growing rapidly from 21.72 per cent in 1951 to 39.00 percent in 2011, especially in the growth corridor around the periphery of Chandigarh (within 20 kilometres). Punjab (see Map 1) deserves special attention from planners and policy makers. To cope up with these urbanization pressures, the population Punjab government has developed various master plans with the help of Jurong Consultants Pty. Ltd., a Singapore based company. The Punjab Urban Planning and Development Authority also established various branch authorities, like ADA (Amritsar Development Authority), BDA (Bhatinda Development Authority), PDA (Patiala Development Authority), JDA (Jalandhar Development Authority) and GMADA (Greater Mohali Area Development Authority).

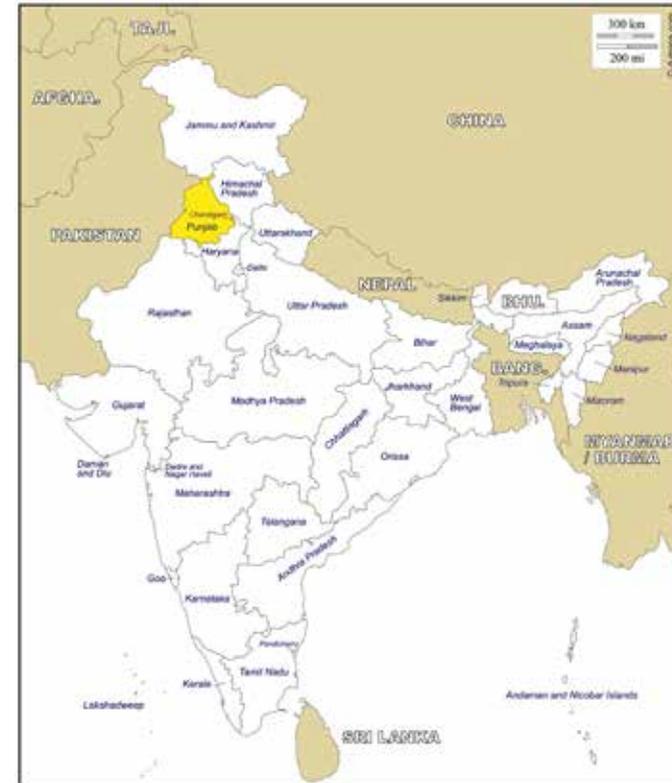


Figure 6-1: Punjab. Source: <http://d-maps.com>

Mohali is regarded as the ‘Paris of Punjab’ and Punjab government is looking forward to making it into a globally competitive metropolis with a resilient capacity to sustain the pace of economic and urban development in Punjab. The urban planners and policy makers want to provide unique lifestyle choices and memorable experiences for residents and visitors. It is their commitment to ensure that the development is able to keep pace with the rest of the world, and also to adapt to a changing global environment.

Keeping in mind the social and physical characteristic, the economic growth potential and the existing development trends within this region, a range of objectives and strategies have been formulated to achieve the vision (Table 6-4):

Table 6-4: The Eco-city of Punjab

Economic Clusters	Primary/ secondary activities
Central S.A.S. Nagar	CBD Financial District Arts and culture Centre Administrative Centre Medical Hub
North- eastern S.A.S. Nagar	Airport / Aviation Hub Logistics & Manufacturing Hub
Zirakpur	Heavy manufacturing Wholesale and trading Warehousing Medium/small Manufacturing
Banur – Zirakpur Corridor	Instructional – knowledge belt Business – technological Belt Southern gateway
Foothills of Shivalik	Nature Conservation and Preservation Public enjoyment of Flora and Fauna Ecological Tourism
Mullanpur	Resort Centre Low Density Country living Northern Gateway
Agriculture /Rural Zone	Diversification of agriculture activities Rural Growth centres

Urban planners in Punjab are making a deliberate attempt to promote more urban development, resulting in alteration of land use from the agricultural to the industrial sector. Urban Planners argue that advanced technology use helps to promote the inflow of people from outside. It helps industry to develop and offers alternate occupations. In the past, hardly any serious effort was made by the government of Punjab to engage in formal urban planning, but the state has now taken this on as a serious challenge and has established an Urban Development Authority (UDA).

One of the flagship projects of Punjab’s UDA is the eco-city development project in the vicinity of Chandigarh, the disputed capital of Punjab and Haryana. The project site is Mullanpur, a rural and largely agricultural area of great natural beauty currently occupied by 32 villages. It is being marketed as the first eco-city of Punjab. This project is named GAMDA. The design claims to

- Protect unique environmental, historical and cultural resources,
- Capitalize on the regional assets and resources to promote dynamic and sustainable economic development, and
- Ensure equitable distribution of resources (environmental, economic and social)

The emphasis is on encouraging growth in public transport. The design envisages an urban center and nodes, comprising well-serviced and well-connected communities with distinct local character and identity. Some of the unique feature will include renewable energy, solar and wind energy usage, water recycling zero effluent discharge, zero or low carbon impact development, abundant greenery and a walk-able environment. This GMADA project is to turn Mullanpur into a town that is in harmony with its environment and nature (see also: www.puda.nic.in/img/approved_masterplan_files/Mullanpur_rpt_2011.pdf).

Planning Parameters

In the preamble to the GMADA’s proposal, a holistic approach to the urban development initiative is promoted. The plan aims to take into consideration the natural growth, migration, and economic data of the Punjab region and of India as a whole that are likely to impact on future urbanization. The plan draws on projections up to 2031 and 2056 respectively.

Singapore based company ‘Jurong International’ prepared the master

plan for this first eco-city in Punjab (Figure 6-2). This city is planned as primarily a residential city with a high standard of living. This city will host what are considered to be non-polluting industries such as Information Technology and Hospitals. Some software companies have already purchased land here. ARK Microsystems, a software development company, has started its operations. It will host many IT related knowledge institutions and is already hosting many IT, Engineering and Management Colleges.

Apart from the major player, GMADA, which has already started the land acquisition and plot allotment process, there are many private players like Omaxe, DLF and Altus Space Builders. DLF is planning to set up a 1,000-acre township. Omaxe, and Altus Space Builder are also developing residential townships. Other developers include the Reliance Anil Dhirubhai Ambani Group (ADAG), Ansals and Rahejas. Major companies are planning to acquire more land in the second phase of the project. Pattern of land acquisition clearly demonstrates the large stake that private players from outside the state will have in capital investment in New Chandigarh city. The project has already been approved.

The population of the GMADA area in 2001 was 711,210 persons, with 38.9% classified as urban. This urban population is highly concentrated in the city of S.A.S. Nagar (44.6%), with the remaining 55.4% spread across nine other towns. Mullanpur village accounts for only 2.2% of the urban population in the area (source: *Punjab Urban Development Authority*, 2001). The Greater Mohali Area Regional Plan 2008-2058 has envisaged 35.9% of the projected plan area to become urban area (42, 740 ha) to be distributed between six Local Planning Areas (LPAs). Mullanpur Local Planning Area, the field research site for the present study is in the north-east of GMADA. The Greater Mohali Area Regional Plan 2008-2058 has identified 7 economic clusters in the area, each with its own distinctive primary and secondary economic activities. Mullanpur is one of these 7 clusters, where the broad planning to become intention is to have low-density country living, a resort centre and a northern gateway to GMADA. Mullanpur's proximity to the proposed film city and education city projects in Chandigarh offers the potential to develop adjacent areas into a resort centre and a regional playground. It is envisaged as a major tourism hub.

Existing conditions in Mullanpur

Natural Rivers and mountains surround Mullanpur Local Planning areas. Nearly 75.5% of the area is agricultural (Table 6-5). The main



Figure 6-2: Mullanpur Eco City Master Plan
Source: Brochure Mullanpur Urban Estate 1.pdf

settlement contains 32 villages (250 ha) and the largest of these is the historic Mullanpur village. The LPA's population is 25,937.

Table 6-5: Land use in Mullanpur

Land use	Area(ha)	%
Agriculture	46.2	75.5
Water body	890	14.5
Rural settlement	250	4.1
Special use (Military)	140.8	2.3
Open space	80	1.3
Industry (Brick kilns)	80	1.3
Mixed Use	60	1

Mullanpur Township has a Gurudwara complex which houses facilities like a primary school, a college, a hospital and temple. 1150.2 hectares of land is under the Punjab Land Preservation Act, 1900, with restrictions on any development to protect the ecological balance and ecosystem of the surrounding Shivalik Hills. Despite Mullanpur's proximity to the Shivalik Hills, there are currently limited tourism facilities in the town.

The level and composition of economic activity in the GMADA area is intrinsically linked to development and population issues. GMADA's ability to sustain and support the projected increase in population will depend on the creation of employment opportunities. The projected growth of Chandigarh (4.2% for the next 20 years) and S.A.S. (Sahibzada Ajit Singh) Nagar (44.6% urbanized) will have spill over effects. GMADA's economy is anticipated to grow as a result of Chandigarh's expansion. GMADA is known for both its manufacturing base and services, particularly IT industry. The area has established a strong presence over the last eight years and leads the state of Punjab in terms of exports. The Software Technology Park of India (STPI) at Mohali has triggered the flow of investments in GMADA with big companies such as Dell Computer, Tata Interactive Services and Quark Media House investing in the area.

The master plan projects that in the coming 25 years the economy of the region is likely to grow to about four times its current size and is likely to experience upscale development of 14.5 times in the coming 50 years. This provides an excellent window of opportunity to market the projected infrastructure and housing adding to the image of the state and its economy. These are highly optimistic projections and may not fully take into account

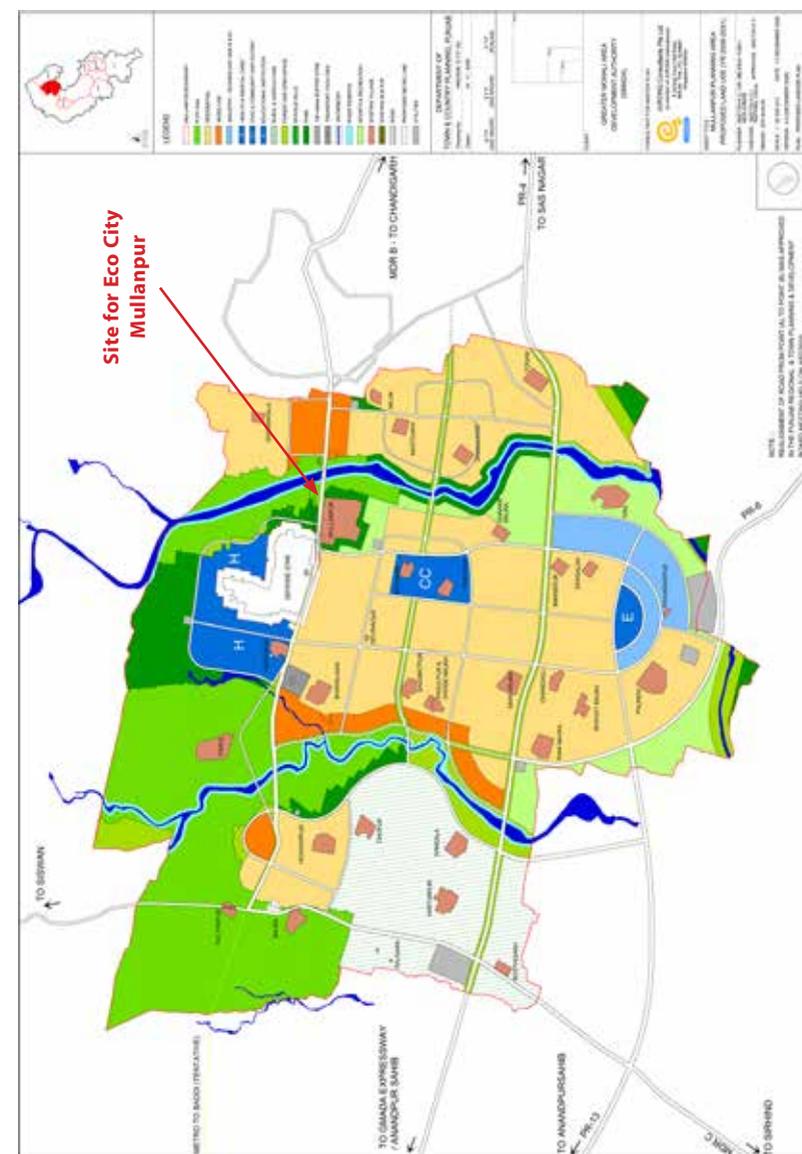


Figure 6-3: Mullanpur Master Plan.

Source: Govt. brochure, Mullanpur Urban Estate

several other factors including the world economic situation and the prospect of natural and man-made disasters striking more frequently than in the past.

With the intent of meeting stated projections, the plan proposes to large economic infrastructure developments for the eco-city. There are provisions to accommodate local supply facilities for inhabitants, as well as a variety of offices for small companies. Creating opportunities for employment and enterprise in the vicinity of the residential complex facilitates the process of building gated communities in delineated geographical spaces. To what extent these spaces can accommodate diverse social and cultural aspiration remains to be seen. For anthropologist-the question is, can these artificial communities replace the web of kinship ties presently experienced by residents of village communities and that are now being deliberately destroyed.

Predicaments abound when urban planning deliberately creates alternate social spaces. These projects often talk about ensuring a balanced social mix (in terms of education, age, income, ethnicity and sex), correspondent to the local population picture and new trends in society. These targets also incorporate gender considerations sustainable lifestyle planning and diversity of housing and spatial structures to create a lively local neighbourhood, with self-organisation of residents to take on joint tasks and social networks that promote communication (see www.upv.es/contenidos/CAMUNISO/info/U0511247.pdf).

The planners believe they can achieve this by providing housing to accommodation different generations and ethnic, linguistic and religious diversity. Experiments in the past including the modern city of Chandigarh have shown, however, that creating so called modern institutions of social clubs, golf courses, community centres for providing recreational spaces and creating community identities and loyalties has not achieved the desired results. External instruments of intervention from the voluntary sectors are often mobilized to provide essential services in times of crisis. Social organizations are not built simply by creating 'mixed forms of property ownership and tenancy'.

The New-Chandigarh development authorities started with lofty ideals, goals and vision statements. To develop their model of the eco-city, they even made some futile attempts to involve local participants including people from the villages that were marked for displacement. The attempt failed, as the meetings remained confined to only those developers who had a vested interest in the real estate in the area. Given the existing state administration structure, any voluntary participation in the project appeared only superficial given the regime of centralized control and rampant

corruption in almost all the departments involved with any construction activity in the state. The only positive outcome of these meetings as per the reports of the GMADA was that the costing was restructured in view of inflation and rising construction costs. The report admits rather candidly that the project has not been able to gain the desired momentum because of bottlenecks generated by political interference and more importantly due to the project's inability to acquire land from the private players.

To evolve a valid perspective in comprehending the issues, need and the model of alternate city spaces-it is important that one first attempts to understand the dynamics that now necessitates the building of eco-cities. For that we have to comprehend the process of urbanization and the need for sustainable development. Economic, social and cultural indicators need to be considered here, which may operate in conjunction as competing forces. There is a large body of literature on urbanization and sustainable development, with contributions made by anthropologists, urban sociologists, geographers, development planners, international agencies like the World Bank, IMF and the International commission on Urban Development and building technology experts including architects and town planers. In the process of developing a methodology for the present study, I will now review some of these studies to contextualise my research.

The case of the Mullanpur eco-city and its wider relevance

The present case study is the eco-city project for the village of Mullanpur Garibdass, and we would now like to consider the relevance of this case to the wider literature discussed above. We will begin with some notes on the likely impact of the project on local people.

According to the census of 2011 the village Mullanpur Garibdass has a total population of 6165 people (53% male, 47% female), with 12% under six years of age. The average literacy rate is 79%, higher than the national average of 74.04%. The present demographic profile will be completely transformed however, once the eco-city plan is implemented.

GMADA, the 'Greater Mohali Area Development Authority' eco-city project, in Phase 1 of its development plan, has acquired agricultural land in five villages. Mullanpur, Ratwara, Ferozepur, Bharojia and Devi Nagar. Most of the acquired land is from Devi Nagar (186 acres),¹ followed by Mullanpur (114 acres), Bharonjia (100 acres), Ferozepur (17 acres), and Ratwara (0.76 acres). The total area of acquired land is thus 419 acres.

In order to gain an impression of the local reception of this project,

I gathered data using the following instruments: in depth interviews with the help of interview guides, questionnaires with structured and unstructured questions, focus group discussion, direct observations, case study and content analysis. The primary aim was to capture people's perception of activities in the Mullanpur local planning area governed by (GMADA). More specifically, the objective was to find out about the capacity of local people to balance the dimension of sustainability in the area of Mullanpur with their own need to maintain a livelihood.

According to the reports of many people in these villages the government has forcefully acquired land. There were several protests in which residents of the village complained to the GMADA authorities and resisted forceful acquisition of their land. The majority of residents were against the idea of building an alternatives city space in the area. Legal protest was also made but lost their case in court. To appease them, the Punjab government launched two schemes. One is called the 'Land Pooling' scheme and other is the 'Direct Compensation' scheme, and we will discuss these schemes shortly.

While surveying for research material in my field area, I came across a Newspaper report published in the *Hindustan Times*, (Chandigarh edition 17 April 2013) highlighting that a large section of the displaced population from the locality was not given the promised compensation. Payments in several cases even to the local area *panchayats* has been pending since 2009. The report mentioned that: "A total of around 1200 million [Rupies] is yet to be paid to 21 *panchayats* for their "shamlat" (communally owned) land acquired for upcoming commercial and mega projects on the city's outskirts".

The report also brought to the fore the case of Chachumajra village panchayat in S.A.S. Nagar that had approached the Civil courts for recovering dues of Rs. 190 million for the land that was acquired from them in 2009-10. The Land Acquisition Authorities (LAC) were defending non-payments, saying that now that the matter is in the courts they will neither release money nor answer any queries in this context.

The report brought to the forefront the claims of the state government that all the land in this project was acquired voluntarily and all the former residents of the area were duly compensated. In our earlier review of the urban development literature, it was repeatedly stated that to build a successful eco-city all the stakeholders have to become equal participants in the project. The report clearly suggests that land acquisition in the New Chandigarh project were certainly not managed properly and that there is simmering social tension in the area.

The fieldwork pursued in the five villages to be displaced for the New Chandigarh eco-city project documented several anomalies to which this newspaper report first drew my attention. The survey showed that people were not interested in any kind of development in their area. The government acquired land forcefully and only few respondents from the concerned villages received compensation from GMADA at a par with the current market price for agricultural land. Most of the people I interviewed said that they did not receive any compensation. Instead of individual compensation, the government offered to them to join the land pooling scheme. Under the land pooling scheme land owners who have around 1 acre will be compensated with 1100 yard plots (1000 yard in residential, and 100 yard will get in commercial area) and those who had less than one acre of land are to be given compensation on a different pattern.² Nearly 98 % of people from the area opted for the land-pooling scheme. They did not surrender their fertile agricultural land voluntarily, as some outside observers may believe, but did it in the absence of any other viable alternative.

There is an established principle that inflates the cost of land every time a particular area is marked for urban development. The five villages under the eco-city development project also experienced this hard reality. After most of the villagers had surrendered their land to the Punjab development authorities and received compensation at the rate of 6 million per acre, a number of private builders moved into the area and started acquiring land at a rate 10 to 20 million per acre. Those who surrendered the land for much less are now feeling cheated and are demanding compensation for the price difference. This has delayed execution of the project and large sections of the people have refused to vacate their premises. The official records suggest that there are several villages in the project area that have not yet been paid compensation. These include Hosiarpur (Rs 410 million), Chachumajra (230 million), Bairampur (130.32 million), Chumajra (80.11 million), Devinagar (Rs 40.37 million), Mauli Baidwan (30.67 million), Raipur Khurad (30 million), Patti Sohana (20.61 million), Sukh Garh (20.58 million), Barakpur (20.09 million). The average compensation for acquiring these *panchayat* lands was fixed at Rs. 100.35 million / acre in the financial years of 2009-10 and 2010-11.

A number of my respondent's discussed protests against this eco-city project in which they took part. Those who have been persistently engaged in this struggle said that agriculture has been their primary profession. Their children are not professionally qualified to do anything else. One man asked with lot of pain in his voice: "how they can survive this developing high tech city and which profession or business will they be able to

work in, even if we get a house in the eco-city” Many others also expressed the same fear saying, “if we lose our land, we will not be able to take to any other occupation and this is bound to take away our present wealth. For year there have been representations from the *Sarpanch*, members of the *Panchayats* and the *lambardar* of the village (land recording-keeping officer of the village) to the GMADA authorities and to the political masters of the state but all our protest have been in vain. Children are not well educated”. We now would like to explore these issues in more detailed case studies.

CASE STUDY 1: While I was on fieldwork I met Mr Singh (62) (pseudonym) who has been serving as *lambardar* (land record-keeping officer) of Mullanpur village for many years and shared his views with me. He told me the central government started a project in 1965 for development of the boundary of the military area in the foot hills of Shiwalik Hills range, and with the collaboration of Punjab state acquired land forcefully from local residents paying them Rs. 500 per acre as compensation. In this project land was also acquired by force and there was no other option for local people. Most of them had to be satisfied with 500 rupee only and resettled themselves somewhere else. He told me at that time people were against the development of their agricultural land, but were helpless to stop it. They lost their land and even houses. Moreover, local flora and fauna was destroyed for this development. The eco-city development is proceeding in a similar fashion.

CASE STUDY 2: I have found another case of a man whose house was destroyed due to construction in Mullanpur (New Chandigarh). When I started to talk to Sh. Bant Singh (74) (pseudonym) he told me that: “My house was located near the main road which leads from Chandigarh to Baddi, and six month ago I received notice from GMADA (Greater Area Development Authority). In that notice I was asked to vacate my house because the main road, which connects Chandigarh with Himachal Pradesh, was going to be made as wide as a highway. I was shocked when I received this letter from GMADA. I have been selling pickles for many year, and I have seen many ups and down in my life, and built my house. Now that I am old it is very difficult for me to settle somewhere else. GMADA assured us they would provide 100 to 1000 yard in residential area in new Chandigarh eco-city but it depends upon how much land we have and where our house was built. No account is made of how much we invested on building that house. But until now I did not get anything from

GMADA and I lost my house. I have four sons. One of them is public servant. The other is managing their life. But they all depended on that house. I have no another option where I can live. And now I am on rent for the last 4 month. I have to pay rent of Rs. 4000 for a house. I am hoping things will settle down quickly and we can live peacefully once again”.

Conclusion

This research demonstrates that there is a great deal of diversity among the projects in different ‘local planning areas’ to be developed under the eco-city master plan by GMADA. The reconstructing of this area as new Chandigarh is just an outsiders’ ambition to local people. The government has acquired land forcefully from local people who were not interested in any kind of development in their area. This development led to social changes such as introducing cultural diversity due to migration, as well as economic imbalances, given that the construction of an industrial hub is not something local village people are likely to benefit from. While the government authorities claim to develop an artificial ecological environment, they may in fact cause extinction of many species by destroying the existing natural and fauna. Moreover, local people are left alone to confront difficulties in adjusting to this so called eco-city The dimension of sustainability (environment, social, economic) is not balanced against their need to survive in this high technological city due to lack of education. Earlier they were agriculturist who relied on their land for their sustainable survival. Many policy-makers and other actors involved in this project have genuinely tried to meet the challenge of making urban living more sustainable. The big question for them now is how they can meet the need for sustainability in a way that also considers the needs of local people. Anthropologists everywhere can make a contribution by bringing local people’s concerns to the attention of the decision makers, and by promoting more inclusive development planning practices.

Notes

- 1 The same author suggest that migrants from within the state of Karnataka are ‘pushed’ by lack of adequate income as well as ‘pulled’ toward urban centers by the promise of better job opportunities and higher income. This suggests that new farm employment opportunities such as those created by NREGS

(Mahatma Gandhi National Rural Employment Guarantee Act 2005) and non-farm employment opportunities such as those contained in the Growth Centers Program 24 have to be increased. (<http://dipp.nic.in/growth.htm>). Only a comprehensive policy package complemented by extensive infrastructural facilities, financial and technological support, especially for the local micro (labor-intensive) enterprises engaged in processing, storing, grading and packaging, can boost non-farm production and service activities involving indigenous resources and utilizing local labor.

2 1 acre = 4046.8 square meters.

3 1 yard = 0.91 metres.

References

- Biswas, Tajin, and Ramesh Krishnamurti 2009. 'Framework for supporting sustainable design.' In E. Dado, R. Behesti and K. Zreik (eds.), *Innovations for building and construction*. Paris: Europia Productions. Pp.373-386.
- Callan, S.J. and J.M. Thomas 2000. *Environmental economics and management: theory, policy, and applications*. New York: The Dryden Press.
- Camagni, Roberto, Maria Cristina Gibelli and Paolo Rigamonti 2002. 'Urban mobility and urban form: The social and environmental costs of different patterns of urban expansion.' *Ecological Economics* 40 (2): 199–216.
- Census of India 2011. *Rural urban distribution of population, provisional population total*. New Delhi: Registrar General and census commissioner.
- Cook, E.A. and H. N. van Lier (eds.) 1994. *Landscape planning and ecological networks*. Amsterdam: Elsevier. Pp.354.
- Cook, E.A. 1991. 'Urban landscape networks an ecological planning framework.' *Landscape Research* 16(3): 7–15.
- Datta, Pranati. 2006. *Urbanisation in India*. Kolkata: Population Studies Unit, Indian Statistical Institute.
- Denis, E., and F. Moriconi-Ebrard 2009. 'La croissance urbaine en Afrique de l'Ouest.' *La Chronique du CEPED* 57: 1-5.
- Turner, R.K., D. Pearce and I. Bateman 1994. *Environmental economics: an elementary introduction*. London: Harvester Wheatsheaf.
- Field, B.C., and M.K. Field 2001. *Environmental economics: An introduction*. New York: McGraw-Hill.
- Gupta, J.P. and K. Teotia Major 2006. *Urban local self-government institution in Punjab: History, structure, capacity and emerging challenges*. Chandigarh: Madhya Marg, Key Paper, Centre for Research in Rural and Industrial Development.
- Hediger, W. 2000. 'Sustainable development and social welfare.' *Ecological Economics* 32:481-492.
- Joss, S. 2011. 'Eco-cities: The mainstreaming of urban sustainability: key characteristics and driving factors'. *International Journal of Sustainable Development and Planning* 6(3): 268-285.
- Kenworthy, R. J. 2006. 'The eco-city: ten key transport and planning dimensions for sustainable city development.' *Environment and Urbanization* 18 (1): 67-85.
- Mahalaya, Chatterjee. 2010. 'Sustainability of urban areas: A holistic approach.' In Kamal Pal (ed.), *Sustainable Development and the Role of Government*. Kolkata: Nath Publishing.
- May, Hald 2009. *Sustainable urban development and the Chinese eco-city: concepts, strategies, policies and assessments*. Fridtjof Nansen Institute Report, 5/2009.
- Naess, Peter 2000. 'Urban planning and sustainable development.' *European Planning Studies* 9(4): 1-22.
- Pearce, D.W., A. Markandya and E.B. Barbier 1989. *Blueprint for a green economy*. London: Earthscan.
- Roseland, Mark 2000. 'Sustainable community development: integrating environmental, economic, and social objectives.' *Progress in Planning* 54: 73–132.
- Shechter, M. 1995. 'Valuing the environment.' In Hans Opschoor (ed.) *Principles of environmental and resource economics*. Edward Elgar Publishing. Pp.177-200.
- Sridhar, K. S., A. V. Reddy and P. Srinath 2010. 'Is it push or pull? Recent evidence from migration in India.' *SANEI Report*, 10-2004.
- Tisdell, C.A. 1991. *Economics of environmental conservation*. Amsterdam: Elsevier Science Publishers.
- UN Habitat 2004. Urban indicator guidelines: monitoring the habitat agenda and the millennium development goal, UN- habitat, Nairobi, Kenya. Accessible at: http://www.unhabitat.org/programmes/guo/documents/urban_Indicators_guidelines.pdf.
- United Nations 2007. Indicators of sustainable development: guidelines and methodologies. New York.
- United Nations 2008. World urbanization prospects (2007 revision). New York: UN.
- World Commission on Environment and Development 1987. 'Our common future.' New York: Oxford University Press.

Internet References

- http://puda.nic.in/img/approved_masterplan_files/Mullanpur_rpt_2011.pdf
- <http://google image of Eco-city>
- http://censusindia.gov.in/2011-provisional/paper 2/data files/India/Rural_Urban_2011.pdf
- <http://www.fni.no/doc&pdf/FNI-R0509.pdf>
- <http://www.upv.es/contenidos/CAMUNISO/info/U0511247.pdf>
- <http://www.mapsofindia.com>

Part III

Sustainable Rural Environments and Food Security



THE STRUGGLE FOR FOOD SOVEREIGNTY:
A GLOBAL PERSPECTIVE¹

Thomas Reuter

Introduction

This paper provides a general introduction to the topic of food sovereignty and food security from an anthropological perspective. It is not designed primarily for experts in this field but for social scientists interested in contributing toward a solution to what is arguably one of the most pressing challenges of the 21st century. The paper illustrates that food is as much a social and political science issue as it pertains to agriculture, biology, and other food-related natural sciences.

Land, water, seeds and agri-‘cultural’ practices are the inseparable key elements of all food production systems, and all interventions in any element of a food system have socio-political and economic consequences for all who depend on it. These human consequences are most effectively conceptualised in terms of the degree of food sovereignty the system delivers to participants. Food sovereignty is herein defined as *the capacity of a people to feed themselves and their children in perpetuity by virtue of having sovereign control over land, water and seeds, as well as the knowledge and practical capacity to employ a sustainable agricultural technique that is appropriate to the local environment and climate.*

The term food sovereignty was coined in 1996 by Via Campesina, a small farmers’ movement protesting the corporatisation of agriculture and promoting sustainable, farmer owned and managed eco-agricultural systems at a local level.² Within this paper, however, food sovereignty is also considered more broadly as an aspirational principle with relevance on a planetary scale, at national and sub-national levels, and even for individual communities and households. While it is unrealistic to expect every community and household to be completely food sovereign, it is certainly possible even for urban dwellers to take significant steps to empower themselves with regard to their food supply (Edwards 2014).

The food sovereignty concept promotes awareness of our utter dependence on local ecosystems for survival, and thus belongs within a broader ‘green shift’ in contemporary cosmology. In denial of our inescapable human dependence on nature, the dualist, transcendentalist cosmology of modernism has long placed humanity outside and above nature. This antiquated ‘modern’ cosmology still underpins today’s corporate global food system, and the dominant, neoliberal model of political economy by which it is legitimised. Food sovereignty favours the less transcendental cosmologies that have inspired many traditional ways of life for millennia, and are still relevant to people in countries like Timor Leste, the main case study for the broader research project on which this paper draws. In this era of ‘late’ or ‘second modernity’ cracks are appearing in the dominant modernist paradigm, however, that make such traditional ways of life appear in a new light. Newly conceptualised but similarly non-modernist cosmologies are now emerging from the findings of the science of ecology and amidst growing fears of a global eco-system collapse. Ecological research is showing that the cumulative effect of a modernist approach to life, of which the massive industrialisation of agriculture over the last century is a key component, has resulted in a gradual ecocide that is also collective suicide. Human (food) security is possible only within sustainable ecosystems. Ecological science thus leads a moral conclusion: The survival of this planet depends on our capacity as a society to habituate sustainable practices and criminalise ecocidal practices.

To describe the juggernaut of the neoliberalism-inspired and corporate-dominated global food system that still expands today to engulf those traditional local food systems that still remain, despite all the insights of ecological reasoning and despite the scientific evidence of an impending ecological crisis, is the main purpose of this paper. For social scientists it is easy to see that food sovereignty is not about meeting the ecological imperatives of our primary dependence on nature alone. Achieving food sovereignty also requires us to be mindful of the social organization and politics of particular food systems, local or global, an area of study that anthropologists have much opportunity to apply themselves to. Apart from exposing practices harmful to nature, the goal herein is thus to question policies and corporate strategies that are harmful to society by disempowering farmers and threatening the health and food security of consumers.

The relationship between Food Sovereignty and Food Security

Food security is a more widely used term in agricultural development and defence policy literature, and refers more broadly to the reliability of our food supply. Food sovereignty is recognised as a major component of food security, though in this literature it tends to be defined narrowly in economic terms – as the self-sufficiency rate (S). This is a measure of the amount of local food production as a proportion of overall food consumption. The literature often fails to note that food sovereignty is a political issue, and that it always reflects the more generally prevailing power relations within and between societies.

Food security rightly looks beyond food production, sovereign or otherwise, and recognises that localised food supply risks are greatly mitigated by the option of food trading. Food trade is commonly refereed to as the external dependency rate (1-S). What this refers to is generally the dependence of nations on food imports, but the idea can also be applied to regions, communities or households. Such dependence is routinely tolerated on the silent assumption that there is sufficient surplus food being produced by other individuals and nations and available for purchase in the market at an affordable price, now and in future. As we shall see, this is a false assumption.

Food security is achieved when food sovereignty – which I have defined as a well-managed state of primary interdependence with nature – is either complete, or securely supplemented with a food-surplus-exchange safety net, which can be defined as a well-managed state of secondary, social interdependence. The current mechanism for the regulation of this secondary dependence is ‘the market.’ My contention is that neither our nature dependence nor our social dependence is well managed in today’s world, and that this dangerous state of affairs needs to be rectified urgently.

While I advocate for boosting local food sovereignty in sustainable ways, it is not my aim to belittle the value of a food exchange safety net. Food trade or aid can be, and at times has been, used to compensate for acute or chronic deficits in local or national food sovereignty. Such compensation is more important now than ever. New food surplus and deficit patterns are likely to emerge suddenly in unexpected places under changing climatic conditions in the 21st century, and food trade will be crucial to mitigate such unpredictable local production risks. At the same time, increased social interdependence for food security increases already substantial and potentially deadly trade risks. It is in this context that we must

consider the deleterious effect of a neoliberal, corporate-owned global food system on human food security.

The Global Industrial Food System: Trade and Production Risks

Large-scale agricultural production and globalised food trade dependence entail certain structural risks. They reduce local food sovereignty, and transfer this sovereignty to the corporations who run the production, processing and trading of food. Today's under-regulated and increasingly monopolistic global food system is showing some extremely dangerous trends. Even in the absence of a global supply shortfall, it has condemned close to a billion non-consumers – the world's poorest – to starvation throughout the last century. In the likely event of catastrophic climatic and environmental change this century, many who still feel well served by this system today may come to discover its true nature. As I shall show, the system is already posing severe environmental and public health risks today, and is also threatening democracy and international peace.

One of the production risks of the global food system stems from the alienation it produces. Procuring food from the global market rather than producing it locally means that we are transfer our responsibility for ensuring a well-managed dependence on local natural environments, to others in often very distant localities. Conversely, export food producers are alienated from distant consumers whom they will never meet. Long supply chains thus create an emotional gulf between consumer and producer, product and productive environment. Many consumers never see and lack awareness of the negative impacts of industrial food production practices on the environment. Such risks ought to be communicated to consumers to allow them to share responsibility and help shape the industry with well-informed consumer choices. Massive lobbying by industrial food producers against regulatory regimes, misleading advertising by processed food manufacturers and market domination by giant retailers ensure that this is not generally the case. Many industrial farms and processing plants are also off limits to the public to prevent the exposure of questionable practices by activists. This alienation causes ignorance, denial and political paralysis.

The global food market is overwhelmingly price-driven and quality-blind, discourages responsible farming and food processing, and thus poses a second serious production risk in relation to human health. This is

not a question of consumer awareness, but reflects the fact that insufficient high quality food is produced to reduce its price. What high quality food there is caters to a boutique market of the most well-informed and wealthy consumers only. Thus the global food system condemns the majority of human beings to an unhealthy diet and another, substantial proportion to starvation. While today more than a billion people suffer from malnutrition due to being underfed, ironically another two billion suffer from malnutrition due to being overfed with high-calorie food lacking in essential nutrients. As Vandana Shiva (2007:82-83) puts it, 'for the first time, the number of children suffering from obesity is about to outnumber those children suffering from hunger.'

It is the global food system that stocks the shelf, and it presents consumers with an ever-narrowing range of increasingly meaningless choices. What choice is there if the supermarket offers ten varieties of muesli bar, yet all are made in the spirit profit maximisation that dominates the food industry, and hence contain 30% sugar or more? In some urban areas, so-called 'food deserts', healthy alternatives are altogether unavailable (Wrigley 2002). Diet-related diseases such as diabetes and allergies are proliferating. For example, before the Second World War less than 0.4% of people in Germany suffered from Diabetes Type 2 but by 2009 the proportion had risen to 10%; a 25-fold increase (Blech 2009:133). This suggests that most people in affluent countries can no longer afford to reach the definition of food security put forward by the 1996 World Food Summit:

Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life' (UNFP 2005:4).

Under-regulated markets reward primary producers for using environmentally unsustainable practices and for mass-producing cheap, unhealthy food. Final payment of the environmental damage bill for industrial agriculture is deferred to future generations, and the cost of junk food promotion is externalised in the form of public health epidemics such as diabetes and obesity.

A third systemic production risk is that the international food trade tends to destroy local food production capacity. This is not a 'free market' effect based on local inefficiency. Often imported food products compete unfairly, by relying on state subsidies or tax breaks at home or on cost cutting, destructive farming methods. Such food dumping depresses demand for 'more expensive' local produce and destroys local food

systems. As well as creating ever-larger zones of external food dependence, this also has a detrimental effect on the overall global food supply. Once it has been lost, reviving local food production can be very difficult. Citing market principles it is often assumed that as prices rise again, local production will resume, but in reality a temporary loss of local food production often goes hand in hand with a permanent loss of local skills, land and other means of production. This is a particularly serious problem in the case of indigenous people's agricultural systems, many of which are non-industrialised and in no position to match the unfairly low price of mass-produced factory food or to effectively market their high quality organic produce to niche markets (unless they are fortunate enough to have access to fair trade networks).

A fourth and perhaps the most important risk for our corporatized global food system is political and trade risk, which I shall explore in depth later. Social dependence of food trade is intrinsically risky in a scenario where behaviour is driven solely by profit motives. Global food supplies will be decimated by the now inevitable impacts of climate change and other environmental and resource bottlenecks, and the 50% increase in world population scheduled to occur by mid-century. It is foolish to assume that food, healthy or otherwise, will continue to be traded at affordable prices under these conditions. During a major food crisis, prices will rise and most ordinary people will find themselves excluded.

Decoupling Food Security from Food Sovereignty: A False and Fading Hope

The serious food trade risks and market failures described above have not been adequately recognized in public discourse. The international trade in food is still more often heralded as a positive development because it appears to have eradicated famine, at least among the more affluent populations of the developed world, and sometimes in developing countries. Defenders of unregulated food trade point out that the declining food sovereignty of individuals and of many countries has not reduced global food security despite enormous population growth in the second half of the 20th century. There are two reasons why this decoupling of food security from food sovereignty has temporarily appeared to be 'successful': the 'green revolution' and the 'transport and logistics revolution.' As we shall see, both are risk prone and unsustainable, at least in their present form.

Countless individuals today have no personal food sovereignty at all

and yet enjoy a considerable degree of food security, for the time being. This situation is the result of a gigantic shift in the social division of labour in the wake of industrialisation, marked by a radical drop in the number of people actively engaged in agriculture.³ We are now witnessing the final stages of this staggering socio-economic transformation. Billions of small farmers and farm workers have relocated from the countryside to urban centres where they have become wage earners and consumers, and continue to do so in countries like China and India. This massive urbanisation was made possible by the mechanisation of agricultural production, reducing the need for human labour and favouring the consolidation of small farms into ever-larger land holdings for economy of scale, particularly in the production of major crops such as wheat or maize. This industrialisation of agriculture is sometimes uncritically referred to as the 'green revolution,' in recognition of the increase in food production it has indeed delivered.

The down side of this industrialisation, however, is that it has gone hand in hand with the bulldozing of vast forest tracts, the massive use of energy intensive and high impact mechanised monoculture cultivation, unsustainable levels of irrigation, heavy use of chemical fertilizers, herbicides and insecticides, the genetic manipulation of food crops and the marginalisation of small farmers. While industrial agriculture has thus temporarily fed a growing world population, it has gone hand in hand with urbanisation, biodiversity loss, water table depletion, soil erosion, salinity and nutrient depletion, fertiliser run-off into waterways, the loss of pollinating insects and significant carbon emissions. These are just a few of the environment impacts that are now bringing the honey-moon period of the 'green revolution' to a bitter end, in tandem with other causes of ecological collapse.

National governments have recognised these market failures to some degree and have regulated against some of the most deadly threats generated by this system, such as the US ban on DDT in 1972. Such isolated regulatory measures, however, tend to mask its failures rather than remedy the system as a whole. It will be impossible to mask the long-term consequences of industrial food production.

The decoupling of food security from local food sovereignty in the global food system further relies on modern transportation technologies, storage infrastructure and logistics, which make the large-scale and long-distance export and import of goods possible and seemingly inexpensive. This transport revolution has facilitated (among other things) a global food trade network. This has been very helpful indeed and much

celebrated. It has contributed to food security, sometimes in spectacular fashion, by compensating for temporary or chronic local food production shortfalls that, in former times, triggered local famines or kept population densities permanently low in some regions. But while international food trade has the potential of serving as a secondary layer of food security beyond self-reliance, and to do so in perpetuity, it will not fulfil this potential in its present, under-regulated and unsustainable form.

One major impact of the transport revolution on public health is due to the fact that fresh food is difficult and expensive to carry over great distances. Apart from the energy intensive option of airfreight, food preservation is imperative for long distance trade or longer-term warehouse storage, and has encouraged the rise of a massive food processing industry. Some forms of food preservation, such as drying, are relatively safe, but many others involve the use of unhealthy chemical and physical treatments, and all involve nutrient loss. Thousands of chemical food additives have been introduced by the food processing industry, while consumer organisations are fighting a perpetual battle for the banning of the most toxic and carcinogenic of these additives and the proper labelling of others (Chapman 2014). Massive overuse of such traditional preservatives as sugar, salt and oil, meanwhile, has also altered the diets of billions of people for the worse. Physical treatments include high-energy-input heating or cooling methods, irradiation and the use of non-renewable, petro-chemical packaging materials. Again, civil society organisations have had some success in pushing for the use of recyclable packaging, for example, but the massive accumulation of micro plastic waste in our oceans and in marine organisms (Cózar et.al 2014), in this case, shows that such steps have often been too little, too late.

Furthermore, the transport revolution has been reliant on the massive use of non-renewable fossil fuels. The energy cost of food increases with the length of supply chains and with the speed of transportation, as does its carbon footprint. Until an alternative source of energy suitable for the purpose of transportation is found and implemented, the transport revolution is unsustainable on these grounds alone.

Decoupling food security from food sovereignty through the green and transport logistics revolutions – reliable as the supply of food may have been until now, for those with sufficient cash – has come at the expense of the environment and public health, and is failing as this honeymoon period is coming to an end. But that is not all. The global food system is also likely to become a severe political risk for all of us unless the global food system is completely redesigned. This risk is systemic, and hence

the political economy of the world food system needs to be examined in greater detail before any solutions can be considered.

This is a highly complicated matter because the contemporary era is marked by a contest of power in some areas, and collusion in others, between corporate globalism and the nation state, or more precisely, the large, single nation states or state alliances (such as the EU) that act as regional hegemony in today's multi-polar world order.

The Coming Food Crisis, the Nation State and the Global Food Cartel

The dependence character of the global food system has only recently become tangible to members of the still seemingly food-secure majority of the human population. The primary trigger has been the fact that the “local” ecosystem of planet earth, and with it the world food supply, is reaching natural supply limits and is showing signs of collapse. A global food supply deficit is almost certain to arise due to global warming and numerous other drivers of ecosystem failure (Cribb 2010). At the demand end of the food market the trend is toward steady increase resulting from global population growth, increasingly meat-based and energy-intensive diets in industrialising societies like China, and the reallocation of food to motorcars in the form of biofuels (Busicchia 2012). Food import dependence will be a growing risk under these conditions, as cooperation and trade give way to resource competition and hoarding. The prospect of a global food trade collapse, in the absence of any binding world food-solidarity agreement, is already causing a food panic in many policy circles.

Food sovereignty is an indispensable, core constituent of material power. As veteran American imperial strategist, Henry Kissinger, once noted, while explaining his desire for US domination of the global oil market and food trade: “If you control oil, you control nations. If you control food, you control people” (cited in Engdahl 2007:42). This statement hints at the changing role of the nation state.

Traditionally, the state has been regarded as a defender of the people against the military or economic incursions of other nation states, and also as guarantor of the rights of the public against the political and economic incursions of powerful private interests at home. For the purpose of an analysis of the global food system, this has meant and still does mean that the more powerful nation states have managed to ensure a steady food

supply domestically, often at the expense of other nations. I will refer to this attitude and associated strategies as ‘food nationalism.’

As political parties and the state as a whole became more dependent on and susceptible to powerful private financial interests, however, it became less able and willing to protect consumers against corporate incursions at home (Wright Mills 1956). For the food system, this has meant insufficient regulation of food production and processing, allowing a network of large multinational corporations to externalise much of the cost of the worldwide environmental and health impacts of their profit-maximising practices. I regard this corporate network as a ‘global food cartel.’

We thus have a highly ambivalent situation whereby the state still acts as expected internationally, but where this protection is losing much of its relevance. While nation states will protect their domestic populations for the sake of political stability, by taking what they can from other nations, the scene is set for the domestic poor to suffer the same fate as the global poor, in a corporate market system based on a ‘user pays’ principle, especially under crisis conditions. Major corporations’ residual commitment to the nation states in which they began their operations is secondary to this profit motif, as is well illustrated by the use of corporate profit shifting to tax havens to the detriment of public revenue (Giessen et. al. 2013).

Food Nationalism

With these caveats in mind, we can now look at the emerging national food security policies. The strategic risk of the emerging food crisis is so great that defence ministries have indeed begun to treat food insecurity as a primary national security threat. The Australian government, for example, announced a ‘National Food Plan’ in 2012, to identify and mitigate food security risks.⁴ National food security plans recognize not only that food trade can be interrupted in the traditional manner, by an act of war or as an indirect result of war (military supply chain disruptions or trade embargoes), but are starting to recognize also the danger of systemic abuse of monopoly powers by corporations and speculation by banks, especially under the crisis conditions of climate change. The danger of inadequate food sovereignty is conceived rather more narrowly within security policy discourses than I have defined it above, namely as a national quest for short-term self-sufficiency by any means, sustainable or otherwise.

In the world’s wealthiest nation states massive protection schemes have long kept domestic farmers and agribusinesses afloat by means of direct

subsidies, income tax breaks, market protection though capricious quarantine-based food import restrictions, and numerous other means. Many nations and regional alliances, such as the EU, have used import quotas or levies to keep local food production capacity high through times of plenty. Such national strategies to protect domestic farmers are now becoming a priority, and apologies for violations of free trade principles are becoming fainter when it comes to food.

We also witness the rise of new strategies in the response to the first regional climatic disasters. Levies, quotas or all out export bans are now being imposed with increasing frequency by food-exporting nations in the wake of local climate driven crop failures, keeping prices comfortably low domestically while driving up prices on the global market and thus excluding more people in the poorest countries from access to food (e.g. see Javier 2010). This serves as a grim warning to food import-dependent nations.

Not all of the new food security strategies are defensive, however. A global land grab is now under way in Third World countries, for example. This land grab is driven by western agribusiness corporations and aided by the development policies they impose through collusion with captive national and foreign development agencies.⁵ In Timor Leste and elsewhere, these policies employ Hernando de Soto’s neoliberal strategy for the dispossession of rural populations under the guise of ‘legal empowerment of the poor’ (Soto 2000). The recent rush by Chinese government-owned enterprises and by South Korean and Indian corporations to participate in this green rush hints at broader geopolitical strategic concerns, fuelled by rising fear of global food and water shortages. These fears are clearly reflected in the World Economic Forum’s most recent findings on global risk perception (WEF 2012:4).

The dominant response to the threat of a global food crisis is thus to adopt the attitude that the easiest way to gain food security in the face of impending scarcity is to employ ever more ruthless forms of self-interested behaviour. The idea is to hoard rather than share one’s own food supply, and to use money or force to secure food elsewhere. Starvation is held to be acceptable, so long as it happens elsewhere. Malnourishment of ‘the masses’ at home, due to consumption of unhealthy, low quality, industrialized food, is also deemed acceptable so long as the wealthy can access organic food if they wish (Cummins 2011). This response is irrational because such a short-sighted risk-externalisation strategy contradicts the social principle of risk sharing so fundamental to all forms of insurance-based security, and to civilised life in general. It is also unreasonable

in a much deeper sense, because abusive practices violate the human dignity of victims and perpetrators alike, replacing civilisation and peace with brutal competition and a rule of terror.

The giant food corporations oppose national governments' push for greater food sovereignty, but for reasons of their own. They brand defensive food sovereignty strategies as protectionism and a violation of the neoliberal trade liberalisation principles they espouse. Some forms of food nationalism are indeed predatory, as we have seen, but what is the alternative the corporate globalists have to offer?

The Global Food Cartel

As an unintended side effect of the industrialisation of agriculture and the internationalisation of the food trade, the means of food production (land, water, fertilizer, herbicides, pesticides, insecticides, genetically-modified or hybrid seeds and associated patents) and the means of food trade (transport, logistics, financial resources and market institutions) increasingly have come to be owned and controlled by a very small number of for-profit organizations or 'corporations'. The problem is not free trade, but unfair and non-transparent production and trade practices and cartel formation.

Corporations extract an unfair profit from food; unfair, for example, in underpaying or undercutting farmers to the point of bankruptcy so they can buy up their land, unfair in treating as mere externalities the horrendous costs of reckless practices that destroy the natural environment and the health of consumers; unfair in exploiting finite food resources (such as ocean fish) to the point of destruction without incurring any liability, unfair in raising global market prices for food to maximise profits at the expense of consumers, especially the world's poorest, and unfair in using cartels to undermine the competition that might otherwise keep food prices in check. Costs are externalised and shared with everyone, while unfair profits are internalised. This is a system for controlling food for profit and for the domination of others.

The corporate cartel that now owns and operates all elements of the global food supply chain is the main beneficiary of industrial agriculture and food processing, and thus responsible for its impact on the environment and public health. Holding the food cartel accountable, however, is not going to be easy. Nationally, the legislation that sets limits on toxins in food and mandates the labelling of food that carries special risks (such as GM food) is weak in most countries, thanks to the powerful lobby

of these corporations. The legal system does provide some recourse to consumer groups, but due to the high cost of legal battles the system as a whole favours the corporations. Internationally, the Westphalian system of nation states is ill equipped and too susceptible to money politics to contain the multinationals (Rothkopf 2008:241-257). A recent illustration of the extent of corporate power at this level is the push for ratification of the Trans-Pacific and Trans-Atlantic Trade Agreements, which would eliminate national sovereignty in matters of consumer protection, such as food labelling. This free trade agenda is advanced primarily by corporations, acting in the collusion with the US administration, while civil society groups and many members of parliament on both sides of the Atlantic oppose the treaties.

The issue of food sovereignty takes on a new meaning in a world where a few corporations have control over the lives of billions of people, and yet the system now in place is so ubiquitous as to be almost invisible. People for whom food is something to be found in the shelves of supermarkets and in highly processed form find it difficult to appreciate the fact that our food supply depends on us all maintaining a balanced relationship with our natural environment, and a politically fair relationship with one another. Unconsciously, we are also loath to question those who feed us, so long as they do, and no matter how they do it.

Given that corporations have tended to amalgamate over time, a consolidated global food cartel is now within close reach across many sectors of production and trade. A pertinent example is the trade in grains, the most important of all food groups. The largest grain companies are *Cargill*, *Continental*, *Louis Dreyfus*, *Bunge & Born*, *André*, *Archer Daniels Midland / Töpfer (ADM)* and *Glencore*. The first five of the companies are privately owned by billionaire family businesses that issue no public stock or annual reports. Revenues of these giant grain traders have doubled between 2005 and 2011 (ABC 2013). *Cargill* and *Continental* alone control about half of the world's grain trade, and acquisitions continue.

This trend toward 'industry concentration' is visible across the global food system (Shields 2010). At the food processing end, for example, three corporations own more than half of the flour milling industry in the US, while at the agricultural input end, most of the U.S. corn seed market is controlled by only two corporations, as reported by Hendrickson and Heffernan (2007). These authors provide very telling statistics across multiple sectors of the food system, which illustrate the trend toward ever increasing concentration within and across these sectors of the food

system. This trend may have originated but is not confined to the US. For example, only four seed firms, DuPont (Pioneer), Monsanto, Syngenta and Limagrain have about 29% of the global market for commercial seeds (UNCTD 2006).

Note that formal mergers are not always needed. Transnational corporations are also able to manipulate the market and escape the scrutiny of federal anti-trust regulators through ‘non-merger alliances.’ In April 2002, for example, the two largest seed corporations and arch rivals, *DuPont* and *Monsanto*, announced that they would henceforth swap their agricultural technologies and drop all pending patent lawsuits between them (Mertaugh 2003).

Cross-sector cartel formation is also progressing rapidly. For example, in December 2010, *Agrium*, a Canada-based multinational that had started out in fertilizer production, acquired a major grain trader, the *Australian Wheat Board*, for some \$1.2 billion Australian dollars. Sidestepping anti-trust regulations, about 40% of these AWB holdings were then sold on to the world’s leading grain seller *Cargill*. *Cargill* in turn is the largest privately held company in the US,⁶ and beyond grain selling and milling, has a very large stake also in the beef, pork and turkey packing and animal feed industry. *Cargill* is in turn a key supplier to *Walmart*, the largest publicly held corporation in the world. A very recent case is a pending acquisition bid by ADM for Australia’s biggest agribusiness, *GrainCorp*, which the ACCC approved on 26 June 2013.

Although this is a convoluted and intimate set of relationships already, I am here simply scratching the surface to encourage others, more qualified in the study of corporate strategy than I, to please continue the detective work. A core issue worth exploring further is the financing of the food cartel, for example. Behind many of the giant corporations that make up the global food cartel are the international investment bankers who direct global credit flows. One banker strategy to maximize investor returns is to reduce competition between their corporate clients operating in the same sector, by encouraging mergers or anti-competitive behaviour. Why indeed should two companies compete if the same people own them? Banks also routinely profit from hunger by speculating on rising prices of food and agricultural land (Itzamná 2012), knowing very well that to do so can cause severe suffering or death among the world’s most disadvantaged people. Citizens’ movements have sought to expose this behaviour and staged global petitions, calling on *Deutsche Bank* and other banks to stop ‘playing’ the food futures market.⁷

The potential for totalitarianism inherent in the food and other global

resource cartels is tremendous, given the reality of money politics and the prevalence of political outsiders in leading government positions in the US and many other ‘democratic’ countries, including in the very agencies set up to watch out for and protect the public from cartel formation. This business model is irrational and endangering everyone, for as John F. Kennedy (1961) said: “If a free society cannot help the many who are poor, it cannot save the few who are rich.” Today’s sociopathic global food system needs to change direction, quickly, but what hope is there to contain or civilise corporate power?

It may be helpful here to look at history, which shows that the issue of corporate cartel formation is not a new problem. A century ago in the US, during the administrations of Roosevelt and Wilson, anti-trust reforms were introduced to curb corporate cartels, culminating in 1906 with the break up of Rockefeller’s giant company Standard Oil into smaller companies known as the seven sisters. This did not ruin the oil industry, nor did it ruin consumers. It was an appropriate policy intervention to try and address a serious market failure.

Today the situation is more acute. Several of the ‘seven sisters’ are now bigger than Standard Oil, Exxon for example. Today’s giant transnational corporations are indeed beyond the reach of national legislators, and any anti-trust action against them therefore needs to be international. The international institutions we already have today in theory could achieve this (Camilleri and Falk 2009), however they still lack a strong enough political mandate to do so, as nation states bicker among themselves or cave in to lobbying.

Another possibility is corporate self-restraint. Individual members of the corporate elite, however, are not free to transform the system of which they are a part.⁸ CEOs are compelled by investor pressure to retain a primary focus on profit, with some green twigs showing in the form of Corporate Social Responsibility, Ethical Investment and similar discourses calling for more social engagement. Although they do network and collaborate, and are beginning to discuss issues such as food security and inequality at the World Economic Forum in Davos and elsewhere, the capacity of the private sector to elicit systemic change is limited because it too lacks a political mandate to take charge of global challenges.

The problem is, in one word, systemic, but how can it be resolved? Firstly, at the political level, the preceding discussion shows that there is an urgent need for democratically mandated, accountable and transparent global institutions that have the capacity to regulate global markets for key commodities, especially food, and to counteract monopolistic tendencies

and abuses of power by private financial interests or resource wars between state actors.

While such global governance is still lacking, protecting or restoring their food sovereignty will continue to be the strategy of choice for most nations. The danger is that such thinking degenerates into competitive food nationalism. Operating on an uneven playing field, this competition will disadvantage poorer nations and their citizens. Nor will it suffice to protect rich nations from the long-term effects of an unsustainable, corporatized and self-serving global food system.

The Food Sovereignty Movement: An Alternative Response to the Food Crisis

A grass roots ‘food sovereignty movement’ has emerged within civil society over the last two decades whose leaders are calling for a shift toward the food sovereignty end of the food security equation at national, local and household levels. The argument is that contributions to sustainable food production can and need to be made at all of these levels. This is a rational response in that enhancing food sovereignty is a practical steps by which food-import dependent nations, regions and households can reduce their own dependence, and reduce also the upward pressure their dependence puts on world food prices, and on the growing number of people priced out of the world market. The basic assumption is that everyone ought to take some responsibility for food production by way of local, regional and national initiatives, to the best of their ability and for the sake of their own physical, psychological and spiritual well being. It is also a rational response because it rejects the centralisation of power over food, land and water – and hence over life and death – in the hands of a few privately owned and democratically unaccountable conglomerates.

The global monopolisation of food sovereignty, and of sovereignty at large, in the hands of a few is still escalating. The frontier of the global food juggernaut lies in developing nations, where anthropologists do much of their research. The foreign development and aid industry operating in these nations, in Timor Leste and elsewhere, still keeps pushing for the transformation of local agriculture, to become more like that of developed nations and hence part of an increasingly seamless industrialised and de-localised food system. The familiar methods include land grabbing, water privatisation, seed monopolisation, the hard sale of chemical inputs and hybrid seeds, farmer bankrupting through food dumping,

retail market domination through chain store proliferation, and other strategies of local food system destabilisation and acquisition. Thus the sustainable and socially responsible food systems of traditional societies are destroyed and associated local knowledge is lost. A wealth of locally adapted food plant varieties is displaced with a few introduced hybrids, or is genetically modified and patented by biotech corporations like *Monsanto*, something food activists think of as bio-piracy. The civil society movement that began with Via Campesina, however, is responding to this threat in similarly global fashion, inspiring local NGOs all over the developing world (such as ETAN in Timor Leste) to take up the fight for food sovereignty in their countries.

A weakness in the food sovereignty movement’s discourse, however, is that this very reasonable ‘responsibility localisation strategy’ is insufficiently distinguished from aggressive forms of food nationalism, such as food export restrictions imposed for the convenience of local consumer that cause outright starvation elsewhere. This lack of distinction may stem from a fundamentally critical attitude toward the global food trade, as it is now. Suspicion toward trade dependence can make it difficult for food sovereignty advocates to appreciate the merit of, and indeed the necessity for, a global trade safety net in order to achieve food security in a destabilised global ecosystem and under conditions of rapid climatic change.

It is well worth considering here the potential benefits of a global food security treaty, based on a moral principle of human solidarity and a pragmatic logic of mutual insurance in the face of an unpredictable climate future. Such a treaty would build on a firm foundation of maximal self-responsibility through the universal application of food sovereignty principles, and would also deal with the major dislocation and resettlement issues that are likely to arise.

Conclusion

With the industrialisation of agriculture we have moved from conscious, local eco-dependence to an alienated form of dependence on money to buy food in the supermarkets that are the shop fronts of today’s global corporate food cartel. Thus we are linked – whether we know it or not, through ever longer and more complex supply chains – to the global market as a whole, but disconnected from the life process which is always local, ‘here and now.’ The full psychological, ecological, social as well as spiritual cost of lacking a direct connection to the process of food production, to

nature and to life itself, both outside and within, is hard to fathom. Suffice to say that such alienation from the life process is an important aspect of a more general psychopathology we see at work in the political economy of today's late modern world (Farmer 2003; Pettman 2012).

Rather than encourage self-reliance and open-minded research into more efficient and sustainable agricultural practices to meet the challenge of an emerging food shortage, such alienation produces a sense of entitlement without responsibility. It favours land grabbing and other aggressive or more covert schemes to gain control over resources that rightly belong to others in order to address the food security concerns of one's own nation or household. The local or indigenous people that anthropologists often work with are strongly represented among the casualties. This pathological attitude needs to change if we are to avoid a race to the bottom and a collapse of civilisation.

Enjoying food sovereignty, on the other hand, is a great asset for any nation, community or household. Having sovereign control of an ample and steady food supply alleviates feelings of fear and aggression, and engagement with food production engenders a deeper appreciation for nature. It gives people a well-grounded sense of self-confidence and connection to nature, and it makes them benevolent and hospitable to others because they can afford to be so. Sharing our surplus in times of crisis can be understood in anthropological terms as an act of global commensality, a principle that has long served human beings to establish a sense of community and shared identity with others; a social act that even animals are able to understand. A fusion of the principles of food sovereignty and food sharing thus inspires the very best in us as human beings, and will best prepare us for the food crisis we are likely to face in the coming decades, as the world is heading for four degrees of global warming (Whitmore & Hopkin 2014).

Notes

- 1 The paper is part of a larger project on food sovereignty in Timor Leste. I would like to acknowledge the contribution of Dr Balthasar Kehi, who has worked on this project as a research assistant. Dr Kehi grew up in the western part of East Timor.
- 2 A history of Via Campesina is provided by *Food First: News & Views* (Spring/Summer Issue 2005, No 28(97):2), in an anonymous article entitled 'Global Small-Scale Farmers' Movement Developing New Trade Regimes.'

- 3 On the history of agricultural industrialization in the United States, I refer to Ikerd (2008:342).
- 4 <http://www.daff.gov.au/nationalfoodplan/national-food-plan>
- 5 An excellent, anonymous report on this global land grab was published in *Le Nouvel Observateur*, 24 December 2008, pp. 8-13, entitled: '20 millions d'hectares sur le marché. A vendre: pays pauvres' (20 Million Hectares on the Market: Poor Countries for Sale).
- 6 Incidentally, Cargill has been accused by Greenpeace of profiting from large-scale deforestation in the Amazon basin and from the human trafficking of 'bonded laborers' to cacao plantations in Africa. This case illustrates the human costs of a profit oriented corporate food system.
- 7 A relevant report by the consumer organization *Foodwatch* is: 'The Hunger-Makers: How Deutsche Bank, Goldman Sachs and Other Financial Institutions are Speculating With Food at the Expense of the Poorest.' http://foodwatch.de/foodwatch/content/e10/e45260/e45263/e45553/foodwatchreport_TheHungerMakers_observationsandcallsforaction_ger.pdf. Another report from *World Development Movement* is: 'Stop bankers betting on food.' Downloaded November 2012, <http://www.wdm.org.uk/food-speculation>
- 8 In coming to this conclusion, I am drawing my own extensive ethnographic research on the national elite of Indonesia, between 2008 and 2013. This research has convinced me that it is unhelpful in most cases to blame individuals for systemic conditions. Nevertheless, individual elite members can contribute to cultural change in their sector.

References

NB: See endnotes for anonymous Internet references.

- ABC 2013. *Against the grain*. Background Briefing, Australian Broadcasting Corporation, Radio National, 16 June 2013, 8:05AM. <http://www.abc.net.au/radionational/programs/backgroundbriefing/2013-06-16/4751634#transcript>
- Blech, J. 2009. Geheimnis der Gesundheit. *Der Spiegel*, Issue 40, 26.9.2009.
- Busicchia, B. 2012. Crops hit by drought and bio-fuel policy: Another food price crisis? *The Conversation*, 1 August 2012. <http://theconversation.edu.au/crops-hit-by-drought-and-biofuel-policy-another-food-price-crisis-8557>
- Camilleri, J. A. and J. Falk 2009. *Worlds in Transition: Evolving Governance Across a Stressed Planet*. Cheltenham (UK): Edward Elgar Publishing.
- Chapman, K. 2014. 'Industry winning the fight against better food labeling.' *The Conversation*, online, 4 February 2014, 6.12am AEST. <http://theconversation.com/industry-winning-the-fight-against-better-food-labelling-22472>
- Cózar, Andrés et. al. 2014. 'Plastic debris in the open ocean.' *Proceedings of the National Academy of Sciences of the United States of America*. 111(28):10239–10244.

- Cribb, J. 2010. *The Coming Famine: The Global Food Crisis and What We Can Do to Avoid It*. Sydney: CSIRO Publishing.
- Cummins, R. 2011. The Organic Elite Surrenders to Monsanto: What Now? *Organic Consumers Association Newsletter*, Jan 27, 2011. http://www.organicconsumers.org/articles/article_22449.cfm
- Edwards, F. 2014. Gleaned, Grown and Gifted: The significance of non-capitalist food economies for food security, sustainability and social change towards the productive city. Australian National University, unpublished PhD Thesis.
- Engdahl, F. W. 2007. *Seeds of Destruction: The Hidden Agenda of Genetic Manipulation*. Montreal: Global Research.
- Farmer, P. 2003. *Pathologies of Power: Health, Human Rights and the New War on the Poor*. With a Foreword by Amartya Sen. Berkeley: University of California Press.
- Giessen, C., B. Brinkmann, B. Obermeyer and F. Obermaier 2013. 'So funktionieren Steueroasen.' *Sueddeutsche Zeitung*, 5 April 2013, online edition. Special investigation, in collaboration with The Washington Post, The Guardian and Le Monde. <http://www.sueddeutsche.de/thema/OffshoreLeaks>
- Hendrickson M. and W. Heffernan 2007. *Concentration of Agricultural Markets*. Posted online: <http://www.foodcircles.missouri.edu/07contable.pdf>
- Ikerd, J. E. 2008. *Crisis & Opportunity: Sustainability in American Agriculture*. Lincoln, NE: University of Nebraska Press.
- Itzamná, O. 2012. Del derecho a la alimentación a la defensa de la dignidad de la Madre Tierra. *Rebelión*, 17 October 2012, online edition. See www.rebelion.org/mostrar.php?tipo=5&id=Ollantay%20Itzamn%25C3%25A1&inicio=0
- Javier, L. A. 2010. Wheat Futures Advance on Speculation – Ukraine Set to Impose Export Curbs. *Bloomberg*, 18 August 2010, online edition.
- Kennedy, J. F. 1961. *Inaugural address of the 35th president of the USA*. January 20, 1961.
- Mertaugh, H. 2003. 'Concentration in the Agri-Food System.' *LEFT TURN*, August / September Issue 2003. <http://www.projectcensored.org/top-stories/articles/19-global-food-cartel-fast-becoming-the-worlds-supermarket/>
- Pettman, R. 2012. *Psychopathology and World Politics*. Singapore: World Scientific.
- Rothkopf, D. 2008. *Superclass: The Global Power Elite And The World They Are Making*. New York: Farrar, Straus and Giroux. Pp. 241-257.
- Shields, D. A. 2010. *Consolidation and Concentration in the U.S. Dairy Industry*. Washington: Congressional Research Service. See: <http://nationalaglawcenter.org/wp-content/uploads/assets/crs/R41224.pdf>
- Shiva, V. 2007, *Manifestos on the Future of Food & Seed*. Featuring essays by Michael Pollan, Carlo Petrini, Jamey Lionette, Prince Charles & Vandana Shiva. Cambridge, MA: South End Press.
- Soto, H. de 2000. *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Elsewhere*. New York: Basic books.
- UNCTD 2006. *Tracking the Trend Towards Market Concentration*. United Nations

- Conference on Trade and Development. See: <http://www.grain.org/article/entries/2197-unctad-study-tracking-the-trend-towards-market-concentration-the-case-of-the-agricultural-input-industry>
- UNFP 2005. *Food Insecurity and Vulnerability Analysis Timor Leste*. Report by the VAM Unit, The United Nations Food Program, Timor Leste, April 2005.
- WEF 2012. *Global Risks 2012: World Economic Forum Insight Report*. Seventh edition. See: http://www3.weforum.org/docs/WEF_GlobalRisks_Report_2012.pdf
- Whitmore, J. and M. Hopkin 2014. 'World falling far behind on two degree climate goal: New reports.' *The Conversation*, 10 September 20-14. <http://theconversation.com/world-falling-far-behind-on-two-degree-climate-goal-new-reports-31508>
- Wright Mills, C. 1956. *The Power Elite*. New York: Oxford University Press.
- Wrigley, N. 2002. 'Food Deserts' in British Cities: Policy Context and Research Priorities. *Urban Studies*, October 2002, 39(11): 2029-2040.

CHAPTER EIGHT

RICE CROP INTENSIFICATION (SRI/SCI) AND HUMAN FOOD SECURITY IN THE CONTEXT OF ANTHROPOGENIC CLIMATE CHANGE

Joan P. Mencher and Daniel Schneider

Introduction

In talking about climate change and human food security, nutritionists, policy planners, and international organizations distinguish between two types of hunger disasters. The first type pertains to situations over which human beings have little or no control, such as earthquakes, tsunamis, hurricanes, massive flooding, sudden and unexpected wars of invasion, etc. These types of disasters often capture the attention of governments and aid agencies the world over, and mobilizing food resources to feed affected populations occurs quite rapidly. While these food disasters and the responses to them are important and worthy of further study, this paper will focus on the second type of food disaster, which is directly linked to human activity. In general, food disasters of this second category occur over a much longer time-span than the first.

In the 21st century we have become increasingly aware of climate change as a threat to food security throughout the world. Climate change is in large part a result of human interference with the carbon cycle, especially since the beginning of the industrial revolution. Atmospheric carbon has increased, through the use of carbon-intensive sources of energy such as coal and petrochemicals, and the loss of carbon stores through deforestation and land use change. Urbanization and the use of agricultural techniques that exhaust the land are some of the other human interventions that threaten food security. Climate change as a result of human-influenced global warming will most dramatically impact global temperatures and rainfall patterns (Altieri and Koohafkan 2008). Rising temperatures on a global scale have the potential to disrupt rainfall patterns, causing an

increase in drought and heavy precipitation events that can damage agriculture through crop failure, flooding, soil and wind erosion. This kind of change has already been seen in the heavy rainfall on the north-eastern quadrant of north America, in the badly affected drought areas in the United States southwest, and in the delay in the arrival of the SW monsoon in 2014 in some parts of India (needs a reference). We can expect that such changes will play an increasingly important role in producing hunger disasters in the near and far future. A hunger disaster is a situation in which large numbers of people experience increased hunger and food insecurity, impacting their ability to lead healthy lives and producing increased levels of stress and anxiety over obtaining basic necessities for themselves and their families. Of course, food disasters range broadly in severity, but all breach every person's human right to food.

Two Types of Agriculture: Commodity-Focused vs. Low-Carbon Focused

Olivier De Schutter, the former U.N. Special Rapporteur on the Right to Food, noted that the world today is dominated by two broad and opposing approaches to agriculture: commodity and low-carbon focused (De Schutter 2010). It is useful to contrast these two major approaches in terms of their impact on climate change, food security and food sovereignty, and hence on the world's ability to fulfil its obligation to feed all human beings regardless of their socio-economic status. Different approaches to agriculture also need to be distinguished as to the degree of autonomy they afford to consumers. As anthropologists who study food and agriculture, we are particularly interested in agriculture's relationship to human-influenced climate change. We find it alarming that the primary sources of energy used in much of the world's food production are precisely those held responsible for a high proportion of the global carbon emissions that cause climate change.

Commodity-focused approaches to agriculture limit production to the relatively few crops that can be sold as commodities on international markets. They are dependent on petroleum and the petroleum industries, are concerned with the short-term extraction of value from rapidly growing crops, are erosion prone, use extremely high amounts of energy, are dependent on monopolistic seed companies and discourage innovative cropping patterns. Commodity oriented approaches are extremely costly for small farmers and are focused on world markets and long-distance trade, which also consumes a considerable amount of petrochemicals. This

global food system frequently leaves community markets and local agricultural infrastructure – such as small, local, and accessible seed banks, farmer education centres, and a wide range of related institutions – with little if any support. Commodity-focused agriculture is also called “corporate” and “industrial” agriculture because it is led and directed on a global scale by governments and multinational corporations who profit enormously by selling seeds, fertilizers, herbicides, pesticides, and petroleum-powered farm machinery.

Commodity-focused approaches to agriculture not only contribute to climate change by relying heavily on petroleum, both for production and for distribution; they also increase farmers’ vulnerability to the consequences of climate change. Each and every food crop grows best in particular environmental conditions. The fact that commodity-focused agriculture sacrifices biodiversity by limiting production to a few food crops that are profitable on the world market means that during adverse weather conditions such as droughts or heavier-than-average rains, farmers using this approach will have little flexibility to adapt – for example, by switching to crops or varieties that are better able to withstand emerging climatic conditions. In addition, over-watering and heavy chemical and industrial fertilizer use in commodity-focused agriculture tend to kill off all living organisms in the soil. These organisms play important roles in crop growth, by breaking down toxic chemicals in soils, making compounds like nitrates, sulphates, and phosphates available for use by growing plants, helping soils retain water, and fixing nitrogen into forms that plants can use (FAO 2014).

Smallholding farmers in the Indian state of Maharashtra, for example, have for decades been devastated by the inflexibility of commodity-focused approaches to climatic variation. Farmers in this area depend on seasonal monsoons to water fields planted with expensive cotton hybrid seeds purchased from transnational seed companies, seeds that require much more water than traditional Indian food crops. When the monsoons fail, so do the crops, and smallholding farmers are left heavily indebted. This has been an important contributing factor in the 53, 818 farmers’ suicides committed between 1995 and 2013 (Sainath 2013). During the past 4-8 years, as information about farmers’ suicides has spread, one of the authors (Mencher 2008, 2010) informally asked heads of NGOs, educated people working in other capacities with grassroots NGOs and with farmers, farm educators and other stakeholders whether they knew of any cases where farmers using the alternative SRI/SCI agriculture approach (below) have committed suicide. The majority of those asked simply stared at me

and did not say a word. One person later told me that she had gone over the names of every suicide case in her area, and all of them were either growing cotton or else bananas for export. We consider this to be telling. It could be because the use of potent pesticides for cotton and export bananas affected the mental health of the suicide victims, or more likely they could not bear the prospect of crippling, life-long indebtedness.

Low-carbon-focused agriculture contrasts in many ways with the commodity-focused approaches. Low-carbon approaches save energy by reducing or eliminating chemical fertilizers, pesticides, and herbicides. Instead, they rely on traditional methods of fertilizing plants (animal waste and compost), and on eliminating weeds by pulling or cutting, and even using them as plant nutrients. Eliminating chemical use helps to improve soil health by allowing worms and beneficial bacteria to grow, apart from eliminating or reducing chemical pollutants that affect the soil, water, and air, as well as the health of farm workers and consumers.

Low-carbon-focused approaches emphasize biodiversity and crop rotation. They are based on a longer time frame for land use, and include more perennial crops, trees, inter-cropping, crop rotations, etc. They also tend, even in temperate climates, to have crops in or under the soil for most of the year (e.g. later fall plantings in temperate climates). Frequent turnover and rotation of crops helps to spur local seed production, seed exchanges, called “seed *melas*” (fairs) in India, and also spur local businesses. There is a tendency for such farmers to create non-traditional opportunities to enter local food markets, providing food for local communities and nearby urban markets. In both the US and “developing societies”, they are found primarily on medium or smaller family farms and cooperative farms.

Lastly, low-carbon-focused approaches tend to combine the best of traditional farming with ecologically sound advances, such as the ‘System of Rice/Crop Intensification’ (SRI/SCI, see below) and other ways of increasing root stamina – including using techniques to aerate the soil, and provide nutrients to roots from weeds instead of killing the weeds. In the remainder of this paper we confine ourselves to discussing the impact of SRI/SCI.

SRI/SCI: A Low-Carbon Approach to Agriculture

SRI/SCI is an agricultural method that was developed (or rediscovered) in Madagascar, and later spread to India and more than 50 other countries (Uphoff 2002). Dr Norman Uphoff of Cornell University has been a central figure in efforts to promote SRI around the world, by establishing an

SRI Institute at Cornell University and maintaining a thriving online forum for information sharing and research on SRI (Mencher 2013). As a method:

SRI works by changing the management of the plants, soil, water and nutrients utilized in paddy rice production. Specifically, it involves transplanting single young seedlings with wider spacing, carefully and quickly into fields that are not kept continuously flooded, and whose soil has more organic matter and is actively aerated... These practices improve the growth and functioning of rice plants' root systems and enhance the numbers and diversity of the soil biota that contribute to plant health and productivity (Uphoff 2009: 73-74).

Because SRI/SCI promotes a set of principles and practices for managing multiple natural variables (as opposed to a series of artificially produced and commoditised chemical inputs), it is adaptable to multiple environments and crops. Importantly, SRI/SCI promotes creative innovation and collaboration on the part of farmers themselves.

In Tamil Nadu, India, SRI/SCI has proven particularly useful in seasons when there is less rainfall. Rains are often sparse during Tamil Nadu's second season (the northeast monsoon), and using SRI/SCI, farmers often switch from rice to millets, which use much less water. Farmers can also include vegetables and tree crops in poly-cropping strategies. Furthermore, this approach makes it possible to grow several varieties of rice or wheat simultaneously, depending on soil conditions – e.g. soil that holds more water vs. soil that is low-lying and needs a slightly different regime (C. V. Ramanujaneyulu, personal communication, 7 February 2014).

SRI agriculture leads to greater biodiversity, along with deeper and more resilient root systems that allow more reliable access to moisture and other nutrients. It also provides protection against rainfall variation (droughts and hurricanes). Among other things, SRI promotes the use of traditional, pre-Green Revolution rice varieties. In the area close to Calcutta, for example, when a devastating typhoon struck the Sunderbans in 2009, thousands of hectares of rice were ruined overnight and the area was submerged in salt water. However, a handful of traditional rice farmers had sown three salt-tolerant rice varieties. These farmers were the only ones who harvested some rice the following winter according to K.P.P. Nair (2013). Nair points out that these were not the miraculous high-yielding hybrid rice varieties about which the rice experts boast, since those were all devastated by the typhoon; instead, they were the result of painstaking work of one person working in a remote village in Odisha to preserve traditional varieties.

Uphoff has pointed out that, in order to cope with climate change, all farming systems will need to be environmentally sound, that is: producing little or no damage to the environment, socially responsible, and economically viable for all farmers regardless of size (Uphoff 2002; Uphoff 2011).¹ Uphoff points out the many benefits from SRI/SCI management practices, which include the following:

- 1 Water saving
- 2 Cost reduction
- 3 Resistance to pests and diseases
- 4 Tolerance of drought, storm damage and other effects of climate change
- 5 Higher milling outrun of polished rice from SRI paddy
- 6 The many benefits from soil organisms that are still being discovered
- 7 The phenotypes produced using SRI/SCI management methods are superior to those produced by “conventional processes” (Uphoff 2006a)

Predecessors to SRI

Gujja and Thiyagarajan (2013) provide historical evidence to show that in the early years of the 20th century, simple changes in agronomic practices were able to bring about major impacts on crop yields. About a century ago, an innovative farmer in Tamil Nadu had the idea of modifying some agronomic practices in rice cultivation, using single seedlings with wider spacing, along with some inter-cultivation operations, and reported a yield of 6004 kg/ha. They make reference to several articles from around 1911 in Tamil, and have published translations of these articles separately. This seems to have continued for some time: as late as 1962 the Government of Tamil Nadu was recommending that farmers plant no more than one or two seedlings per hole and that holes were spaced 6 inches apart (Government of Madras 1962: 175). According to Gujja and Thiyagarajan (2013), the British Government popularized single-seed planting in the Madras Presidency even before Indian Independence.

Though it may be difficult to prove it, the totally dismissive attitude of government agricultural officials toward the views of local farmers as observed and documented by Mencher in the 1960s and 1970s might have been a factor in the disappearance of this approach. As the “Green Revolution” got underway, the dominant mode for increasing yields was to

increase inputs, resulting in greater income for the manufacturers of fertilizers, herbicides and pesticides in India, as had been the case in the U.S.

How does SRI work?

SRI truly challenges the paradigm of agriculture that the US and its corporations (including their Indian branches and independent Indian corporations) have been pushing from the beginning of the “Green Revolution”. For the past five decades the entire emphasis on improving crop productivity has focused on inputs, including fertilizers, insecticides, herbicides, hybrids and in some parts of the world, limited experiments with GMOs. This approach had little concern for biodiversity, inter-cropping or crop rotations. While the Green Revolution clearly did lead to some increase in yields, better management techniques such as SRI might have produced equally good yields without all the chemical inputs (Mencher 2014). According to Uphoff (2014), SRI differs from earlier agricultural approaches in that it represents a paradigm shift, building on a new vision and re-conceptualization of agriculture.

Part of this change involves paying far more attention to the soil and to soil biota (Uphoff 2002, 2006a, 2006b). Farmers and researchers generally do not expect to “produce more with less” because of the influence of the Green Revolution paradigm which focused on increasing inputs for higher yields. Nevertheless, the dynamic biological factors of root growth and functioning and the positive contributions from the plant-soil micro biome allow for increased yields under SRI with reduced inputs (Gujja & Thiyagarajan 2013.) This turns out to be true not only for rice, but for other crops as well, including wheat and even tomatoes. Crop genotypes have more productive potential than previously suspected:

Even unimproved (not hybrid) varieties (including many well-known traditional varieties preferred by local farmers and consumers), supplemented by vermi-compost, green manure and other organic inputs, can give very high yields with SRI/SCI management--up to 6-12 tonnes per hectare--at lower cost, and often higher market price, since the taste meets local preferences (Mencher 2013)

Noting the importance of attending to soil organisms, Uphoff points out that the orthodoxy of modern agriculture – the belief that the only or best way to feed the world is through modified genetics and increased agrochemical inputs – is not the only game in town. The performance of

SRI method of rice cultivation

Cultivate rice in organic way with less water and less seed.
Minimize pest and disease incidence, obtain high yields with low investment.

Raising nursery
For one acre, 2 kg seed is sufficient. Plough the field thoroughly and make two raised beds of 4 X 50 feet dimensions. Make irrigation channel all-round the bed and sprinkle well decomposed compost over it. Spread sprouted seed thinly on the bed and apply another layer of compost over the seed. Cover the bed with straw and sprinkle water every day. The seedlings with 3-4 leaves would be ready after 8-12 days for transplantation in the main field.

Preparation of main field
Puddle and level the main field thoroughly as usual. Keep the field wet without any standing water. Make channels at every 2m to drain the excess water. Make crisscross marks on field with rope or marker at 25cm spacing in both directions.

Transplantation
Pick the 8-12 day old seedlings from nursery, along with little soil without damaging their roots and seed. Carry seedling to the main field on metal plates or plastic trays. Only one seedling should be placed at the crisscross junction carefully in the main field.

Irrigation management
Maintain soil moisture with adequate irrigation. Remove excess water through drainage channels. It helps in healthy growth of roots and results in profuse tillering.

Fertility management
Build up soil fertility through crop rotation with legumes like sun hemp, dhaincha and incorporation of the same in to the soil 7-10 days before main field preparation. Apply organic amendments like compost @ 4 tons per acre.

Weed management
Periodically run rotary weeder in between the crop rows and incorporate the weeds into the soil. It would enrich the soil with about one ton organic manure.

Profuse growth of roots help obtain high yields

- ▶ More tillers, more panicles
- ▶ More grain per panicle and fuller grain

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Figure 8-1: SRI method of rice cultivation

SRI, along with the System of Intensification of Wheat [SWI], Sugarcane [SSI], Teff [STI] and at least seven other new applications, and recent advances in microbiology should bring these new ways of thinking and farming into the mainstream over the next few decades (Uphoff 2006a, 2006b). While SRI initially requires more labour, long-term labour expenditure is less than in traditional rice cultivation. SRI farmers tend to become truly innovative and experimental, and many work to spread their innovations. SRI management maximizes yields for all types of seeds and all farm sizes. In rice production, control of flooding has the added benefit of significantly reducing the production of methane, a potent greenhouse gas.

In a pamphlet published jointly by Africare, OXFAM, and WWF-ICRISAT (Africare et al. 2010), many advantages of SRI/SCI for climate change adaptability are discussed, including an average 20-50% increase in crop yields. This not only generates more food, but also can release other land and labour for productive activities. There are also reduced requirements for water and seeds, and a reduced (in some cases zero) reliance on chemical fertilizers, pesticides and herbicides. In addition, there is greater resistance to lodging of tillers and to other storm damage, increased resistance to pest damage, increased drought tolerance, a shorter growing season, reduced time for planting, providing labourers more flexibility, and more diversified cropping patterns. In a recent detailed study by Barbara Harris-White (Gathorne-Hardy et al. 2013) there is a good discussion of how and why less water works so well with SRI. Furthermore, research and experimentation on soil microbiology promises further increases in yields and improvement in soil quality.

The SRI approach is also being applied to many different types of crops such as sugar cane, wheat and other grains, and various legumes. Yet agricultural research in India, as well as elsewhere, needs to take into account global warming, including changes in monsoon patterns and increasing drought in some places. Only healthy well-nourished and well-watered soils will be able to support plant growth. This includes not only new management techniques like SRI/SCI, but also such practices as rainwater harvesting and the planting of locally hardy trees.

The critical role of trees in agriculture

In a useful and popular article on our coming food crisis, Gary Nabhan (2013), an archaeologist-anthropologist, points out:

Fortunately, there are dozens of time-tested strategies that our best farmers and ranchers have begun to use. The problem is that several agribusiness advocacy organizations have done their best to block any federal effort to promote them, including leaving them out of the current farm bill, or of climate change legislation at all. One strategy is to promote the use of locally-produced compost to increase the moisture-holding capacity of fields, orchards and vineyards. In addition to locking carbon in the soil, composting buffers crop roots from heat and drought while increasing forage and food-crop yields. By simply increasing organic matter in their fields from 1 per cent to 5 per cent, farmers can increase water storage in the root zones from 33 pounds per cubic meter to 195 pounds.

Nabhan provides examples of lessons which third-world farmers can teach to farmers in the US and elsewhere in order to survive global warming successfully, making use of an innovative yet traditional mind-set. An example from India also brings this out: In Trichy District, the director of a grassroots NGO group headed by local people, called Kudumbam (Tamil: 'family'), recognized that the land was growing drier because there were no trees with large deep roots to help hold whatever water fell, whenever it might rain (not only in rice-growing seasons). With much effort he managed to convince people in one village to start planting local trees on land that belonged to the NGO. That was more than 15 years ago. Nowadays, as one approaches Trichy by road from the north, many of the villages along the road have striking numbers of trees. Apart from providing shade for people and animals, these trees also represent the beginning of programs to retain more moisture in the soil. Today, in these villages there are trees that provide shade for people, and also support a level of soil moisture not found before. This is similar to a program initiated in Niger commended by the United Nations Council on Sustainable Development (UNDP 2012). Another change that can make a difference is the planting of neem and other trees on the *bunds* (embankments) between paddy fields. Neem trees are particularly useful because of their well-known natural pesticide property, and trees in general keep the land better moisturized without flooding. The world needs more exchanges of this kind of information, about what works in different places, how and why.

According to an article by Devinder Sharma (2007) there were government plans which called for moving over 400,000 farming families off the land in two states, Tamil Nadu and Uttar Pradesh, in order to set up special economic zones (SEZ's) at the time. Whether or not this will change now after the 2014 election and change of government remains to be seen.² This sometimes leads to conflicts. A case study in Rajasthan shows that

when land was taken away from smaller farmers to set up a SEZ, the result was a significant decrease in the quality of the dispossessed farmers' diet, including at least partial hunger (Levien 2012). We still do not know what the present government will decide to do – whether they will push for more SRI/SCI, in opposition to the WTO, or will allow the wealthy Indian elite to push for the US model of agriculture with its destructive and costly inputs (TSCF 2013a, 2013b). Hopefully the US model will be fought, though it will take at least a year to know what is going to happen and to understand who will suffer from increasing malnutrition. At present when land is taken from farmers either for building SEZ's or highways or the like, only a few larger landowners are benefiting. Furthermore, the land now being made available for large highways and industries includes some of the best farmland in India. The northern part of coastal Tamil Nadu, where Mencher worked before and during the Green Revolution, has recently been shown (by archival materials) to have been quite fertile prior to the depredations of the Mysoreans in the mid-18th century and the battles between the French and British (Buchanan 1807).

Just as family farmers are fighting for some recognition under the current US farm bill, so are advocates for Indian smaller farms fighting government plans. Yet at present, the newly elected government in India is again trying to push out some of the NGOs that are fighting for the smaller farmers (Vyawahare 2014). Meanwhile, a large protest march for land justice was held in India in the summer of 2012 (Caputo 2012), with 50,000 of India's poorest walking in worn sandals or bare feet 350 miles from Gwalior to Delhi. The march was growing towards 100,000 participants when the government offered to meet their demands for land to cultivate. A similar March in 2007 led to the government setting up a commission, which did essentially nothing (Ramesh 2007). In 2013, however, the demand for action became intense. As noted in various news reports, activists expressed a view that "to make sure India's rise as a global economy isn't to be achieved on the backs of its poorest!" Our question is: Will corporate pressure undermine promises made by the Government, unless people are persistent in their protests? Access to land for the poor went against the plans of the previous central government and some state governments. We do not yet know, however, what path the present government will take. With elections over, despite a two-day nationwide strike in February 2013 (the first since Independence), poorer people are determined to make their needs known and to demand action. Furthermore, to cope with climate change all farming systems will need to be environmentally sound, socially responsible, and economically viable for all farmers

(as noted above). There is a growing need to resist the importation of the US food system to India, as is recognized by millions of smaller farmers and farmer-led organizations (ASHA 2014a, 2014b).

What can anthropologists do?

Social anthropologists have important roles to play in relation to these issues. To begin with, we can document approaches such as SRI/SCI in general, or specific programs such as the CMSA program in Andhra Pradesh, which I have discussed elsewhere (Mencher 2011, 2013). Details about what works, and what does not, what can be changed and what is rooted in cultural differences, are badly needed. There are many differences in gender roles in agriculture between regions, castes, ethnic groups, etc., and most of this information is not known to policy planners, who often assume that the patterns they are familiar with from their own native regions are pan-Indian.

Extension workers, along with NGO workers and others involved with SRI/SCI could work with anthropologists to find data on some of the reasons why the new approaches have been more successful in some areas than in others. Size of farms is one relevant variable, but there are many others. It will also be important to help improve communication between farmers and consumers, especially to help bridge the gap between poor farmers and the middle class so that they can understand and support one another better.

Comparing extension methods such as farmer field schools versus demonstrations on NGO land would also be useful. Finding ways to make people aware of the importance of preserving their most fertile and well-watered land from encroaching development is also needed. In 2013, Mencher noted, in a village she first studied in 1967, that some of the best triple-cropped paddy land was being dug up to make bricks for luxury homes for the wealthy, while the agricultural labourers were unable to find work.

Each of the NGOs in the study she conducted in 2006-8 (unpublished) are fighting to help small communities and to encourage alternative pathways. In Karnataka, Andhra Pradesh and Tamil Nadu some of the NGOs are helping village farmers to create small ponds as water storage tanks. Such innovations may start with only one or two families in the first year, but once other families see that they are successful in growing more food, the idea often spreads within and beyond the original village.

Another useful way to spread knowledge of solutions is by making information available to local farmers in one area concerning how another group of farmers managed to cope successfully. One example was in the Philippines, where two typhoons had battered one of the islands very badly (Chandrasekhar 2011). Testimonials from the farmers whose rice fields endured the back-to-back onslaught of two typhoons quite impressed Indian farmers. Hearing from people like themselves made a big difference, perhaps more even than seeing a good field demonstration. Interestingly, both in China and India, farmers have found that SRI/SCI also leads to a decrease in pests. Finally, millers prefer wheat and rice grown this way because they find it gives less chaff and that there is less shattering.

From the NGOs that Mencher works with, she has found that those who work with tribal populations, for example in the Wayanad District of Kerala and in parts of Andhra Pradesh, are able to take advantage of the fact that tribal groups tend to use exchange labour rather than paying labourers a daily wage. It would be interesting to learn if such labour exchange is prevalent elsewhere in the world. This is most common in areas where there is less inequality, as is true of most tribal areas. In India it also exists in Tripura and Central India.

Multinational Corporations vs. Family Farmers: A worldwide Conflict

The biggest problem that remains is the conflict between the family farmers and the multi-national corporations that are strongly supported by the United States, along with the EU countries plus Canada, Australia, and to some extent their corporate partners in countries like Brazil, India, China and a few other developing countries. This is a political issue, and not one easily amenable to the tools or approaches of anthropology or sociology. The power and wealth of corporations has been growing rapidly since the 17th century, when the British and Dutch East India Companies, along with other early European trade corporations, began operating globally (see Metcalf & Metcalf 2006, Boxer 1979, Furber 1976). This corporate globalization process has accelerated greatly in the period from the 1950 until today. In this short period of time, these organizations have been wreaking havoc on the climate and have had a deep impact on the survival prospects of the planet itself, as well as bringing worldwide inequality to the highest levels in history. Approaches like SRI show a potential to reverse these trends, but this cannot be done without reaching the hearts

and minds of the majority of the people. Changes in ideology will be the key to societal change.

There are many individuals and groups in third-world countries who still view the West as the best model to follow. Often they are unaware of the harm that the present system has done to the Western countries themselves – in terms of increasing inequality and severe poverty and causing damage to the environment – and do not know about the various alternatives that are increasingly being supported by progressive groups within the West. Influencing such people, including the many third-world families who have migrated to the West, is another important goal. Sometimes they are more open if they know that we are also working to have an effect on people in the United States and EU. And finally, working to influence policy planners in the US and India at all levels, whenever people are even slightly open to listen, especially as life gets harder in the US.

Notes

- 1 We would add that there is a growing need to resist the multinational corporations' attempts to control all of the world's food production.
- 2 In the Indian Constitution agriculture is a state matter, but current interpretations place the importation of GMOs under foreign affairs, which is the business of the Central Government.

References

- Africare, Oxfam America, & World Wildlife Fund (WWF) 2010. *More rice for people, more water for the planet*. Washington D.C.
- Alliance for Sustainable and Holistic Agriculture (ASHA) 2014a. Letter to PM Narendra Modi: Fulfilling the BJP promise of according highest priority to agricultural growth, increase in farmers' income and rural development. New Delhi: Alliance for Sustainable and Holistic Agriculture. <http://www.kisanswaraj.in/2014/05/29/asha-letter-to-pm-narendra-modi-fulfilling-the-bjp-promise-of-according-highest-priority-to-agricultural-growth-increase-in-farmers%E2%80%99-income-and-rural-development/>, accessed 2 July 2014.
- 2014b. Farmer Unions Demand Income Guarantee and Ecological Sustainability in Farming. New Delhi: Alliance for Sustainable and Holistic Agriculture. <http://www.kisanswaraj.in/2014/03/06/farmer-unions-demand-income-guarantee-and-ecological-sustainability-in-farming/>, accessed 2 July 2014.

- Altieri, Miguel A., & Parviz Koohafkan 2008. *Enduring Farms: Climate Change, Smallholders and Traditional Farming Communities*. Third World Network, Panang, Malaysia.
- Boxer, Charles Ralph 1979. *Jan Compagnie in War and Peace, 1602-1799: A Short History of the Dutch East-India Company*. Heinemann Asia.
- Buchanan, Francis 1807. *A Journey from Madras through the Countries of Mysore, Canara, and Malabar*. Volume 1, chapter 1. London: The East India Company.
- Caputo, Mara 2012. *Indians march for land rights*. October 8. <http://www.actalliance.org/stories/jan-satyagraha-march-for-land-rights>, accessed 2 July 2014.
- Chandrasekhar, Nemani 2011. *Innovative rice-growing method withstands typhoons*. Oxfam in the Philippines. <http://www.oxfamblogs.org/philippines/innovative-rice-growing-method-withstands-typhoons.htm>, accessed 2 July 2014.
- D'Almeida, Kanya 2014. 'Picture the World as a Desert.' *Inter Press Service News Agency*. <http://www.ipsnews.net/2014/06/picture-world-desert/>, accessed 2 July 2014.
- FAO (Food and Agricultural Organization of the United Nations) 2014. *Agriculture and soil biodiversity*. Rome, Italy: Food and Agricultural Organization of the United Nations. <http://www.fao.org/agriculture/crops/thematic-sitemap/theme/spi/soil-biodiversity/agriculture-and-soil-biodiversity/en/>, accessed 2 July 2014.
- Furber, Holden 1976. *Rival Empires of Trade in the Orient 1600–1800*. Minneapolis: University of Minnesota Press.
- Gathorne-Hardy, Alfred, et al. 2013. 'Life Cycle Assessment (LCA) of Greenhouse Gas Emissions from SRI and Flooded Rice Production in SE India.' *Taiwan Journal of Water Conservancy* Special Issue.
- Government of Madras 1962. *Madras District Gazetteers: South Arcot, Madras, India: Government of Madras*.
- Gujja, Biksham, & T. M. Thiyagaraja 2013. *Transforming rice production with SRI: Knowledge and practice*. National Consortium on SRI (NCS), Hyderabad, India.
- Levien, Michael 2012. 'The land question: special economic zones and the political economy of dispossession in India.' *The Journal of Peasant Studies* 39(3/4):933-969.
- Mencher, Joan 2008. 'Water Harvesting vs. Corporate Privatization of Water: How some grassroots NGOs and farmers deal with water scarcity in vulnerable South Indian regions.' Paper presented in a session on Climate Change at the Society for Applied Anthropology in Memphis, TN, March 2008.
- 2010. 'Alternatives to large-scale "impressive" water projects—how can states begin to deal with human rights to food and water?' Paper presented at the Society for Applied Anthropology (as part of a day-long program on water access), Merida, Mexico, March 2010.
- 2011. 'Immense New Challenges to the Future of Food: Reports from the AAA Task Force on the World Food Problems.' Annual Meeting of the American Anthropological Association, Montreal.
- 2013. 'Food Sovereignty: How it turns the growing corporate global food system upside down!' Paper presented at the Conference on Food Sovereignty: A Critical Dialogue, Yale University, 14-15 September 2013. Paper available at <http://www.yale.edu/agrarianstudies/foodsovereignty/papers.html>.
- 2014. 'People-Centered vs. Profit-Centered Agriculture: what each means for the survival of earth as a living planet, and where does SRI/SCI fit in.' Paper presented at the International Seminar on Agrarian Transition in India, Pondicherry University, Pondicherry, India, 28-30 January 2014.
- Metcalf, Barbara Daly and Thomas R. Metcalf 2006. *A concise history of modern India*. Cambridge: Cambridge University Press.
- Nabhan, Gary Paul 2013. 'Our Coming Food Crisis.' *The New York Times*, July 21: A19.
- Nair, K. P. Prabhakaran 2013. 'A Potful of Rice for the Future.' *Fountain Ink Magazine*, <http://fountainink.in/?p=3268>, accessed 30 August 2013.
- Ramanujaneyulu, C.V. 2014. Personal Communication. 7 February 2014.
- Ramesh, Randeep 2007. 'Poor but defiant, thousands march on Delhi in fight for land rights.' *The Guardian*, 24 October 2007. <http://www.theguardian.com/world/2007/oct/25/india.randeepramesh>, accessed 2 July 2014.
- Reuters 2014. UPDATE 2-India's poor monsoon threatens first drought in five years. <http://in.reuters.com/article/2014/07/10/india-monsoon-rainfall-idINL4N0PL3YH20140710>, accessed 12 August 2014.
- Sainath, P. 2013. 'Farmers' suicide rates soar above the rest.' *The Hindu*, May 18.
- Sarich, Christina 2013. 'The 10 Companies Controlling the World's Food Supply.' *Nation of Change*, 21 October. <http://www.nationofchange.org/10-companies-controlling-world-s-seed-supply-1382363748>, accessed 2 July 2014.
- Schutter, Olivier De 2010. 'Agro-ecology and the Right to Food.' Paper presented at the United Nations Human Rights Council, New York.
- Sharma, Devinder 2007. 'Displacing farmers: India Will Have 400 million Agricultural Refugees.' June 22. <http://www.stwr.org/food-security-agriculture/displacing-farmers-india-will-have-400-million-agricultural-refugees.html>, accessed 2 July 2014.
- 2014. 'A silent revolution brewing on our farms.' *India Together*, 13 June 2014. <http://indiatogether.org/rice-seed-exchange-programme-by-farmers-agriculture>, accessed 2 July 2014.
- TSCF (The Second Chance Foundation) 2013a. The US is using the WTO to destroy India's Food Security Bill and open India's markets. New York City: The Second Chance Foundation. <http://thesecondchance.org/wordpress/?p=358>, accessed 2 July 2014.
- 2013b. The WTO Compromise is NOT a Victory for India. New York City: The Second Chance Foundation. <http://thesecondchance.org/wordpress/?p=469>, accessed 2 July 2014.
- UNDP (United Nations Development Program) 2012. *Reforestation protects the*

- environment, increases food supply and income.* United Nations Development Program. <http://www.ng.undp.org/content/nigeria/en/home/ourwork/environmentandenergy/successstories/Reforestation/>, accessed 2 July 2014.
- Uphoff, Norman 2002. SRI—The System of Rice Intensification: An Opportunity for Improving Food Security in Latin America? Paper presented at the Second International Rice Meeting, Havana.
- 2006a. ‘The System of Rice Intensification (SRI).’ Paper presented at the SRI Forum in Biratnagar, Nepal. Presentation is available at <http://www.slideshare.net/SRI.CORNELL/0619-the-system-of-rice-intensification-sri>.
- 2006b. ‘Thoughts on the History, Principles and Practices of SRI and Its Importance for the Present Scenario.’ Paper presented at the National SRI Symposium, Hyderabad, India, 17 November 2006.
- 2009. ‘The System of Rice Intensification (SRI) as a system of agricultural innovation.’ In I. Scoones & J. Thompson (eds.), *Farmer First Revisited: Innovation for Agricultural Research and Development*. Bourton on Dunsmore, UK: Practical Action Publishing. Pp. 73-81.
- 2011. ‘Agro-ecological Approaches to Help “Climate Proof” Agriculture While Raising Productivity in the Twenty-First Century.’ In: *Sustaining Soil Productivity in Response to Global Climate Change: Science, Policy, and Ethics*. Pp. 87-102.
- 2014. ‘Revising agronomic and socio-economic paradigms for crop improvement: Findings from SRI research globally.’ Paper presented at the Conference on Recent Changes in Rice production and Rural Livelihoods: New Insights on the System of Rice Intensification (SRI) as a Socio-Technical Movement in India, New Delhi, India, 19 June 2014.
- Vyawahare, Malavika 2014. Greenpeace and Other Advocates Fear Clampdown After Leaked Report. *The New York Times*, 12 June 2014.

CHAPTER NINE

LAND DEGRADATION AND ECOLOGICAL
KNOWLEDGE-BASED LAND REHABILITATION:
HAUSA FARMERS AND FULBE HERDERS
IN THE SAHEL REGION, WEST AFRICA

Shuichi Oyama

Population increase has had dramatic effects in the Sahel region of West Africa, including famines, food shortages and conflicts over land and natural resources. Land degradation is also causing a decline in crop and livestock production. The livelihoods of people in affected regions are thus threatened by food shortages and the loss of subsistence resources, especially in rural areas. The Hausa people living in the arid environment of southern Niger have long relied on the cultivation of pearl millet and cow pea. Due to the increase in population, however, they now need to cultivate their crops without allowing for a fallow period and, as a result, face a land degradation problem in their cultivated fields.

Field observations and interviews with villagers have shown that land degradation can proceed rapidly if adequate care is not taken with land management. To avoid the risk of land degradation and prevent food shortages, Hausa people carry trash from their homesteads and add it to degraded land as manure. This trash is called “*taki*” in the Hausa language. The *taki* mainly contains organic matter, such as plant residue and livestock excreta, along with small amounts of low biodegradability materials such as worn-out clothing and plastic sandals, used plastic bags, and discarded metal dishes and pots.

This paper describes land rehabilitation trials based on the ecological knowledge of local people and the conflict prevention measures present in their society. We constructed 50m x 50m fenced plots for *in situ* experimentation and scattered urban trash onto the degraded land. This experiment revealed that urban trash input is a useful tool for plant recovery and land rehabilitation. The main problem lies in the imbalance of the organic matter cycle. Land degradation in rural areas and sanitary

problems in urban areas are two sides of the same coin. We need to include input from urban cities in this organic matter cycle in order to solve the land degradation problem.

Background

Land degradation (desertification) can bring about crop failures, food shortages, malnutrition and financial problems for Sahelian nations. Perceptions of a continuing crisis in managing Sahelian resources are rooted in five aspects of the Sahel Drought of 1972-1974, as it was understood at the time: crises in rainfall (drought), food supply, livestock management, environmental degradation, and household coping capabilities (Mortimore and Adams 2001). The governments in the Sahel have striven to tackle the desertification problem in order to combat poverty and improve the people's standard of living. Numerous projects were undertaken to conserve the land, protect the natural resources, achieve development and alleviate poverty. One of the major project concepts developed was the greenbelt – a strip of tree plantations ring-fencing urban areas in order to protect cities from sand encroachment and erosion. In 1965, the Republic of Niger established a 2,500 ha greenbelt around the capital, Niamey, consisting of local and introduced species. Mali, Mauritania, Senegal and Burkina Faso have also initiated greenbelt projects. These projects had five aims: (1) to protect land against sand encroachment, (2) to fight against erosion and improve crop production, (3) to produce firewood and reduce pressure on existing natural forests, (4) to develop and manage the natural forests, and (5) to supply fodder for pastoral production (Sahara and Sahel Observatory 2008).

At the second EU-Africa Summit in 2007, the European Union (EU) and African states agreed to implement a large-scale green wall project, the “Great Green Wall Initiative of the Sahara and the Sahel,” across a vast area of the Sahara. Project activities were started in Algeria, Burkina Faso, Chad, Djibouti, Egypt, Ethiopia, Mali, Mauritania, Niger, Nigeria, Senegal, Sudan and Gambia in order to push back desertification and to help promote agriculture and improve the livelihoods of people in the region. In September 2011, the EU and the Food and Agriculture Organization of the United Nations (FAO) decided to endorse a contribution of 1.75 million Euro for this project so that it could adopt a more ecologically appropriate and socio-economically sustainable, holistic approach that would be more effective and of direct benefit to the local land and water users. This involved identification of the best land management practices and

up scaling of their use (Europafrica.net 2011). Although the governments involved started combating desertification with the support of international organizations in the 1970s, desertification caused by drought continued to affect the residents of the arid and the semi-arid areas (Kadomura 2001).

The primary subsistence activities carried out in the Sahel region are cultivation and grazing. The main crops are maize (*Zea mays*) and cassava (*Manihot esculenta*) in the southern region, sorghum (*Sorghum bicolor*) in the central region, and pearl millet (*Pennisetum glaucum*) in the northern region. Rain occurs along the edge of the Sahara desert and agriculture is limited. Raising animals is the predominant activity and the pastoral people of the region constantly move from place to place with their livestock. The nomadic Fulbe people chiefly keep cattle and the Tuareg people keep camels and goats. Historically, the settled farmers have built up socio-economic relationships with the nomads in the Sahel region in order to maintain their mutual subsistence (Baier 1980; Oyama 2002). The farmers provide pearl millet and sorghum, cotton clothing, wooden and iron goods to the pastoralists in exchange for products derived from their domestic animals. The pastoralists enter into contracts with farmers in order to set up camps in the cultivated fields of their farmer partners for several weeks or months at a time. They then put their animals out to graze around the camp and stay at these camps at night. In return, the farmers provide substantial meal and pay rewards after the completion of agreed contract periods. The domestic animals provide excreta and the farmers can see for themselves the resultant improvements in soil fertility.

Rapid population increase, low-technology agriculture and overgrazing are considered the main causes of systemic strain and land degradation in the Sahel region (Ayantunde 2000; Mortimore and Turner 2005; Tschakert 2007). Gritzner (1988) put forward seven proposals for measures that could be used to combat environmental degradation: (1) wadi-head planting, (2) dune stabilization and tree restoration of regional gum forests, (3) the establishment of shelterbelts and the establishment of an urban energy system, (4) the rehabilitation of peri-urban fringe areas, (5) the conservation of endangered species and reservoirs of biological diversity, (6) the diversion of surplus river water into regional depressions, and (7) improved natural forest management.

Although the settlers of the Sahel area, both farmers and pastoralists, are regarded as contributors to desertification, few research studies have examined people's recognition of the processes involved and indigenous countermeasures that are implemented to address the problem of land degradation. The adaptive capacity of the residents has been ignored or

underestimated in the past, and this makes it difficult to select the best measures to combat land degradation and promote agricultural development. The way in which the Hausa farmers recognize soil degradation and take remedial measures, moreover, has been shown to be consistent with available scientific information on soil (Hayashi *et al.* 2000a, 2000b; Oyama 2009, 2012; Oyama and Mammane 2010). This article describes the daily practices and countermeasures used by Hausa farmers to combat land degradation and how this compares with available scientific information. We also aim to clarify the structure of land degradation in terms of the wider perspectives of rural-urban relationships.

Research Area

The research area was “D” village in the Dotchi Region, Department of Dosso, in the Republic of Niger (Figure 1). This village is located seven kilometres away from Dogondotchi town, the local centre of administration and economic activities. It is sited at an altitude of 240m and has a population of 280, in 41 households. The villagers are Hausa farmers, except for a single household of Fulbe and Tuareg pastoralists who simultaneously cultivate millet and graze livestock. Hausa farmers also maintain their livelihood by farming millet and grazing animals.

The national meteorological station in Dogondotchi started collecting data in 1923. These show that the average annual precipitation over 30 years was 446 mm. The dry season extends for eight months, from October to May. The maximum temperature usually exceeds 35°C from October to November and from February to May. The minimum temperature is usually below 20°C in the early morning and rises rapidly after sunrise. In meteorological terms, the diurnal temperature variation is large.

A wadi (seasonal drainage route) flows from east to west at the north and south end of the village site. Water flows along such wadi immediately after rainfall. According to the meteorological data, the village is sometimes exposed to violent winds, stronger than 20 m/s, immediately before rainfall. Winds stronger than 10 m/s can blow from the east, east-northeast and southeast. During the dry season a dry, hot wind called the Harmattan blows from the east and raises clouds of dust.

The soil type found in the research area is classified as Arenosols (FAO/UNESCO 1971). Arenosols are sandy soils with low organic matter, organic nitrogen and phosphoric acid content. This soil type is distributed over a wide area of central Mali, southern Niger, and northern Chad.

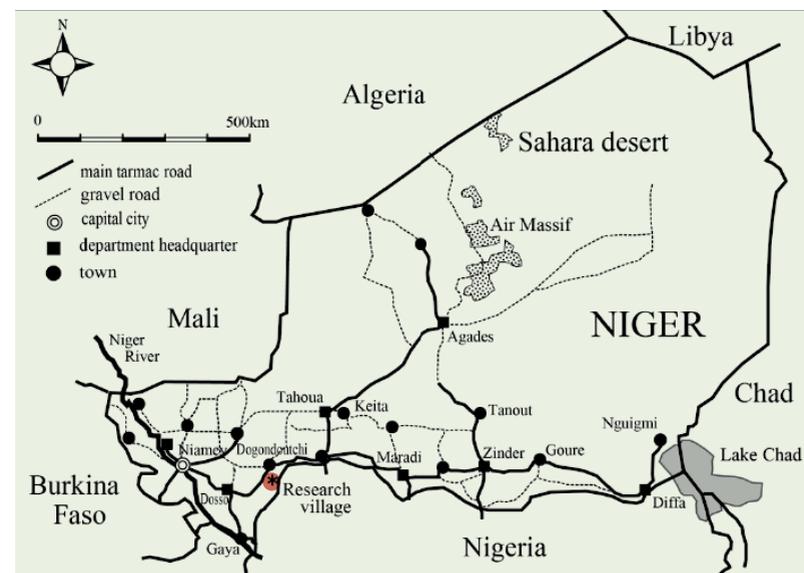


Figure 9-1: Research site in a village in southern central Niger

Ecological Knowledge of Soil and Plant Productivity

Hausa farmers have recognized the changes in soil conditions resulting from continuous millet cultivation (Oyama 2009). Soils with high organic matter content evidently yield high crop productivity. The Hausa call this more productive land type *kasa* or *kasa taki* (“sand with organic matter”). Compared to *leso* and *foko* types of land, explained later, the *kasa taki* layer (brownish grey, 5YR 6/1 on the Standard Soil Colour Chart, 0-3cm deep) shows weak acidity and contains abundant soil nutrients (Table 1). In the research area, a rich aggregate structure and high soil porosity were observed on the surface of the ground. Underneath this sand containing organic matter, there were innumerable termite holes. The Hausa refer to this type of soil as *kasa gara* (“termite sand”). The termite sand lies at a depth of 3-12cm and soil nutrition within this layer is poor (Table 1). A solid, sedimentary clay layer (dull orange, 5YR 7/3), which the Hausa call *foko*, lies under the *kasa taki* layer. The *kasa taki* topsoil produces favourable growth conditions for millet, and the average stem height observed on 20 August 2003 was 156cm. The air-dried weight of millet gain produced was 1.1 t/ha in the middle of October.

	pH H ₂ O	Total		C/N	Exch. Baseol (+)/kg			P (mg/kg)	
		N (%)	C (%)		Na ⁺	K	Mg ²⁺		Ca ²⁺
(1) kasa (millet yield 1.1t/ha)									
0–5cm ("kasa taki")	5.8	0.025	0.39	16	0.01	0.18	0.49	0.88	18
10–15cm ("foko")	5.2	0.014	0.16	11	0.01	0.24	0.16	0.22	13
(2) lesso (millet yield 0.1t/ha)									
0–5cm ("leso")	5.1	0.007	0.08	11	0	0.07	0.09	0.25	7
10–15cm ("foko")	4.4	0.009	0.10	11	0	0.06	0.02	0.08	3
(3) foko (millet yield 0t/ha)									
0–5cm ("foko")	4.6	0.012	0.10	8	0	0.05	0.04	0.12	5
1–15cm ("foko")	4.4	0.008	0.08	10	0.02	0.04	0.04	0.09	4

Table 9-1: Soil properties described by the folk classification of "kasa", "leso" and "foko" soil types.

Source: Oyama (2009)

The *kasa* soil type changes into *leso* after a few years of continuous millet cultivation without manure input (Figure 9-2). This *leso* soil type is recognized as representing an early stage of degraded soil conditions and is associated with lower millet yields.

The *leso* soil type has an aggregate structure of white or pale orange sandy soil (5YR 8/4) containing little silt and clay (Table 1). In the trial site, the *leso* topsoil accumulated up to 9cm in depth. Under the *leso* topsoil, bright reddish brown (5YR 5/6) sandy soil formed a solid, sedimentary layer of *foko*. This sandy soil layer, *leso*, did not disturb the root growth of the crop but soil nutrition was poor (Table 9-1). The average stem height of millet in the fields containing *leso* soil was 36cm on 20 August 2003. The plants failed to form panicles and the grain yield fell to a paltry 0.1 t/ha.

Once a transition to *leso* soil is recognized in a field, the farmers usually tend to the land by fertilizing it with domestic animal excreta and plant residue derived from livestock fodder and millet panicles. They also waste no time in contracting the local pastoralists to set up camps on their land to provide the excreta needed for their fields. However, due to a shortage of manure and plant residue in the village, the Hausa often fail to tend to the



Figure 9-2: The early stages of land degradation

After a few years of continuous millet cultivation, the soil containing organic matter has changed to a nutrient-poor sandy soil due to leaching and wind erosion.

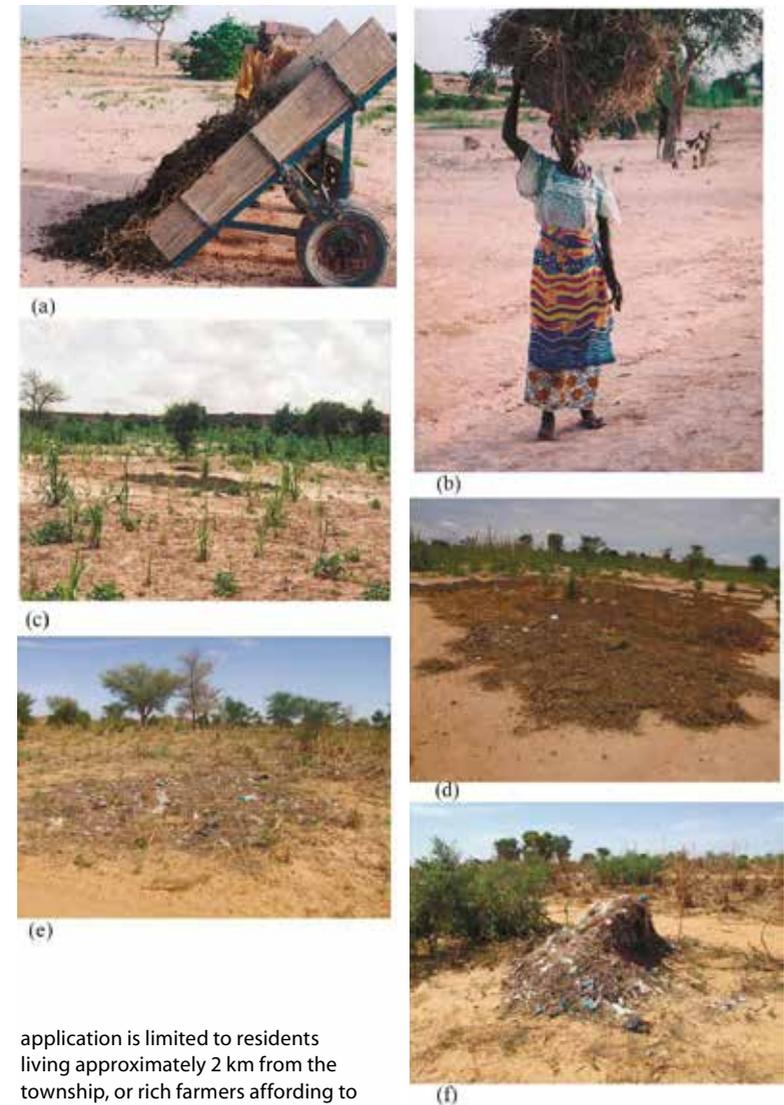
fields in a timely manner and continue millet cultivation without manure input. The millet yield from the degraded *leso* soil then falls to low levels, but they continue to cultivate millet in the degraded *leso* soil.

A few years of continuous cultivation without land care leads to wind and water erosion of the topsoil, and expose the solid sedimentary layer. This sedimentary layer, called *foko*, is characterized by extremely low plant productivity. X-ray diffraction analysis results (JEOL Ltd, JEOL-3530) show that the *foko* layer is mainly comprised of quartz sand (87.1%) containing aluminium oxide (8.9%) and acidic sulphate (1.6%). The *foko* soil is characterized by strong acidity and poor soil nutrition (Table 9-1). The clay layer is runny when wet but hardens after it dries. When the *foko* layer is exposed at the surface, the root growth of crops planted there is greatly restricted due to the soil's single-grain structure and poor chemical composition. The solid *foko* layer also greatly impedes water infiltration into the ground. The millet germination rate at our trial site was low and most of the plants died, even after germination. All the millet withered after attaining only a 7cm stem height on August 20. The millet grain yield was nil (Oyama 2009).

According to the Hausa villagers, it is possible to restore plant productivity artificially in degraded *leso* and *foko* soils. To do this, they enter into contracts with the pastoralists in order to obtain animal excreta for their farms (Oyama and Mammane 2010). They also carry household trash, *taki* in the Hausa language, such as plant residue from forage and crops, pearl millet stems, livestock excreta, worn clothes and plastic sandals from their homesteads, to the degraded land (Figure 9-3). They have also recognized the importance of the biological activities carried out by termites, *gara* in Hausa, decomposing the trash. Organic matter, especially plant residue and livestock excreta, are a favourite food of termites. According to the Hausa, worn clothes and even plastic sandals, plastic bags and metal dishes and pots are important components in this method of soil and crop yield improvement.

Figure 9-3: Trash input on degraded farmland (opposite)

- (a) The farmers carry trash from their homesteads to the degraded ground of their own farmland using an ox cart.
- (b) A widow carries trash every day in order to improve the soil condition of the farmland for her young son.
- (c) The Hausa farmers have recognized the land and soil conditions of their farmland, and they add trash in order to cope with land degradation.
- (d) The trash transported from the homesteads in the village is mainly plant residue and livestock dung. These are important components for improving crop yields.
- (e) Some farmers collect the urban trash, containing plant residue, livestock excreta, waste plastic bags, plastic sandals and other trash, from the town. However, this urban trash



- application is limited to residents living approximately 2 km from the township, or rich farmers affording to carry them from towns.
- (f) The farmers often leave the trash in a mound shape. According to the farmers, this mound shape plays an important role in trapping wind-blown sand and improving the soil properties.

Urban Trash Input and Plant Productivity: An *In Situ* Experiment

The Hausa farmers recognize that their fields are prone to land degradation, but they do not just passively receive this. When they recognize that soil fertility has decreased, they either contract the Fulbe and Tuareg nomads to camp in their crop fields, benefiting from the livestock excreta used to improve their soil, or they scatter trash onto their fields for the same purpose.

According to my interviews with local Hausa people, they started using homestead trash for land rehabilitation from the experience of the 1972-1973 and 1984-85 droughts. They suffered from food shortage and lost their seed for the next season. They started carrying homestead trash to the degraded land of their millet fields. The crop seed germinated from the homestead trash and they were able to produce some valuable crops. Because of manure shortage in recent years, some of the Hausa farmers, especially the richer villagers, began to collect and bring in urban trash for recovering crop productivity in their fields around 2005. Only the small number of farmers can afford to use ox carts and to hire the tractor for carrying urban trash to their fields because of the expensive transport costs and limited means of transportation; others carry it by hand.

The author aimed to apply local knowledge and daily practices of Hausa farmers for large-scale land rehabilitation in Sahel region and clarify the land rehabilitation effects of urban trash input on the solid sedimentary layer associated with degraded land. In August 2008, a trial area 45m (north-south) x 50m (east-west) was fenced off with barbed wire to keep out people and livestock. Within this area, which sloped 3° from east to west, five 4m x 30m plots were prepared.

In November 2008, the author began the urban trash project by applying different amounts of trash to each plot. No trash was scattered onto Plot 1, which served as a control. Plot 2 was treated with 600 kg (5 kg/m²) of scattered trash, Plot 3 with 1,200 kg (10 kg/m²), Plot 4 with 2,400 kg (20 kg/m²), and Plot 5 with 5,400 kg (45 kg/m²) of trash (Figure 9-4). The trash was brought in by tractor from the town of Dogondoutchi, 8 km from the project site. The trash included much sand, plant residue from livestock feed, animal excreta, used plastic bags, old clothes and sandals, broken pots and plates. To take into account the possible future use of such trash to combat further land degradation, we left all the non-organic matter in the trash with the consent of the village residents.

After trash was scattered, observations were carried out, noting any changes in soil properties and the incidence of natural plant germination

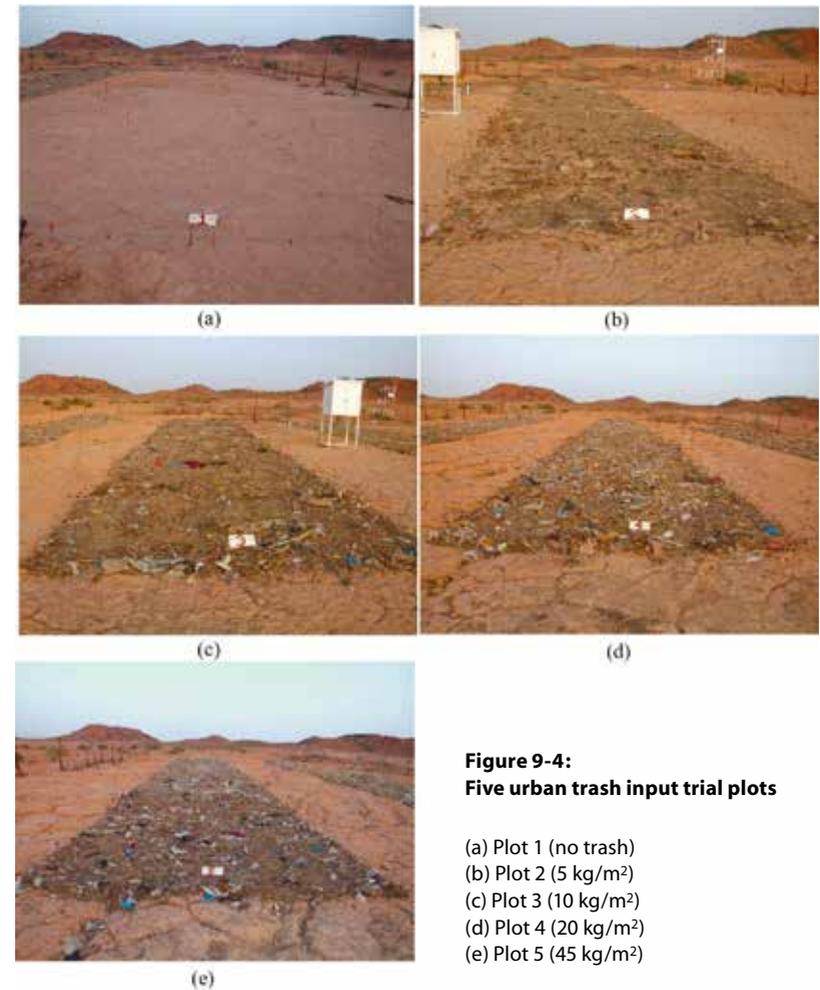


Figure 9-4:
Five urban trash input trial plots

- (a) Plot 1 (no trash)
- (b) Plot 2 (5 kg/m²)
- (c) Plot 3 (10 kg/m²)
- (d) Plot 4 (20 kg/m²)
- (e) Plot 5 (45 kg/m²)

(no new seed crop was sown artificially). All the plant species that grew were identified and the air-dried weights of each plant species were measured. One Fulbe pastoralist and one Hausa farmer were interviewed regarding information on livestock preferences for these plants. The cut plants were not put back into the plots, but taken away for use as livestock feed. This was repeated 24 months later in November 2010, and 36 months later in November 2011 (Oyama 2012).

Plot 1, with no trash input, showed no visible change or plant growth in three years (Figure 9-5). Plot 2, with 600 kg (5 kg/m²) of scattered trash, contained 16 plant species weighing 310 g (25.8 kg/ha) after one year. The predominant plant species was *Amaranthus* spp. (8.0 kg/ha), along with *Borreria radiata* and *B. stachydea* (6.6 kg/ha), and pearl millet or *Pennisetum glaucum* (3.8 kg/ha). The Hausa eat the leaves of *Amaranthus* spp. The other plant species were mostly suitable for livestock. After two years, the range of plants present was reduced to four species weighing 34 g (2.8 kg/ha), including a small amount of *Digitaria longiflora* (1.3 kg/ha), *B. radiata* and *B. stachydea* (0.7 kg/ha), and *Zornia glochidiata*. *Z. glochidiata* is highly esteemed as livestock feed by the Fulbe as it is considered the most desirable feed during the rainy season. After three years, there was no plant growth present.

Plot 3 received 1,200 kg (10 kg/m²) of trash input. After one year, there were 16 plant species present, totaling 4,003 g (333.6 kg/ha) in weight. The predominant plant species were pearl millet or *P. glaucum* (241.1 kg/ha), *Jaquemontia tamnifolia* (50.8 kg/ha), and *Amaranthus* spp. (15.7 kg/ha). There was a lot pearl millet growth, probably because the seeds were already in the leftovers from threshing included in the trash. After two years, there were 12 plant species present weighing 1,002 g (83.5 kg/ha) – markedly less than the previous year. The predominant species were *Z. glochidiata* (30.2 kg/ha), *Polycarpacea linearifolia* (14.3 kg/ha), and *D. longiflora* (12.3 kg/ha). Six plant species, such as *P. linearifolia* (14.3 kg/ha), *Gynandropsis gynandra* (5.3 kg/ha), *B. radiata* and *B. stachydea* (4.9 kg/ha), and *Brachiaria xantholeuca* (3.0 kg/ha) were seen only in the second year. In the third year, there were three plant species present weighing 535 g (44.6 kg/ha): *Z. glochidiata* (36.9 kg/ha), *B. radiata* and *B. stachydea* (5.8 kg/ha), and *Balanites aegyptiaca* (1.8 kg/ha). *B. aegyptiaca*, only seen in the third year, has leaves which can be utilized by livestock as well as the Hausa people during famine. The fruit is edible as well. These are called “famine foods (*abincin nyunwa*)” in Hausa societies. Germination was probably from seed contained in the trash. The plant species found in Plot 3 were all favoured as livestock feed.

Plot 4, with 24,000 kg (20 kg/m²) trash input, grew many plant species. After one year, the plot contained 35 species weighing 59,547 g (4962.3 kg/ha) in total. The predominant plant species were pearl millet (*P. glaucum*) weighing 4257.2 kg/ha, *Hibiscus sabdariffa* (225.5 kg/ha), and *B. radiata* and *B. stachydea* (166.1 kg/ha). *H. sabdariffa* is cooked and eaten by the Hausa as a side dish. Pearl millet comprised 85.8% of the total, by weight. After two years, there were 17 plant species present weighing

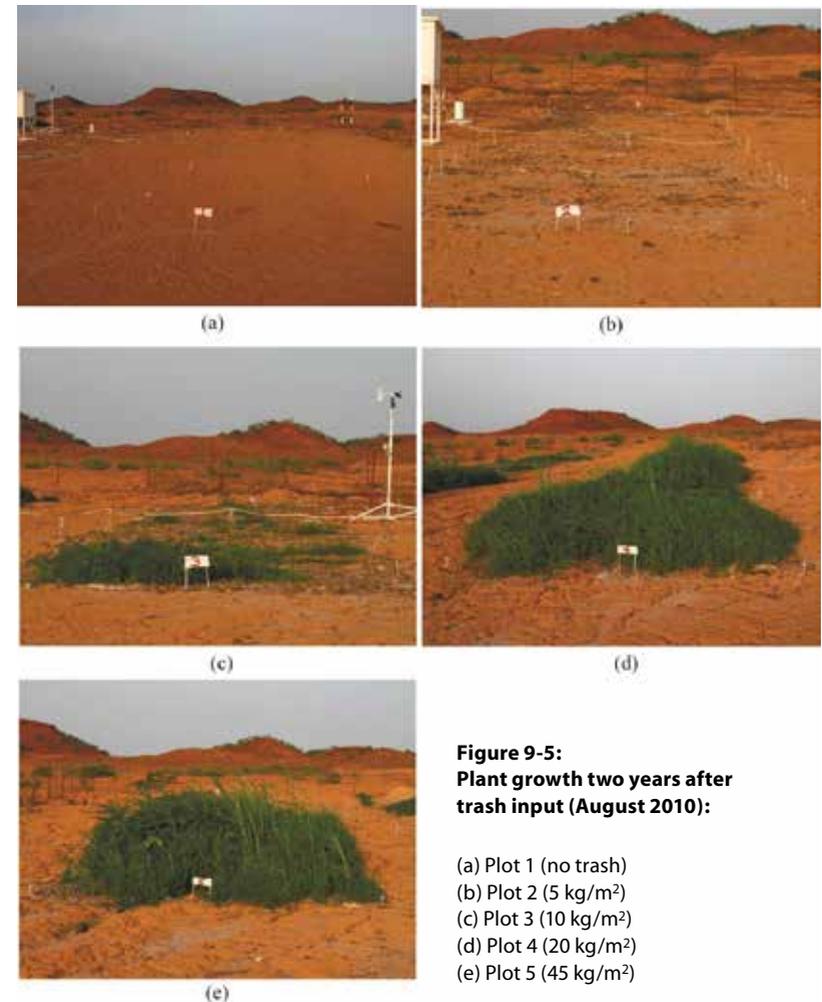


Figure 9-5:
Plant growth two years after
trash input (August 2010):

- (a) Plot 1 (no trash)
- (b) Plot 2 (5 kg/m²)
- (c) Plot 3 (10 kg/m²)
- (d) Plot 4 (20 kg/m²)
- (e) Plot 5 (45 kg/m²)

37,903 g (3158.6 kg/ha). The weight of pearl millet decreased to 0.6 % of the total at 18.3 kg/ha. The predominant plant species were *B. radiata* and *B. stachydea* (1235.8 kg/ha), *H. sabdariffa* (785.3 kg/ha) and *Indigofera priureana* (595.8 kg/ha). Five plant species, *B. aegyptiaca*, *Ipomoea vegan*, *Z. glochidiata*, and two unknown species were only observed after two years. After three years, there were 16 plant species present, weighing

15,674 g (1306.2 kg/ha). Among these, *B. radiata* and *B. stachydea* (714.3 kg/ha), *Schizachyrium exile* (231.3 kg/ha) and *I. priureana* (173.5 kg/ha) were the predominant species. Six plant species (*Cassia obtusifolia*, *Indigofera astragalina*, *Aristida mutabilis*, *Pennisetum pedicellatum*, *Gymnospria senegalensis*, and one unknown) were only observed after three years. There was no pearl millet. Most plant species found in Plot 4 were favoured as livestock feed.

Plot 5, with 5,400 kg (45 kg/m²) trash input, produced 17 plant species, weighing 43,847 g (3653.9 kg/ha) after one year (Figure 5, above). Among these, pearl millet weighed 3496.4 kg/ha, *S. exile* weighed 51.0 kg/ha, and *B. radiata* and *B. stachydea* weighed 38.08 kg/ha. Pearl millet comprised 95.7% of the total, by weight. The residents of Dogondoutchi town often owned millet fields and threshed their own millet. Therefore, the trash contained many millet seeds left over from threshing, and it was probably these seeds that germinated. Two years later, 18 plant species were counted, weighing 10,800 g (900.00 kg/ha). The weight of pearl millet decreased to 7.2% of the total, weighing 64.6 kg/ha. The predominant plant species were *I. preuriana* (370.8 kg/ha), *B. radiata* and *B. stachydea* (128.5 kg/ha), and *S. exile* (83.8 kg/ha). Only nine species were seen after two years: *I. preuriana*, *G. gynandra*, *D. longiflora*, *Acanthospermum hispidum*, *Alysicarpus rugosus*, *Celosia trigyna*, *Sesamum alatum*, *Cymbopogon giganteus*, and *Tephrosia purpurea*. After three years, 13 plant species were counted, weighing 9,099 g (758.3 kg/ha). The predominant species were *I. preuriana* (211.1 kg/ha), *B. radiata* and *B. stachydea* (197.9 kg/ha), and *S. exile* (119.5 kg/ha). No pearl millet was seen after three years, as in Plot 4. After three years, three new species were noted: *Indigofera tinctoria*, *Brachiaria xantholeuca*, and *Zornia glochidiata*. As in Plots 2, 3 and 4, the plant species found in Plot 5 were mostly species favoured as livestock feed. Interviews with the Fulbe pastoralist and the Hausa farmers revealed that Plots 2 and 3 did not support enough plant growth to be considered a grazing field, but growth in Plots 4 and 5 was sufficient until the third year after trash application. This means that at least 20 kg/m² of urban trash was necessary for plant recovery, from the viewpoint of the residents – including both pastoralists and farmers.

Effects of Urban Trash Input on Land Rehabilitation

With the addition of trash input, rainwater that would otherwise run off penetrated into the ground through termite tunnels in the hardened

sedimentary layer. Up to a point, the amount of trash added was directly related to water retention. The heaps of trash were able to catch the wind-blown sand as well as organic matter carried by the Harmattan sandstorm during the dry season and during turbulence in the rainy season, and dispersed the rainwater running off onto the ground. The wind-blown sand, along with clay and silt moved to the soil surface by termites, were also important for improving the physical properties of the soil for millet cultivation (Oyama 2009). The addition of trash on top of the sedimentary layer prevented further soil erosion and exposure. Termites quickly decomposed the organic matter, while the metal and plastic waste remained in place longer and played an important role in trapping the wind-blown sand.

The *in situ* experiment has revealed that urban trash input on degraded land improved plant growth through a combination of the seven factors described below (Figure 9-6). The Arenosols soil type is prone to damage from water and wind erosion (Bleich and Hammer 1996) but low mounds with a range of elevations superimposed on the flat topography in effect (1) trapped sand and organic matter blown in on the strong winds. This is the same wind erosion control effect that Michaels *et al.* (1995) aimed for, using millet residue, but crop residues are not usually left in place in this region because of livestock grazing and termite decomposition. The local people take any crop residues away to their homesteads where it is all eaten by livestock. The Hausa people welcomed the addition of plastic sandals, bags, metal pots and plates in the trash scattered onto their fields because these do not easily decompose and, since they are not affected as much by the termites, they cover the soil and trap wind-blown sand longer than organic matter.

Next, the author considered the various effects of elevated termite biological activity due to trash input. Most trash comprises pearl millet stalks and leaves, leftover livestock feed and animal excreta. Trash input induces the termites to gather. Termite guts and nests contain symbiotic microorganisms such as bacteria, protozoa and fungi that decompose cellulose and lignin, fix nitrogen and produce methane (Lee and Wood 1971; Benemann 1973). These biological activities alter the chemical properties of the soil and, as a result, termite mounds can contribute to high levels of soil fertility (Benemann 1973; Adepegba and Adegoke 1974; Pomeroy 1976; Bagine 1984).

As a result of this termite activity, (2) termite shelters placed over the organic matter contain concentrated amounts of organic matter and termites dig up the small grains of clay and silt particles in the soil and mix them with wind-blown sand, (3) termite tunnels also penetrate the

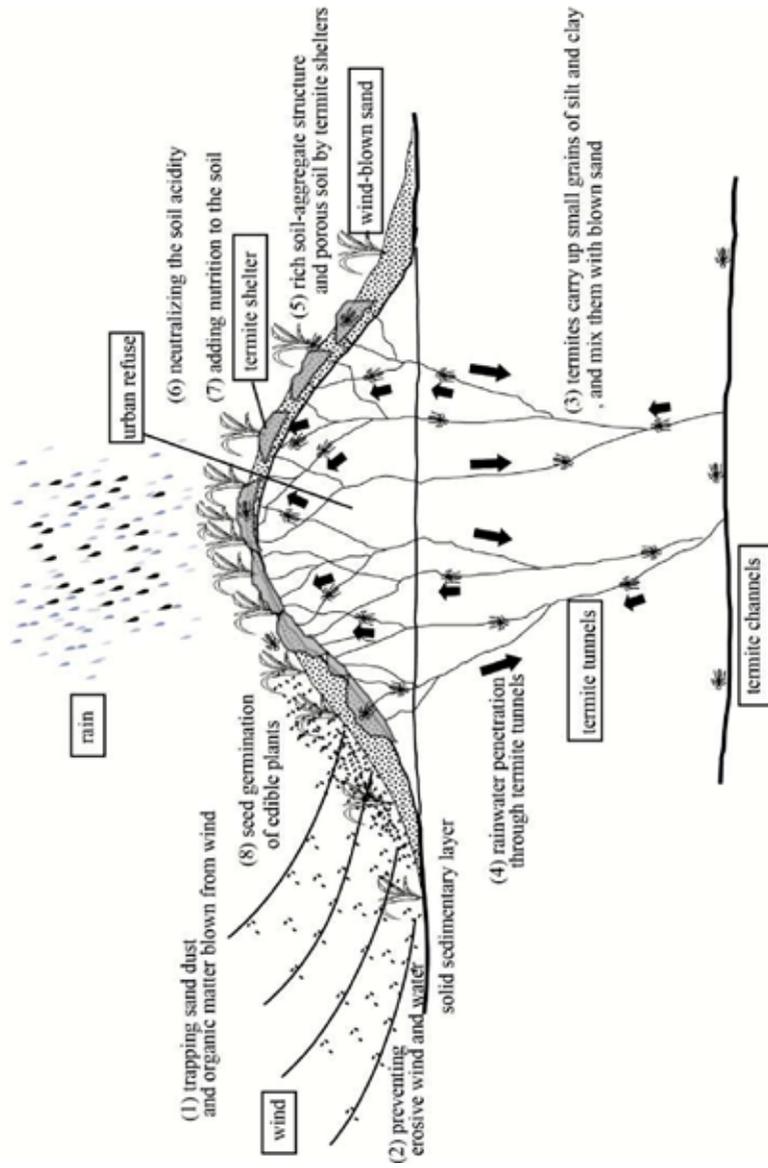


Figure 9-6: Seven effects of urban trash input on land rehabilitation and the ways in which it can be used to combat desertification.

sedimentary layer, allowing rainwater to infiltrate easily through the tunnels, and (4) an aggregated soil structure is created as the termites stick grains of sand together with their saliva as they build their mounds. Our observations showed that the aggregated soil structure is porous, allows plant roots to grow and penetrate readily, and contains oxygen and moisture – both of which are necessary for plant growth.

These all contribute to ameliorating the poor natural nutrient content and strong acidity – as indicated by the low pH of the parched and degraded land. Organic matter, including livestock excreta, contains much nitrogen, phosphate and potassium, and significantly improves the chemical properties of the soil. Urban trash and excreta are neutral to alkaline, and (5) neutralize the soil acidity (pH 4.5) of the degraded land, as well as (6) adding nutrients to the soil (Table 9-1, above). The author has frequently received the question and comments about the toxicity of urban trash and the safety of using it as a fertilizer. The safety of urban trash for land rehabilitation practices was therefore tested by analysing the heavy metal contents of 100 trash samples from the capital Niamey, using Energy Dispersive X-ray spectrometry (Shimadzu EDX-700HS). The urban trash from homes was found to comply with the European Union environmental safety standard. Consequently, we can safely use urban trash so long as we avoid the king of hard waste dumped at roadsides, in the marginalized greenbelt and in industrial areas. The author is planning to publish a more detailed report of urban trash safety for land rehabilitation in a forthcoming paper.

Finally, (7) urban trash contains many seeds of edible plant species – including pearl millet, *Hibiscus sabdariffa*, *Balanites aegyptiaca*, and many other plants suitable as feed for livestock. These germinate naturally with the arrival of the rainy season and, in the experimental plots we set up, the seeds germinated and grew thanks to the presence of the moisture and nutrients derived from the trash. The seven effects described above can be combined to improve soil fertility and plant growth productivity.

Conclusion: Possibilities for Land Rehabilitation

There is little disagreement between scientists and farmers about the beneficial effect of organic matter on soil (Warren *et al.* 2003). The concept of utilizing urban trash for land rehabilitation involves putting to use the indigenous knowledge and daily practice of the Hausa who live in south central Niger. The Hausa reside in a semi-arid climate and know that their

fields are prone to land degradation, but they do not just passively accept this. When they recognize that soil fertility has decreased, they either contract the Fulbe and Tuareg nomads to camp in their crop fields, benefiting from the livestock excreta used to improve their soil, or they scatter trash onto their fields for the same purpose. This recycling at the homestead level encompasses peoples' daily living arrangements and their farming or livestock management practices (Orr 1995).

The crops and meat that people eat are all derived from the nutrients found in the soil. With daily life on the homestead at the core of the process, our study found that organic matter was recycled from people and livestock to the soil in the fields, to crops and livestock again, and then back to the homestead. Termite activity facilitated the recycling process from waste materials through to soil nutrition. However, after the 1960s, major traffic networks gradually expanded in southern Niger and regular markets opened along the roads. The organic matter cycle was severely disrupted as the number of regular markets reached 2,277 in 2005 (unpublished data from the Ministry of Commerce, Niger Government) and the farmers sold significant amounts of millet, cow pea, groundnut, livestock, firewood, livestock feed and firewood to these markets at frequent intervals. In our study, the villagers stated that "excreta and trash are hard to come by these days," and this may not simply be due to population growth and the increased area of farmland in villages, but also to the amount of farm products taken out of the villages to be sold elsewhere. This causes disruption in the nutrient cycle and is unsustainable.

The population of the capital, Niamey, was 18,000 in 1905. This grew to 233,414 in 1977, 398,300 in 1988, and 675,000 in 2001. The food demand from the ever-increasing population in Niamey has continued to grow, consuming enormous amounts of crops and livestock from the countryside. It is only natural that, in this process, Niamey has produced an increasing amount of urban trash. Because the infrastructure to process trash has remained quite undeveloped and inadequate in Niger, the urban areas have become overwhelmed with rubbish and unsanitary conditions. Infrastructure in Niamey is also inadequate and, in some rainy seasons, infectious diseases such as cholera and typhoid have taken a deadly toll. On the other hand, rural farming areas cannot obtain enough organic matter and the soil nutrient levels are depleted, resulting in poor crop productivity. This is what causes desertification, and the ecological imbalance is as stark in rural as in urban areas.

In other words, land degradation on farms and trash proliferation in urban areas are two sides of the same coin. The problem lies in the

imbalance in the organic matter cycle (Figure 7). Urban trash contains much organic content in the form of excreta and leftover foodstuffs that are rich in nutrients. Urban trash is, therefore, an advantageous resource that can be used to improve depleted soils in farmland areas and it should be utilized for land rehabilitation.

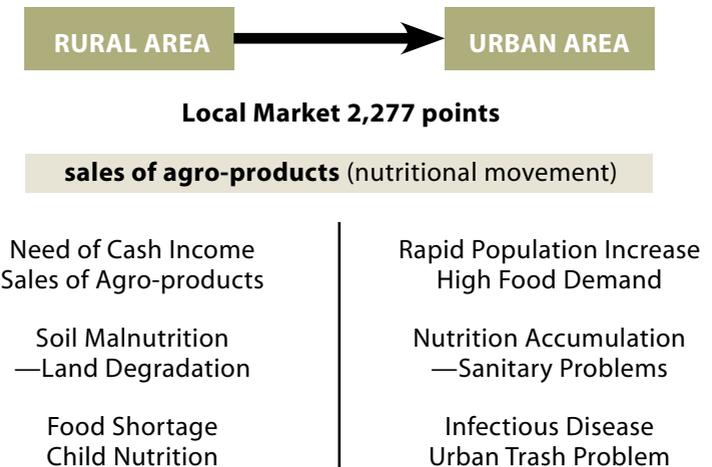


Figure 9-7: The rural – urban structure of land degradation and trash problems

References

- Adepegba, D. and E. A. Adegoke 1974. 'A study of the compressive strength and stabilizing chemicals of termite mounds in Nigeria.' *Soil Science* 117(3):175-179.
- Ayantunde, A. A. 2000. 'Herder's perceptions, practice, and problems of night grazing in the Sahel: Case studies from Niger.' *Human Ecology* 28:109-130.
- Bagine, R. K. N. 1984. 'Soil translocation by termites of the genus *Odontotermes* (Holmgren) (Isoptera: Macrotermitinae) in an arid area of Northern Kenya.' *Oecologia*, Vol. 64, pp. 263-266.
- Baier, S. 1980. *An economic history of central Niger*. Oxford Studies in African Affairs, Oxford, Clarendon Press.
- Benemann, J. R. 1973. 'Nitrogen fixation in termites.' *Science* 181:164-165.
- Bleich, K. E and Hammer, R. 1996. 'Soils of Western Niger.' In B. Buerkert, B.

- E. Allison and M. von Oppen (eds.), *Wind erosion in Niger: Implications and control measures in a millet based farming system*. Dordrecht: Kluwer Academic Publishers. Pp. 23-32.
- Europafrica.net 2011. 'Great Green Wall for Sahara and Sahel: Combat Desertification, Improving Food Security and Climate Change Adaptation.' <http://europafrica.net/2011/10/10/africa-and-europe-joint-efforts-to-combat-desertification/> (Accessed 12 December 2011).
- Food and Agriculture Organization of the United Nations (FAO) and United Nations Educational, Scientific and Cultural Organization (UNESCO) 1971. *Soil map of the world 1:5,000,000*. Rome, UNESCO.
- Gritzner, J. A. 1988. *The West African Sahel: Human Agency and Environmental Change*. Chicago: The Committee on Geographical Studies, University of Chicago.
- Hayashi, K., O. O. Fashola, T. Masunaga and T. Wakatsuki 2000a. 'Indigenous soil knowledge for sustainable agricultural development in the Sahel zone of Niger, West Africa 1. Soil quality characterization of a small inland valley watershed.' *Tropics* 9:245-258.
- 2000b. 'Indigenous soil knowledge for sustainable agricultural development in the Sahel zone of Niger, West Africa 2: Indigenous soil classification system.' *Tropics* 9:259-273.
- Kadomura, H. 2001. Combating desertification and drought. In *Our Fragile World – Challenges and Opportunities for Sustainable Development – Forerunner to the Encyclopedia of Life Support Systems (EOLSS)* London: UNESCO/EOLSS Publishers.
- Lee, K. E. and Wood, T. G. 1971. *Termites and soils*. London: Academic Press.
- Michaels, K., M.V.K. Sivakumar and B. E. Allison 1995. 'Wind erosion control using crop residue II: Effects on millet establishment and yields.' *Field Crops Research* 40:111- 118.
- Mortimore, M. J. and W. M. Adams 2001. 'Farmer adaptation, change and 'crisis' in the Sahel.' *Global Environmental Change* 11:49-57.
- Mortimore, M. and B. Turner 2005. 'Does the Sahelian smallholder's management of woodland, farm trees, rangeland support the hypothesis of human-induced desertification?' *Journal of Arid Environments* 63:567-595.
- Orr, B. 1995. 'Natural forest management in Sahelian ecosystems of southern Niger.' *Journal of Arid Environments* 30:129-142.
- Oyama, S. 2002. 'People, millet cultivation and cattle grazing of dryland in Sahel: Socio-ecological research of Hausa cultivators in southern Niger.' *Geographical Reports of Tokyo Metropolitan University* 37:83-92.
- 2009. 'Ecological knowledge of Hausa cultivators for the land degradation process in Sahel, West Africa.' *Geographical Reports of Tokyo Metropolitan University* 44:103-112.
- 2012. 'Land rehabilitation methods based on the refuse input: local practices of Hausa farmers and application of indigenous knowledge in the Sahelian Niger.' *Pedologist* 55(3):466-489.
- Oyama, S. and I. Mammone 2010. 'Ecological knowledge of Hausa cultivators and *in situ* experiment of the land rehabilitation in Sahel, West Africa.' *Geographical Reports of Tokyo Metropolitan University* 45:31-44.
- Pomeroy, D. E. 1976. 'Some effects of mound-building termites on soils in Uganda.' *Journal of Soil Science* 27:377-394.
- Sahara and Sahel Observatory 2008. 'The Great Green Wall Initiative of the Sahara and the Sahel; Introductory Note Number 3.' Tunis: Sahara and Sahel Observatory and World Bank.
- Tschakert, P. 2007. 'Views from the vulnerable: Understanding climatic and other stressors in the Sahel.' *Global Environmental Change* 17:381-396.
- Warren, A., H.Osbahr, S. Batterbury and A. Chappell 2003. 'Indigenous views of soil erosion at Fandou Béri, southwestern Niger.' *Geoderma* 111:439-456.

Part IV

Indigenous People and Nature Conservation



CHAPTER TEN

THE TOTO INDIGENOUS PEOPLE AND NATURE CONSERVATION IN JALDAPARA WILDLIFE SANCTUARY

Ashok Das Gupta

Introduction

This paper discusses the Toto indigenous people residing in the Indo-Bhutan foothills and their contribution to the conservation of Jaldapara Wildlife Sanctuary in the state of West Bengal, India. The more specific focus is on the approximately one thousand individuals living in Totopara village, and their involvement with conserving the Titi Forest pocket on right bank of *Torsha* River within the Jaldapara Wildlife Sanctuary, that has been recently promoted to a National Park by the government of India.

Totos have shifted from slash-and-burn swidden agriculture to cultivation on permanent terrace fields on the foothill slopes. They learnt agriculture from Nepali speaking groups who came here in last hundred years, but a major section is fallen under agricultural labour category. Totos have recently moved from orange orchard (agro-forestry) to areca nut cultivation. They also propagate millet and corn along with rice, wheat and vegetables and even spices. They grow bamboo on the foothill slopes from which they produce the baskets that are essential for their frequent work as porters. They do not go into the deep jungle for big game hunting today, but domesticate livestock including boar and local cattle called *Mithun*. Totos still collect fuel and various yams, jungle potatoes, catechu, medicinal and fruit plants, silk cotton, teak and other varieties of timber from the forest. They venerate and offer yearly sacrifices to the spirits of the hills and rivers. Their social system is stratified (comprising *Kaiji*, *Gapu*, *Pau*, *Yongtong*, *Yangpui*) and the commoners at least are expected avoid many actions that could destroy the ecosystem, based on a traditional notion of bio-resources conservation. The paper explores ways in which their forest knowledge contributes also to contemporary government conservation efforts.

The Toto People

Language and demographics

Toto tribe is formally classified as one of the three “Primitive Tribal Groups (PTG)” of West Bengal state in India.¹ Their language nowadays shows many outside influences but traditionally is related to the ‘Tibeto-Himalayan’ branch of ‘Tibeto-Burman’ subfamily of the Tibeto-Chinese family of languages. It is similar to the languages of the Rai, Limbu (or Subba), Lepcha (or Rong), Dhimal and Bhutia and other indigenous peoples residing in the sub-Himalayan region (Grierson, 1909: 250-251; Sanyal, 1973: 45). Moitra (2004) calculated the separation of Toto from *Dhimal*, by gruto-chronological analysis, as 800-1200 AD. Toto language is “non-pronominalized”, whereas Dhimal or Dhemale is basically “pronominalized,” wherein the influence of ancient Munda language is clearly visible (Majumdar, 1991:50). Most of the Dhimals have become Hinduized and are related to Rajbongshi (or Rajbanshi) caste people and the Tharu. Dhimals today are no longer present in the *Duars*, but in Morong and Siliguri *Terai* near the Indo-Nepalese border (Mechi-Mahananda-Konki river system). Today the majority of the Toto are receiving their basic formal education in Bengali as the official and most commonly used language in the state of West Bengal.

Totos once inhabited the whole area from Teesta to Sankosh-Gadadhar, but due to several causes the community gradually was decimated outside of Totopara village. These reasons include diseases like malaria, black fever, and other epidemics, changes in nature-human interactions, demographic shift and immigration by other groups, oppression and the rising influence of modernity. The Toto populations outside Totopara may have been absorbed into related communities such as the Mech people (Bodo tribal group). Mech people are found sporadically in the entire *Duars* region, with a higher concentration in Assam.

Mech people also exist in Ballaguri and Madarihath. Other Totos may have retreated back into the Bhutan Himalayas, Sikkim and Nepal and intermingled with local groups like the Doya, Lepcha, Garo, and Dhimal. The remoteness of Totopara probably accounts for the fact that the Totos could retain their distinct identity in this area. Totos have long been known as a porter tribe, deriving part of their livelihood from carrying goods between Bhutan and North Bengal, India.

Totos in Totopara too had nearly perished by 1951, but protective measures under the Constitution of India have helped preserve their heritage and

assure a steady population growth. The total population of Totos according to the 1951 census was only 321, living in 69 different houses at Totopara. In the 1991 census, the Toto population had roughly tripled to 926 people, who lived in 180 different houses. In the 2001 census, their number had doubled again to 1,184 individuals. In 2006, Totos numbered around 1,300 and in 2011 around 1,800 individuals.

Social Organisation

Totos maintain thirteen exogamous clans (*sarkhae*): *Linkajibei*, *Dankobei*, *Dantrobei*, *Nubebei*, *Machingbei*, *Manthrobei*, *Mankobei*, *Bongobei*, *Budubei*, *Budhbei*, *Piso-changobei*, *Nurun-changobei*, and *Dhiren-changobei*.

Totos have maintained strong community sentiments, shared clan property, and still follow their traditional political and religious leaders, known as *Gapu* and *Kaiji* respectively (also sometimes known as *Mondal* and *Subba*). The *Gapu* is the formal owner of all the property of Totopara. British India in the 19th Century provided protection to the Totos, and reduced the rank of the pro-Bhutan *Kaiji* below the *Gapu*, who came to act for them as a tax collector. Totos have developed other offices like *Yangpui*, *Pau*, *Yongtong*, *Kharbari* (messenger) and *Chowkidar* (village guard). They had the *Amepha* assembly as their traditional governing body. Elders of a lineage or clan (*yongtong*) are respected in Toto society, and take care of rites-de-passage, but there is also a priestly figure (*Pau*) in each hamlet. *Pau* are also traditional medicine men (like the *Jhankiri* of Nepali communities) and have knowledge of medicinal plants, disease, mental health and spirit possession. *Yongtong* and *Pau* are close associates of the *Gapu* and *Kaiji*. Currently Sugrib Toto holds the office of *Gapu*, while *Jitsang Heubba* is the chief priest. Together, they are responsible for maintaining the Toto social system.

According to Murdock’s classification, Toto kinship terminology is of the Hawaiian type (Sarkar, 1993:25). They call relatives *neoscha* and distinguish between *miphu papaya* (consanguinal) and *pami-bei* (affinal kin). Cross cousin marriage is permitted along with widow marriage, polygyny, and love marriage. Negotiated marriage and monogamy are the most preferred. There are four usual ways of acquiring the mate viz., (1) marriage by negotiation (*Thulbehoea*), (2) marriage by escape (*Chor-behoea*), (3) marriage by capture (*Sambehoea*) and (4) love marriage (*Lamalami*).

Marriage ceremonies now are held in the months of January, February

and March. Toto people once sold their orange harvest in the winter and autumn, which meant that they could best afford to hold the marriage ceremony at this time. They invite other community people and serve them tea, fruit juice, fowl and goat. But, traditionally two heads of cattle from each family and a pig were butchered and served to the whole community in the village or hamlet, together with *Eu*, an alcoholic beverage prepared of fermented rice and millet.

Marriage outside the Toto society is an offence; there are few instances, which have not been appreciated by the society. Marriages or sexual intercourse with members of outside communities like the Bihari, Nepali and Mech (Bodo) have occurred in past but are treated as a punishable offence. Even eating with outsiders other than Lepchas and Bhutias is an offence. These regulations have contributed to maintaining the distinct character of Toto culture in Totopara village.

Political History

Sanyal (1973) stated that the Totos originally prevailed throughout the entire Western *Duars* or Bengal *Duars*, a region of foothills and flood-plains. The area has had a turbulent political history. It was taken from Bhutan by the British, who added the Bhutan foothills to Jalpaiguri district. The Bhutan war between the British in India and the Royal Kingdom of Bhutan started in 1865. The Koch-Rajbanshi dynasty in Cooch Behar had been a collaborator of Mughal-Rajput alliance and therefore had border disputes with Bhutan, in which the British in the Bengal Presidency intervened. The Bhutan *Duars* Act of 1868 gave full control over the *Duars* area to the British East India Company in alliance with Mughal Padshahi. The area was divided into western Bengal *Duars* and eastern Assam *Duars*.

In post-independent India the Bengal *Duars* have remained part of the Jalpaiguri district in West Bengal, which is one of the 29 states and six Union Territories that make up India. West Bengal possesses 19 districts of which six constitute the northern part of the state. This northern West Bengal is an administrative unit referred named as North Bengal. The six districts of North Bengal are Cooch Behar, Jalpaiguri, Darjeeling, Malda (also Maldah), North Dinajpur (Uttar Dinalpur), and South Dinajpur (Dakshin Dinajpur). Jalpaiguri is the largest among them.

Along the Indo-Bhutan border, there are 18 Duar and hence the area is known as the *Duars* or 'Doors.' Eight of them today fall within

the state of West Bengal (Jalpaiguri district) and the rest are in Assam. The term "Duar" is also used in various other sub-Himalayan highland areas. The eight doors of Jalpaiguri are Chalsa-Malbazar, Jom Duar or Mainaguri, Chamurchi Duar of Jaldhaka and Singtam, Lucky Duar or Luxmi Duar (Totopara is situated here), Alipurduar-Hasimara, Bauxa Duar, Kumargramduar, and Sankosh.

Natural Environment

Forest types in *Duars* region are very diverse and are generally classified as follows:

Northern Dry Deciduous,
Eastern *Terai* Sal,
East Himalayan Moist Mixed Deciduous Forest,
Sub-Himalayan Secondary Wet Mixed Forest,
Eastern Sub-Montane Semi-evergreen Forest,
Northern Tropical Evergreen Forest,
East Himalayan Subtropical Wet Hill Forest,
Moist Sal Savannah,
Low alluvium, and
Savannah Woodland.

This complex ecosystem has a high level of biodiversity. Many of these forests have been reduced, however, by the encroachment of tea plantations and human settlements.

Totopara village

Totopara village (26° 50'N and 89° 20'E) lies on the ancient trade route 'Laxmi Duar' in the Ballalguri area, within the Madarihat sub-district of Jalpaiguri. Totopara is located about 22 kilometres from Madarihat town and five kilometres from Ballalguri village.

The village is surrounded by the Bhutan foothills to the north, *Torsha* River to the east, and Titi and Hauri tributaries and the Titi forest reserve to the south-west.

A single lane road, crossing the Titi and Hauri tributaries twice, connects the village with National Highway 31 through Hantapara. An

alternative jungle path through Titi forest reserve runs along the right bank of *Torsha* River. On the left bank of this river lies the Hasimara-Joygaon route to Bhutan.

Totopara village is composed of six hamlets – Panchayat Gaon, Mandal Gaon, Subba Gaon, Mitrang Gaon, Puja Gaon and Dumchi Gaon. The market place is located at Panchayet Gaon, which lies at the centre of Totopara.

A first settlement survey was conducted at Totopara in 1989-1894 still under the traditional political system. The whole area of about 3.12 square miles was at first recorded in the name of the Toto political chief (*Mondal* or *Gapu*) on behalf of the entire community (Sunder 1895: 86-88; Das 1967: 8-9; Sanyal 1973: 10).

In the 1951 Census of India, the total area of Totopara was recorded to be 1,996 acres (8.0814km²) and the area was classified as unreserved.

Individual land ownership was introduced in 1969 and the result was that the government appropriated more than 1,600 acres of the total area, leaving only 347.43 acres of land to then 89 Toto families. The district collector was the top government official in the district, and overlooked this process. The government at the time wanted to introduce private land ownership in Totopara, and thereby managed to grab a major portion of Toto land and bring it under direct state control. Private land ownership has been given to Toto people only for 347.43 acres of land, though Toto community sentiment was very strongly opposed to this. The district collector was of course a non-Toto. The land he acquired was basically a forest region and these 1600 acres were declared *khas* or 'government land' under the supervision of the district collector in Jalpaiguri (now part of Falakata district). The Totos still continued to cultivate some of this state land, at the south-eastern end of Totopara village, a fertile stretch on the bank of *Torsha* River, until control of the area shifted from the district officer to the forestry Department. In 1981-82, the forest department stopped this arrangement and took possession of the land under the ambit of the Forest Conservation Act.

The remaining 347.43 acres of land in Totopara could not remain free from outside encroachment either, as many non-Totos, especially Nepali speaking Gorkha people (Gurkha) came to Totopara to permanently settle down there. The Toto are thankful to the Nepali speakers for having introduced settled cultivation into this sub-Himalayan slope. Nevertheless, the newcomers have acquired more than 72 acres of Toto land. Other communities and caste groups in Totopara include Nepali-speaking groups like Limbu or Subba, Tamang, Manger, Kami, Damai, Sarki, Ghate, Gurung,

Newar, Chhetri, Rai, and Baun; Hindi speaking Sunri, Sunwar, Chamar, Muslim, and Marwari; Bengali speaking Goala; a Rajbanshi; and other tribal communities like Garo, Mech (Bodo), Sherpa, Lepcha and Oraon.

The first of two primary schools was established in the village in 1990. Later in 1995, a high school with hostel facility was also established there. There is a village library, a rural commercial bank, agricultural cooperative, a primary health center with 6 bed facility, one mother-and-child welfare centre, one veterinary centre, six adult education centers (under *Toto Kalyan Samiti*), a post-office, a tribal welfare centre, a residential hostel, a clubhouse (*poikimsha*), a video hall, a few shops and eating places in the market, a place for weekly market and one self-help centre. To encourage ethno-tourism, there is a proposal to create a park in Totopara. In this era marked by a global market economy, many Totos are leaving their village in search of jobs. Sometimes this is not so very different from their long-established pattern of working as porters along the ancient trade routes throughout the *Duars*.

Toto, like other forest dwellers, demand some control over forest resources, pointing out that they know much about sustainable resource management in traditional ways. They do not oppose Forest Conservation Act, but strongly favour more rigorous implementation of the Forest Rights Act.

So, a question emerges whether they could contribute to protecting forest reserves, wildlife sanctuaries and national parks in the area and, if so, how?

Totopara and Jaldapara Wildlife Sanctuary

Jaldapara Wildlife Sanctuary was established in 1941 for the purpose of protecting the great Indian one-horned Rhinoceros and due to presence of rich biodiversity more generally. The region was given the more strictly protected status of a national park in 2011-12. Jaldapara Wildlife Sanctuary (now the Jaldapara National Park) is situated at the foothills of Eastern Himalayas in the Alipurduar Sub-Division of the Jalpaiguri district. Jaldapara is spread across 216.51 km² of vast grasslands with patches of riverside forests. It is connected to Gorumara National Park, Bauxa National Park, Manas National Park and many reserve forests and sanctuaries like Chilapata and Chapramari.

Some important fauna of this region are Royal Bengal Tiger, clouded leopard, Himalayan black bear, sloth bear, Indian wild dogs or wolves,

civet, pangolin, small cat species, elephants, rhinos, chital, sambar deer, barking deer, hog deer, gaur (commonly known as Indian bison), wild buffaloes, antelopes, wild boar, numerous rodents including giant squirrels, hispid hare; several snake varieties including Indian python and king cobra; numerous migratory birds including the rare brahminy duck, and sedentary birds including flycatcher, drongo, red jungle fowl, peafowls, hornbill, numerous woodpeckers and pheasants. Major tree species are Sal, Teak, Champa, Gamar, Simul, and Chikrasi. Forests also contain some other important plants such as Rain Tree (*Shirish* or *Albizia lebeck*), Silk Cotton trees (*Shimul* or *Bombax malabaricum*) and bamboo groves, and there is also *Terai* grassland vegetation and tropical riverine reeds. More than 300 species of trees, 250 species of shrubs, 400 species of herbs, 9 species of cane, 10 species of bamboo, 150 species of orchids, 100 species of grass and 130 species of aquatic flora including more than 70 sedges (Cyperaceae), 284 species of birds, 73 species of mammals, 76 species of snakes, 5 species of amphibians and the highest fish diversity of North Bengal have been so far found in nearby Bauxa National Park.

Toto are the smallest tribal group of Jalpaiguri district in West Bengal. Their settlement Totopara sits on a hillock in the Titi forest reserve and by the bank of the River Torsha. At one time the entire Jaldapara region was called "Totopara" and was covered with dense forest. Toto occupied the Jaldapara area from 1800 AD or earlier. There are many other place names starting with the prefix Toto or Tot or Tat.

Toto people have given up hunting as a livelihood for now, but actually are very good hunters. Surrounded by deep forest, the Totos remain nearly completely isolated from mainland even after independence, until the Nepali speaking Gorkha migrants and a Swedish Mission post exposed them to the influence of the outside world.

Titi forest is primarily composed of mixed deciduous foothill forest associated with savannah grasslands as well as ferns typical to a rain forest. On the bank of Torsha River, widespread grasslands covered with *thadda* and wild varieties of cane, a favourite food of rhinos. *Chopsi* and *Mailsa* also grow there and attract elephants. Interestingly, wild beasts do not usually enter Totopara village. There is no news of elephant attack. Totos worship the deity of Torsha River in a festival known as *Amuchu* (in Bhutan the Torsha River is known by the name *Amu*, and *Chu* means the river).

Toto were a porter tribe and therefore their mode of production was not focused on exploiting the forest resources.

They do catch varieties of local fish but prefer meat. Fishing is done more in the rainy season when varieties of small fishes and snails are

available in good number and serve as good source of nutrition. Dried fishes are sold in the local market. Other communities buy fish from the market also. Some quick growing fishes like *Tilapia* are now cultivated in water tanks filled up through water pipelines from Bhutan. A 500 feet deep well has been dug in Totopara, which has long suffered from a lack of running water in its hilltop location..

Local people in Madarihat-Falakata say that the entire region was once covered with wild cane varieties and there was little agricultural diversity. Those swamps were a habitat of snakes and migratory birds. Thereafter cane bushes were nearly totally replaced by traditional orange orchards maintained by the Totos. And, more recently, orange orchards have been replaced by areca nut plantation. However, dense bamboo groves are still grown on hilly slopes and in uplands with heavy rainfalls.

Totos raise livestock along with some hunting, gathering, fishing. Previously, Totos practiced slash-and-burn or swidden cultivation. They have now shifted fully to a settled cultivation model, but still go into the jungle to collect wild vegetables, food supplements, bamboo, bushes, wood, grass, leaves, fire wood, *ling* (jungle and spiny potatoes), rhizomes, yams, edible mushrooms, caterpillars, wasps, spiders and honey.

Nepalese in Totopara cultivate paddy, maize, millet (*marua* and *kaon*), potato, sweet potato, knolkhol, radish, turpin, tapioca, arum, cane, bamboo, areca nut, nuts, mustard and other rapeseeds, vegetables, rhizomes, chilly, peppercorn, clove, cardamom, cassia, ginger, turmeric, wheat, and so forth. Totos with agricultural land generally cultivate millet, areca, malt (instead of wheat) and corn associated with a few vegetables, rapeseeds and some rice. They produce their crops in bench terraces instead of the contour trenches commonly seen at higher altitudes. Terraces reduce soil erosion, retain rainwater and are cultivated with bullock (*pi'ka*), plough (*holo*), wooden beam (*jua*) and hinge (*tong*). They also like to raise crops in the clayey soil of the Torsha basin but most of those fertile lands have been appropriated by non-Totos. Entire *Duars* is a heaven for tea estates. Totos did not permit their land for any such tea plantation. In this way, the Totos are serving for both forest and agricultural biodiversity.

Toto nuclear family size does not often exceed five. This level of reproduction does not stress local natural resources on a large scale. In a conversation with Mr. Dhaniram Toto (45) in 2012, he criticized mainstream Indian people for causing a population boom and overpopulating the globe. According to him, the world is not only for humans but also for all creatures and what we consider to be non-living objects. Totos are in favour of family planning and therefore not creating excess pressure on nature.

Totos are animists and thus have a notion of protection for nature inbuilt into their worldview. They venerate nature and consider different natural features to be home to supernatural beings. They form a distinct triangle of nature, human and super-nature. Totos venerate spirits of the road, sky, hills, forest, rivers, moon, star and sun. Totos also pray to clan deity *Choisung* and soul of the departed ancestors *Chimadora*. Totos have belief in *Mana*. They do not go at night to the *Ishpa* black hills where two malevolent male spirits (*Bindi-kepa* and *Yasudang-choishu*) and one female (*Choirra*) live in the deep greenery. The entire black hill is essentially a sacred grove. Totos have faith in the benevolent spirit *Bansak-pa* the female deity of jungle. Totos in their language designate any worship with the term *kobi* and sacrifice fowl or pigeons to the spirits. Before going hunting, they used to perform a *Sunchako kobi* ritual. These practices serve as a reminder for the Totos not to spoil or damage the bio-resources of Totopara and nearby rivers, hills and forests. And if they do so, they have a notion of feedback to the effect that to damage nature is to harm one's own self.

Totos also bred lac worms in *shirish* trees (*Albizia lebbek*). Lac worm secretion is now only used as sealing wax, but once was used on a large scale in varnishing leather goods and tie-dyeing silk. However, lac production has vanished from Jaldapara similar to orange groves and cane vegetation. Deforestation and rising temperature were the causes behind the decline of orange plantations. And for that we certainly cannot hold the Toto responsible.

Generally, the Toto people protect rather than damage the forest. There are a number of reasons why that is the case. First, Totos only utilize very small amounts of firewood in a controlled manner, which contributes very limited carbon emissions that are sustainable within the self-regeneration cycle of the forest. Second, the settlement pattern of the Totos is low impact because they live concentrated within Totopara village and adjacent forests rather than scattered and deep in the wilderness. Third, the amount of road traffic they generate is very low, with only the occasional Jeep and a once daily bus connecting their isolated village with Madarihat town. While here are many other villages along this road, mostly populated by agriculturalist Nepali speaking people and the Mech community their villages and agricultural lands do not fall within the nationalised part of the area controlled by the forest department. There is another minor road through the jungle along the bank of Teesta River that passes through dense forests now falling under the jurisdiction of National Park. Totos once used this route but since the establishment of

the National Park vehicles are prohibited on this path. Even travelling that way on foot has been prohibited.

Before establishment of the National Park, the region was considered as a wildlife sanctuary for its rich biodiversity. Savannah grassland, riverine forest, ferns, bamboo and cane could be found here. At that time, people from neighbouring forest villages would collect some dry wood for fuel and also used some peripheral portions of the forest for grazing their cattle. I have never met with any Toto people with their cattle in the deep forest, however, or heard of any such reports from rangers. Nepalese and other groups in the region, such as Rajbanshi and Bengali peasants located on other side of the Jaldapara forest, are more likely to make such incursions into the park. Some Adivasis living in nearby areas also collect fuel from the forest.

In this context it needs to be considered that there are nowadays many Muslims, Hindi speaking people, Nepalis, Rajbanshis and even Bengalis residing in Totopara village. Nepalese are dominant, and the settled cultivation they have introduced to this land has been replacing previous agro-forestry and slash-and-burn type of cultivation techniques. This has had significant impact on the Toto's relationship with the forest. Totos are no longer hunter-gatherers and forest cultivators but settled agriculturalists in association with animal husbandry.

Forest department generally does not interfere with the internal matters of Totopara village or the land controlled by its people. If there is any further marginalization of the Toto through land grabbing, then that has been done by the Nepalese. However, Nepalese are also appreciated as introducers for settled cultivation techniques. Mech and Toto people thus maintain a good relationship with the Gorkha Nepalese (also Gurkha), but that does not mean that they have included under the Gorkha fold, like the Lepcha or Limbu.

Nepalese have a close relationship with forest officials and many of them work as forest department staff. The Totos are also not in conflict with the forestry department. The Indo-Bhutan border area is maintained by border security force and know about and respect the word of the Toto carriers, who carry oranges across in the harvest region. The forest department also does not hinder this traffic of goods. Totos also collect some fuel for the forestry staff, and collect wild potato for them from the mountain slopes and forest regions, which are boiled to serve as fodder for domestic pigs. Otherwise, they do not need enter into the deep forest, and hence have no such clashes with the forest department employees.

At one time, the entire Jaldapara forest region was under the control of

Toto community. Now the situation is different. Forest department is the soul authority over this forested land. In that sense, Totos have been highly marginalized over the last one and a half centuries, and it is very questionable that the current level of nature preservation is any greater than it was under the sole management of the Toto.

Forest officials deploy members of the nearby Rabha community, rather than Toto, for joint forest management. I have often seen Rabhas entering into the deep forests without hesitation, and they are renowned for their courage in the face of wild animals. Jaldapara is renowned for its leopard rehabilitation centre, one-horned rhinoceros, leopard, elephant and different deer species, hence poaching is the main problem here alongside illegal logging. Rabhas cultivate in marshlands within forest areas (outside the reserve) and also rear their cattle on marsh weeds. Often Rabhas and forest employees have had clashes in the past. Production of marsh weed, bamboo made implements, hydrophyte manures as well as mud-land fishery is exemplary of community based management systems established between the forest department and Rabhas. Such negotiation is absent between the forest department and the Totos, who are nowadays more focused on their agricultural activities and community life.

Conclusion

Totos in Totopara have been successful in preserving their identity and many of their traditions. They have strong resilience and exercise restraint in their use of natural resources in their environment. Their belief in the spirit world favours a reverent attitude toward nature and the resources it provides. The Toto way of life and their religion are thus based on nature and its rhythms. At the same time, external influenced has also transformed their way of life, and has seen them largely dispossessed of any forested land. The Toto are not opposed modernity despite these experiences. With the establishment of Jaldapara National Park they have adapted to a way of living that is compatible with the protection of biodiversity.

Notes

- 1 The rather anachronistic and somewhat disparaging designation “primitive tribes” is still in common usage in India for indigenous minority peoples like the Toto. The actual status of indigenous people in India is a different matter and a complex issue, however, that is beyond the scope of this paper to discuss.

References

- Chaudhuri, S.K. 2004. *Constraints of Tribal Development*. New Delhi: Mittal Publications.
- Das, A. K. 1967. *The Toto*. Calcutta: Cultural Research Institute, Special Series No. 11, Govt. of West Bengal.
- Grierson, G. A. 1926. *Linguistic survey of India, Vol-III: Tibeto-Burman family, Part-I*. Calcutta: Central Publication Branch, Govt. of India.
- Majumder, B. 1991. *A Sociological Study of the Toto Folk Tales*. Calcutta: The Asiatic Society.
- Majumdar, B. 1998. *The Totos: Cultural and Economic Transformation of a Small Tribe in the Sub-Himalayan Bengal*. Calcutta: Academic Enterprise.
- Moitra, M. 2004. ‘Uttarbanger biluptoprai janojati: Dhimal.’ In R. Biswas (ed.), *Uttarbanger Jati-O-Upojati* (in Bengali). Calcutta: Punascho.
- O’Malley, L.S.S. 1907 (reprint 1999). *Bengal district gazetteers: Darjeeling*. New Delhi: Logos Press.
- Risley, H. H. 1891 (Reprint 1998). *The tribes and castes of Bengal* (Vol. 1). Calcutta: Firma KLM.
- Sarkar, A. 1993. *Toto: Society and Change (A Sub-Himalayan Tribe of West Bengal)*. Calcutta: Firma KLM.
- Sanyal, C.C. 1973. *The Meches and the Totos: Two Sub-Himalayan tribes of North Bengal*. Siliguri, India: North Bengal University Press.
- Sunder, D. 1895. *Survey and Settlement of Western Duars: A Comprehensive Five Year Plan for the Development of Toto tribes*. Jalpaiguri, India: District Welfare Committee for Scheduled Castes and Scheduled tribes.

CHAPTER ELEVEN

LITTLE ANDAMAN ISLAND AND INDIGENOUS KNOWLEDGE, WITH A SPECIAL FOCUS ON WOMEN

Sweta Banerjee

Introduction

The Andaman and Nicobar Group of Islands (6-14° N, 92-94° E), with a total geographical area of 8,249 square kilometres, form one of the Union Territories of India. Port Blair, the capital, is approximately 1255 km from Kolkata, 1190 km from Chennai and 1200 km away from Vishakhapatnam. The climate is humid tropical, the annual average temperature varies from 24-28° C, and rainfall varies from 1400-3000 mm (ISFR 2011). The Islands are very lush and are regarded as one of the biodiversity hot-spots of India. In this paper I argue for the need to empower local people toward the achievement of sustainability, focusing particularly on the role of women. Onge women need to be engaged in efforts to help save the island's ecosystem because of their extensive traditional knowledge of the environment. Anthropologists too are needed to facilitate this process, ensuring that the relevant government decision makers hear the marginalised voice of local people.

Local knowledge about environment and recent environmental change needs to be documented before it is lost. By participating in such a research process, local people become empowered, which is badly needed. Businessmen from mainland India, who are busy stripping Andaman Island of its resources, now control the life of local people. The Onge cannot be returned to their traditional lifestyle, but community initiatives are now urgently needed to use their still available traditional knowledge in conservation programs. This case study exemplifies the plight of indigenous people and the potential use of their local knowledge in many parts of the world.

Figure 11-1: Map of Little Andaman within the Andaman and Nicobar Islands

Source: d-maps.com

Little Andaman Island and Its People

The Andaman Islands were first colonized at the end of Pleistocene, when Myanmar was still connected with the Island Group (Sarkar 1953). The negrito 'Onge' people are believed to be the descendants of these first settlers (Cipriani 1955). Today the Andaman and Nicobar Islands are home to four so-called "Primitive Tribes" of negrito peoples who live in different "Tribal Reserves": the Great Andamanese (about 24 individuals) on Strait Island, the Sentilene on the mainly North Sentilen Island (100-200 individuals), the Jarawa on Middle and South Andaman (about 250 individuals) and the Onge on Little Andaman Island (95 individuals). The Nicobar Group of Islands are home to the Shompen on Great Nicobar and the Nicobarese, who are dispersed across Car Nicobar, Little Andaman and other islands.

Within the Union Territory of the 'Andaman and Nicobar Islands', Little Andaman (location 10°30'41" – 10°54' N; 92°25'15" – 92°33' E) is the southern-most island of the Andaman Archipelago (see Table 1a & b), and falls under the Jurisdiction of the South Andaman Islands. The island is about 122 km away from Port Blair and 48 km south of Rutland Island. Little Andaman is very flat with moderate elevations around the centre, with coral reefs encircling the Island. The western shore is rocky and the eastern sandy. In the interior the land gradually rises to a maximum altitude of 200 meters. The island is rather remote and is covered with rich tropical forests. Hut Bay is the headquarter of Little Andaman.



Table 11-1: Geographical Data on Little Andaman

Source: Forest and Plantation Development Corporation (1989), Census of India 2001 and Field surveys (1992, 1994, 2010); Indian State Forest Report (ISFR) 2011.

Area	731.416 sq.km. (73141.6 ha)	
Mean Annual Rainfall	3000 mm	
Mean Temperature	25 ° C – 30 ° C	
Population (2001)	16892	
	Onge	95 (2010)
	Nicobarese	1365
	Others	15432
Land Use (Revenue)	3435.96 ha	
FOREST PLANTATION		
Nature regeneration area	154.7 ha	
Red oil palms	1593.0 ha	
Spices	21 ha	
Reserved Forest (including tribal reserve of 52.2 ha)	67091.0 ha	

The 92° 30' E parallel divides the Island into two parts because of its elongated shape. The western part is almost virgin forest, while nearly all human activity takes place in the eastern part of the island. Previously the line of forest clearance was far from the 92° 30' E line, but after the Boxing Day tsunami (2004) it almost reached that parallel due to reconstruction of new settlements in a new location far away from the reach of sea waves and at a higher elevation. Little Andaman has several mangrove swamps: Jacson Creek in the west, Bumila Creek and Egu-Belong Creek in the north, and Dugong Creek (La-Banare) and Tae-Eya Creek in the north-eastern corner. Little Andaman Island has an ecosystem that does not occur anywhere else in the Andaman or in Nicobar, mainly consisting of extensive fresh and saline water marshes and peat bogs (Government of India Planning Commission 2007:6). According to the Ramsar Wetland Convention, peat land covers only 3-4% of the land area of the world but is an important carbon sink holding 25-30% of carbon, which is twice as much as forest. Mangrove swamps and wetlands also provide sustenance and nurture biological diversity. This is evident from the concentration of birds, especially water fowl, as well as mammals, reptiles, amphibians, fish, invertebrates and countless plant species (Banerjee 2011). The ecosystem of the Little Andaman can be classified into – 1) Forest ecosystem, 2) Marine ecosystem, 3) Mangrove ecosystem (Saldhana 1989).

Table 11-2: Profile of the Andaman and Nicobar Islands

Source: Andaman & Nicobar Directorate of Tourism, Port Blair; Census of India 2001, 2011; Indian State Forest Report (ISFR) 2011.

Area	8249 sq. km
Number of islands	572
Inhabited islands	37 (2001 Census), 38 (2011 Census)
Population	379,944 (Rural 244,411; Urban 135,533)(2011 Census)
Climate	Tropical
Area under forest cover	90%, 81.51% (ISFR 2011)
Humidity	70-90%
Tribes	06
Endemic birds	39
Endemic plants/animals	150 species
Average annual rainfall	3200mm
Coast line	1912km (1/4th of India's 7500km)
Exclusive economic zone	6,00,000sq.km(30% of India's EEZ OF 20,00,000 sq.km)
Natural hazard profile	Seismic Zone V

The Andaman and Nicobar Islands lie close to a recognized subterranean fault line, but earthquakes of great intensity have not been recorded. The reason may be that the islands are just off the line of Greatest Weakness, which runs from Sumatra through Great Nicobar, Car Nicobar, Barren and Narcondam to the Arakan-Yoma (Myanmar). The Andaman and Nicobar Islands were certainly at one point of time connected with Arakan Yoma (Myanmar). This so-called 'Sunda shelf' was a land bridge connecting Java, Sumatra, and Borneo during the Pleistocene. Earthquakes are frequent in this wider region, and for the Andaman Islands the greatest threat are now tsunamis. April–May and November–December are the months most subject to cyclonic disturbances. Several large uprooted trees and trunks along the eastern coast, as witnessed during field work and reported also by the 'Onge' tribal people, are evidence of recent cyclonic ravages.

On 26 December 2004, an earthquake with a magnitude of 9.2 on the Richter scale hit the Andaman and Nicobar Islands, followed by a tsunami (Stein & Okal 2005). The southern islands of the archipelago were the worst hit. In Little Andaman, near Hut Bay, the headquarter of the island, the entire fishing community who lived in the coastal area were washed away, along with the community hall of the Forest and Plantation

Development Corporation. Fishermen who survived were relocated to higher areas and several new settlements were constructed. These measures further encouraged immigration of members of fishing communities from the southern states of India, mainly from Andhra Pradesh, because everything was provided free of charge by the authorities and nobody checked the documents to make sure applicants for aid were actually local Andaman residents. The road from Hut Bay to Netaji Nagar (approximately 11 km away) was greatly damaged. Many people died and were missing due to the tsunami.

Surprisingly, because of their proximity to nature and indigenous knowledge, not a single Onge died. On the day of tsunami they first were alerted by a 'great shaking' of the land and their sixth sense and strong community bonding propelled them all to move together to some safer place. When the water of the sea retracted, they knew it would come back with vigour and they would not be safe near the beach. Their inherited knowledge about earthquakes and tsunamis saved them. They did not care about leaving behind material possessions, like us, so called civilized people might, and hence acted without hesitation. Their wealth lies in their knowledge of nature. As I am emotionally close to them, I feel quite certain their nomadic way of life helped them to act quickly, and who would know their island's natural conditions better than the Onge. They follow the rhythms of nature and can feel any disruption in that rhythm. This simple fact highlights the importance of indigenous, local knowledge, and the outside world should reflect on this deeply.

The mangrove forests of the island reduced the impact of the tsunami, and took the brunt of the force of the tidal wave. As per the India State of Forest Report 2011, changes in forest cover in Andaman and Nicobar Island and loss of coastal vegetation in tsunami-affected areas was substantial. This is evident from satellite images. Rehabilitation efforts such as shelterbelt plantations to increase mangrove cover have made the affected areas ready to face further tsunamis, with the mangroves natural barrier function restored.

Onge Indigenous Knowledge and Modern Technology

I started studying the Onge in the year 1989. A desire to conduct research on an almost virgin island with an aboriginal and multi-ethnic immigrant population is what had inclined me to choose Little Andaman Island. The research was based mostly on ethnographic fieldwork. In those days,

travelling to Little Andaman islands was a real challenge. I still remember venturing on to the open sea, trying not to fall off the country boat, clutching my trusty SLR and notebook. During my entire stay at Dugong Creek I was with them from dawn to dusk.

I went fishing with the Onge men and they often gave me some fish to eat. In the forest I collected tubers and roots with Onge women, I went boating with them in their dug out outrigger boats, crossed the creek, and joined other activities. I also participated at South Bay in their handicraft making for the annual Andaman Nicobar Island festival at Port Blair. I closely observed their activities at the settlement. During my stay at Dugong creek, I found true tranquillity, peace and purity both with people and nature. The research was focused on the island environment and focused on their geographical and environmental knowledge. I spent quality time with them and the emotional bonding was so deep that they shared many moments of joy and sorrow with me. When I last re-visited the island, I felt honoured when most of them, including Mr Totenage, Tanaguru, Ms Chhoiboi and Ms Kaki, still remembered me from so many years ago, when I stayed with them near their settlement. They are neither artificial nor diplomatic, and judge people in their own way. They appreciate their natural surrounding and nature's gifts. I tried to understand their surrounding nature and land, based on their perception. When I left at the end of my first fieldwork, almost everyone came to say goodbye on the jetty at Dugong Creek.

To visit the South Bay settlement, my other field site, was rather challenging. I first visited the settlement one early morning after walking 14 km one way through the tropical forest from the Light House, located approximately 4 km from Harminder Bay, crossing the river at low tide. On the way back from the settlement, however, the tide was high and the water was up to my neck, so that I had to hold my hand high to save my camera and notebook from the incoming waves. I was lucky to see both the settlements and observe the difference and similarity of them. They are like two branches of the same aboriginal group.

The Onge always use for their survival the knowledge they have gained from their daily experience, and this knowledge is passed down through the generations. They have very good observation power. They can see far away things and can predict cyclonic storms by sensing it or observing subtle natural phenomena. Even the slightest change in their island environment, which they greatly venerate, is evident to them. They also understand seasonal changes very well from natural signs such as the flowering of specific species of plants. They know the forest as well they know themselves.

The Impact of the Tsunami and Associated Immigration

New roads have been constructed and connectivity is better now, after the tsunami, thanks to generous reconstruction aid. Before the tsunami one had to walk many kilometres to reach the cremation ground or 'burning ghat' (for Hindus) but now any one can use motorized transport. After the tsunami, many changes in people's behaviour could be noticed, especially among the Bengali settlers.

In 1967 Bengali refugees arrived in Little Andaman as settlers from mainland India. The Bengali community is now the overwhelming majority of local population. They speak Bengali and also have learned Hindi to communicate with other communities. As a native Bengali of Kolkata it was an advantage for me. They settled in four villages and by the side of the main road that runs from Hut Bay to Vivekandapuram, about 22 kilometres from Hut Bay. Other villages are Rabindranagar, Ramkrishnapuram and Netaji Nagar. Previously their settlement pattern was linear but now they spread out along the road and scattered everywhere. A change in people's attitude was brought about slowly by the effect of globalization, but the greatest shift occurred after the massive inflow of funding in the wake of the tsunami. After the tsunami everybody, especially the new settlers, became greedy for money at any cost. Living conditions also changed. The Nicobarese of Harminder Bay, for example, shifted to the interior after the tsunami, into the new settlement provided by the authorities, and corrugated iron sheds replaced their traditional huts.

Onge: Past and Present

The first initiative to venture into the island was attempted by the British. The first friendly contact was made by a British surveyor, M.V. Portman, in 1886-87. The Onge fought with the British resulting in loss of lives. The Onge first met the British 25 years later than the Great Andamanese, but were faced with similar subsequent problems of depopulation (Sarkar 1993 :19). The population declined from 700 in 1858, to 672 in 1901 and 112 in 1971. The entire Little Andaman group was once the home of the Onge, but at present they are in a true sense cornered, in the Dogong Creek area. After the tsunami, the Onge who had lived in the South Bay area of Little Andaman were pushed to the north-eastern corner of the island. The South Bay Onge settlement had been more peaceful, with less interference from outsiders except for some Nicobarese, who were resettled in Harminder

Bay as part of administrative steps taken by the government to remove them from Car Nicobar. Due to overpopulation in Car Nicobar, 165 families were resettled in 1973 (Danda 1987:67).

The Survey of India's old topographical sheets (1968) also showed Onge settlements all over the island, even on the western coast (the western part of the Island is largely undisturbed due to inaccessibility and cyclonic disturbances). In the year 1976 the Government of India took initiatives to resettle the Onge into a small pocket of Little Andaman – Dugong Creek. Some Onge of South Bay area did not migrate to the government specified area in the north-eastern corner of the island and preferred to stay in the South Bay area. They were forced to live in wooden houses with roof-tops covered with corrugated iron, a complete shift away from the much cooler palm leaf-thatched houses of earlier days. Even in winter the tin roof houses are not comfortable to live in as the Island is not far away from the equator. The South Bay Onge houses were built some way up from the ground, maybe to protect them from the tidal effects of South Bay.

With the beginning of settled life, the previously nomadic lifestyle of the Onge was disrupted. Nomadic life was not only conducive to sustainable resource use but also cleanliness and hygiene. Onge are not accustomed to having to deal with the accumulation of leftover food and garbage in a permanent location. Outsiders forced them to live by their presumably more 'civilized' way of life and never asked the Onge how they wanted to live. But traditional wisdom and knowledge are not so easily misappropriated, as is land, for example. Now we, the so-called civilized society, need to learn from their wisdom and knowledge to survive in a changing world wherein the priority needs slowly to shift away from the destructive paradigm of western industrial development to a new paradigm of local, indigenous wisdom.

Carrying Capacity and the Anthropogenic Effect

The carrying capacity of Little Andaman Island should be considered in all development initiatives by the government administration. Encroachment on finite natural resources has been a regular feature. Unlike the Onge, immigrants from the mainland have exploited and are still recklessly exploiting the island's forests for commercial and industrial purposes, endangering the island's rich biodiversity.

Human activities are creating new pressures and placing new burdens on the natural resources of the coastal zone on the eastern side of

the island, well beyond its carrying capacity. This is hardly an exceptional case. Human societies all over the world are presently using natural resources at an overwhelming rate and at a level that is not sustainable. The global growth of the human population, combined with the consistent urge to obtain more and more of the so-called 'better things in life' is threatening the very existence of a healthy, aesthetically pleasing and productive natural environment. Some of the solutions now being proposed under CRZ (Coastal Regulatory Zone) regulations may provide realistic steps to save the island, but we need to change our approach and attitude to find truly innovative, alternative solutions to the world's environmental problems (Banerjee 2011).

Preserving Little Andaman Island's Ecosystem For The World

Some of the existing agricultural activities on Little Andaman Island, such as plantations of areca nut, clove, cinnamon, pepper and other spices, peanut, bananas (both Cavendish and red Dacca, a specialty of the Nicobarese community), coconuts and vegetables, are sustainable and should be retained. Indeed, Little Andaman supplies vegetables and fruits to Car Nicobar and other islands in the Nicobar archipelago. The supply of vegetables to Nicobar is a profitable business, as is the supply of areca nut to mainland India. Copra for making coconut oil and other products is also sold to the mainland. Other activities such as the sale of shark fins and sometimes turtle eggs, and the industrial and other activities such as quarrying, plywood manufacture and red palm fruit oil processing may not be sustainable.

The rich tropical forest is one of the main resources of the island and forest clearance for any purposes should be severely restricted. Some organizations (e.g. the Forest and Plantation Development Corporation) have tried to regenerate lost forest, and these initiatives have shown just how difficult it is and how long it takes to reverse any damage. The forest is more important than expanding other activities because it is the backbone of the local ecology. Islanders' basic tendency to clear forest for anything that requires land should be changed, as this is a question of future generations' survival. Fishing activity also can be sustained at a certain level but should not create undue pressure on marine and mangrove ecosystems.

Coordination between different communities should be a global priority. A holistic approach must be considered for safeguarding the subsistence

and welfare of everyone within the world community, not just a privileged few. This is also true at a more regional level, as in the Andaman Islands. The natural ecosystem of the island, insofar as it remains intact, contains a wealth of life for local people and the whole world to appreciate. Islanders still have a lush green tropical forest, rich marine resources and highly productive mangrove forests and wetlands, and also have their local knowledge to contribute through knowledge exchange and transfer. Little Andaman has so much to offer. New settlers thus should strictly consider the impact before inviting more of their relatives to migrate to the island. Any poaching activities, whether local or international, and any attempts to burn the rich tropical forest to convert it into agricultural land or residential developments should be stopped.

The island has limited land and one of the world's most fragile and a unique ecosystem. After the tsunami the newly built settlements have already changed the landscape of Little Andaman Island. A Supreme Court of India verdict has stopped the expansion of palm oil plantations and set limitations for the timber industry, but that alone cannot stop inappropriate development. Local people and women in particular need to take the initiative to stop such practices and save their island.

One positive aspect of the Andamans and especially Little Andaman is that, perhaps due to its island character, the crime rate is very low. Things are changing, but for now there is strong social cohesion. Distinctions of religion, race, caste, creed play no great role here. These are ideal conditions for an anthropologist to act and unite people across ethnic communities for the good cause of saving their environment, before it's too late. The principle of sustainability and sustainable development must be followed.

Indigenous Wisdom vs. Modern Knowledge Systems: UNDRIP and North America (Canada)

The value of indigenous wisdom and knowledge is now beginning to be recognized throughout the world. The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) was adopted by the United Nations General Assembly during its 61st session in New York City on 13 September 2007 (see Wikipedia http://en.wikipedia.org/wiki/Declaration_on_the_Rights_of_Indigenous_Peoples). Canada subsequently abandoned the Residential Schooling System (CBC News 2008, 2014) for aboriginal Inuit (Eskimos), Metis and First Nations Indian nations (like Heiltsuk).

The decision, as part of government policy, to educate them in western culture and teach them only in English language had proven to be the wrong course and destructive. A communication gap between indigenous parents and their children arose. Inuit parents did not know English and due to their schooling children only knew English well, and not native languages like Innuinaqtun.

Who is more knowledgeable here, and who is not, is a vital question to answer. Some things are learnt and some are forgotten, who can tell which will prove the more valuable skill and knowledge henceforth? Perhaps only the future will tell. In industrial countries people are now beginning to consider what is best for themselves and for their future generations, and some have come to recognize the need to spend time every day with nature for the sake of their mental and physical health.

The Primitive in the Modern World

In the case of Onge aboriginal people, first, there was the formation of AAJVS (Andaman Adim Janjati Vikash Samity) under the Tribal Welfare Department, presumably for taking care of them. Then they were pushing the Onge back into a small corner of their own territory. After that came the establishment of schools, trying to teach them in Hindi language. This proved difficult, as they were not interested in learning another language. Nevertheless, during my first visit I saw some of the Onge children attending the class, after the teacher repeatedly requested them to attend school. There is considerable confusion in Onge society. Restricted from living their past, nomadic lifestyle, they are today trying to live a settled life (1976-2014). The shift in lifestyle has led many of them to live an idle life, sedentary in a negative sense. The dole payments provided by the Administration has made them transition to a diet of fried food and alcohol, which they were not accustomed to. One publication (Basu and Sarkar 1994:160) I read in the year 1994 claimed that they did not drink alcohol. However in the same year the first Onge I met at the guesthouse at Hut Bay asked for money to buy more alcohol. A few years back, eight Onge men died after consuming some unknown liquor (mistaken as alcohol) they found at the beach of Dugong Creek. All of them were neighbours, only Mar. 'Tanaguru' escaped because he went out that day for hunting as part of his past hunter-gatherer identity. He is always fond of hunting and this old habit saved his life. After the death of his neighbours he left his house and presently is living inside one of the settlements with new neighbours of

the Onge community.

Women in the Onge Community

Women in the Onge community actively participate in most functions of their family and have decision-making power (Basu and Sarkar 1994:163). They were previously earning wages for collecting coconut from the coconut grove as day labourers, together with male members of their community, but now Onge women are engaged with 'copra' (dry coconut) making and it is giving them better wages. Previously they were collecting tubers, fruits and roots from the forests, sometimes with their partner, as part of their traditional food gatherer practice. Sometimes they catch fish with their hand-woven fishing nets. They also shave the hair of their children with the help of a shaving blade and decorate them with white ochre. They use many medicinal plants to recover from certain diseases such as fever, stomach pain, cough etc. It may be mentioned here that when there was a Malaria outbreak in Kolkata (Calcutta), one of the local newspaper ran headlines about the Onge, who claimed their medicinal plants could remedy cerebral malaria.

Slowly they are now engaging themselves more with cooking rice and fish and sleeping, or sitting and voidly looking towards the forests or coconut groves, as they have nothing special to do and nothing to contribute except the daily household chores as most women do. They are now using spices, and cooking curry in mainstream Indian fashion. Their food habits are taking an unhealthy turn. Our contribution to their food habits is a shift from boiled and roasted food to fried and spicy food. Be that as it may, I believe the fundamentally constructive nature of the women can be mobilized to restrict future destruction of the environment of Little Andaman Island.

Forming a Sustainable Women's Council

A sustainable women's council, represented by one woman from each and every community, would contribute greatly to the promotion of environmental awareness and better, fairer management of resources that are, after all, the common property of the people, and would act as a pressure group toward positive change in the lifestyle of the islanders. They need to become active participants in the policy making processes that affect them,

making their opinions heard in discussions about growth, development and conservation measures. They would be well capable of engaging other islanders in efficient resource management, reversing the trend toward depletion of natural resources, and implement strategies for development and institutional change consistent with future as well as present needs.

Preservation of tropical forests is of the utmost importance as it acts as a natural form of carbon sequestration. Similarly, pollution of the sea should be restricted as the Andaman Sea is a part of the Indian Ocean, and oceans as a whole act as a great natural carbon sink. The Mangrove swamp areas should be preserved, as these areas are part of wetlands giving shelter to many life forms and protecting everyone from storms, even from tsunamis. The mangrove and saltmarshes in which the island is rich also act as a carbon sink. The cutting of mangrove forest for fuel wood should be restricted, especially in Tae-Eye Creek. This cannot be achieved without participation and support from the local communities. Local people can carry out certain activities for themselves and for their future generations' survival, and can demand a share in any income generated by the government from the island as a community share of public revenue. The different views and knowledge of every community can be fused to create a unique knowledge system that will be as unique as their island is. So as to use the existing resources wisely, the formation of women's council is highly recommended. As givers of life and nurturers, who know how to make others fit for survival, women are perhaps the most suitable people to save the surrounding nature.

The complex and mixed population of the island includes Bengali refugees from erstwhile East Pakistan (Bangladesh), Ranchi tribals who came as labourers from the present state of Jharkhand, the Sri Lankan expatriate community and the mainland fishing community, which is mainly from the state of Andhra Pradesh, office workers of mixed ethnicity and culture, as well as Nicobarese and the native Onge. Undoubtedly, it would be a challenging task for women to build bridges between these diverse communities but their very diversity could give a boost to a Sustainable Women's Council, with knowledge from every community helping them to save the island together.

Concluding Remarks

What can anthropologists do? Onge women can be engaged for saving their and our environment by contributing their knowledge with the help

of an anthropologist. They do need someone to guide them through the complex systems of the modern Indian state, and someone whom they can trust. Onge have excellent memory, even very elderly persons. A dedicated ethnographic researcher can still document their knowledge about their land and environment, their worldview, cosmological knowledge, anything they notice now and did not notice before, and how they handle change in a systemic way (e.g. the effects of climate change). The most important thing to document is how they use nature's resources while still keeping them intact for future use.

By participating in this research process the Onge may feel that they can even contribute to saving the world. The psychological effect of active participation in such a cause may revive them from their present depressed condition. To live with the status of being day labourers on their own land and someone else from outside enjoying their 'resources' – this experience would be quite shocking to any community in the world. Even the shrinkage of their territory had a tremendous psychological effect on them. Now they cannot be brought back to their old lifestyle, but it can be documented as the history of the Onge, told in their own words. The Onge are somehow managing with the limited resource of the Dugong Creek area to live, and yet resources sometimes become scarce due to poaching by others – locals or international visitors. Through active participatory mapping, using simple techniques, we can document their perceptions about everything they use for survival before it is too late. The documentation should be culturally appropriate and their opinion should be respected. From the Sustainable Women's Council certain measures should be adopted, keeping a close watch on migration dynamics and restricting illegal encroachment on the forest, the mangroves or the beach. They should preserve the natural resource in the western part of the island by controlling people who are directly or indirectly engaged with poaching. The government meanwhile should restrict further expansion of arable land at the cost of virgin tropical forest, and stop Ranchi tribals from burning virgin forest either for swidden farming or for plantation and settlement. The people already settled on the island should be provided alternative income sources to survive. Wealthy people from the mainland already depleted the natural resources of their native places. They do not value the natural environment, they do not care for climate change; they only care for more money. The migration dynamics is important because the already settled population will increase naturally and add to the present population. Further migration will create enormous pressure on the limited land of the island and its resources. Indeed there are a lot of

restrictions imposed on genuine researchers but none on illegal poachers and encroachers. Introduction of a permit system for hunting and other resource use is recommended.

Governments should help the people to take such occupations as will cause minimum damage to the environment. There is a quota system for islanders if they want to educate themselves in mainland India, for the Island has very limited facilities for higher education. The proposed Sustainable Women Council group could coordinate with the island's administration in this regard to develop human resources. Andaman Nicobar Medicinal Plant Board could help the women to generate income in a sustainable way by collecting plants. The art and crafts of every community can be developed. The fine handicrafts of the Onge and Nicobarese women, made from cane, can be sent to the mainland for marketing.

Now the world is moving ahead with new technology. In the USA and in Canada indigenous communities already have developed GIS databases for their community and everything they do is documented and updated. We cannot expect that level of support right now for Little Andaman Island but in the near future it will be possible. The indigenous people's knowledge and their relationship with the environment, if documented and updated properly, will reveal the effects of climate change as well. If this were to happen on Little Andaman, it could become a model to be followed by others in the Andaman and Nicobar archipelago.

Lastly, any development within a reserved forest or tribal reserve should be considered very carefully indeed to ensure does not contradict the conservation policy of the government. A relevant Act (Regulation) is in place, but what is lacking is active implementation and execution of the Act. The Sustainable Women Group could take steps to ensure the Act is implemented properly and thus restrict further damage to the island's unique wetlands. This biotope in particular needs to be preserved urgently and a reservation exclusively for the wetlands is required. Everyone needs to develop a sense that "this island belongs to me, and I will save it at any cost because it will save my family and me." The choice is largely in the Islander's own hand. They have to decide whether they will take the opportunity or not.

References

Bandhopadhyay (Banerjee), Sweta 2003. *Environment of Little Andaman: A Geographical Appraisal*. Unpublished PhD Thesis. University of Calcutta, Kolkata, India.

- Banerjee, Sweta 2011. 'Development vs. Conservation Of Little Andaman – An Approach Paper with Special Focus on Tourism.' Paper presented as a Resource Person on Special Invitation to a UGC sponsored National Seminar, Port Blair, Andaman and Nicobar Islands, India.
- Basu B. K. & Sarkar B. N. 1994. 'Onge People of India-Andaman and Nicobar Islands, Volume XII.' *Anthropological Survey of India*. Pp-157-164.
- Basu, B. K. 1990. *The Onge – The ASI Andaman and Nicobar Tribe Series*. Calcutta: Seagull Books.
- Beatley, Timothy, J. David Brown and K. Anna Schwab 1994. *An introduction to coastal zone management*. Washington D.C.: Island Press.
- Berbeta, Kailash Chandra 2004. *Forest Resources and Sustainable Development: Principles, Perspective and Practices*. New Delhi: Concept Publishing.
- Bhaskar, Satish 1979. 'Sea Turtles in the South Andaman Islands.' *Hamadryad*, Vol 4, No 1.
- Bose, Saradindu 1964. 'Economy of the Onge of Little Andaman.' *Man in India* 44(4).
- Census of India 2001 and 2011. *Andaman & Nicobar Population Table*. New Delhi: Directorate of Census Operations.
- Cipriani, Lidio 1955. 'On the Origin of the Andamanese.' *Census of India* (1951), Vol XVII, Appendix E, Delhi. Pp -LXVI-LXXI
- Danda, Dipali G. 1987. 'Human Science: Little Andaman and the Onge.' *Anthropological Survey of India*, Calcutta, p. 67.
- Dhingra, Kiran 2005. *The Andaman and Nicobar Islands in the Twentieth Century*. Oxford: Oxford University Press.
- Directorate of Tourism 2008. *Draft Andaman & Nicobar Tourism Policy*. Port Blair: Andaman and Nicobar Island Government.
- Edwards F. Steven 1987. *An Introduction to Coastal Zone Economics*. New York: Taylor and Francis.
- Gee E.R. 1926. 'The Geology of the Andaman and Nicobar Islands with Reference to Little Andaman.' *Rec. Geological Survey of India* 59(2).
- Google Earth version 7.1.2.2041
- Government of India Planning Commission 2007. *Report of the Task Force on Islands Coral Reefs, Mangroves and Wetlands in Environments and Forests*. Eleventh five-year plan, 2007-08, Pp-1-93
- Forest Survey of India 2011. Ministry of Environment and Forest, Government of India, Indian State Forest Report (ISFR), Dehra Dun. Pp-247-250.
- Odum, E.P. and H.T. Odum 1969. 'The Strategy of Ecosystem Development.' *Science* 164.
- Portman, M.V. 1988. *The Exploration and Survey of Little Andaman*. Reprinted from the Proceedings of the Royal Anthropological Society, London: W.M. Clowes & Sons.
- The Ramsar Convention on Wetlands. See http://www.ramsar.org/cda/en/ramsar-activities-40ramsar-40-messages-40_k7/main/ramsar/1-63-443-490%5E24937_4000_0
- Reddy G.P., V. Sudersen and D. Venkatesan 1989. 'Onge Foraging System:

- Strategies of Resource Utilisation.' *Journal of the Indian Anthropological Society* 24 (2):101-106.
- Saldanha C. J. 1989. *Andaman and Nicobar Lakshadweep – An environmental Impact Assessment*. Delhi: Oxford and IBHN.
- Simmons I.G. 1986. *The Ecology of Natural Resources*. 2nd edition. London: Edward Arnold Publishers Limited.
- Sinha P., Rakshit M., Hariprasad M. and Patel M.C. 1982. *Report on Geological Mapping in Parts of Great Nicobar and Parts of Little Andaman Islands*. Calcutta.
- Sarkar, Jayanta 1993. 'Endangered tribes and their development in Andaman and Nicobar Islands- Andaman and Nicobar Islanders Studies on Small Populations.' *Indian Anthropological Society* 1993, p. 19, Calcutta.
- Sarkar S.S. 1953. 'The Origin and Migration of Negritos in the Andaman Islands.' *Man in India* 33:Pp-265-274.
- Stein, S. and E. A. Okal 2005. 'Speed and Size of the Sumatra Earthquake.' *Nature* 434.
- Tahsildar's Record 1992, 1994 and 2010. Hut Bay, Little Andaman: Tahsil Sub Division Office.
- UNESCO 1973. 'Ecology and rational use of island ecosystems.' Paris, France: *UNESCO Man and the Biosphere Program* (MAB), Report Series No. 11.
- UNESCO 1974. 'Impact of Human Activities on Mountain and Tundra Ecosystems.' *UNESCO Man and the Biosphere Programme* (MAB) Report Series No. 14. Paris, France.
- UNESCO 1973: Conservation of natural areas and of the genetic material they contain. UNESCO man and the Biosphere Programme (MAB) report series No. 1. Paris, France.
- Wikipedia entry on the UNDRIP: http://en.wikipedia.org/wiki/Declaration_on_the_Rights_of_Indigenous_People
- Whitaker, Romulus 1985. *Endangered Andamans*. Environmental Service Groups, World Wild Life Funds India & MAB India, Department of Environment.

Part V

Environmental Justice and Corporate Social Responsibility



GLOBAL AND LOCAL CRISES IN THE BALANCE
OF HUMAN-ENVIRONMENT RELATIONSHIPS:
AN ANTHROPOLOGICAL STUDY OF THE IMPACT
OF THE COAL INDUSTRY IN INDIA

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Introduction

The industrialization of agrarian societies still continues and goes hand in hand with a cultural change, and a more instrumentalising attitude towards nature. The environmental impacts of the coal industry in India, which this paper explores, include issues with land use, waste management, water pollution and air pollution. The industry produces vast quantities of toxic waste products annually, which gradually pollute the land, water, air and the entire environment. Most health problems in mining areas are due to unchecked pollution, reducing the longevity of the miners and communities in nearby villages. Deforestation is posing another threat to the environment. While profits are internalized and maximized by coal-mining and steel-making businesses, costs are thus born by the public and minimized by the industry. The need for more corporate social and environmental responsibility is thus revealed as a key issue in the struggle for environmental justice, in a climate of rising corporate political influence over the policies of nation states.

Environment is a very broad concept, especially in social science. The environment makes us who we are by affecting our thoughts, feelings, and behaviours, not just our external circumstances. Everything that affects us during our lifetime is part of our environment. This is why growing fears about the deteriorating condition of the environment concern us all. Efforts are now being made to stop further abuse and make improvements where damage has already occurred.

The first worldwide meeting of heads of state specifically in response to concerns about the environment was the Earth Summit in Rio de Janeiro in

1992, formally known as the United Nations Conference on Environment and Development (UNCED). The International Environment Education Program is one outcome of the 1992 conference, and globally coordinates efforts to educate people at all levels of society about environmental concerns. The relationship of man and environment is bi-directional, however, human beings also affect the environment.

The environmental crisis is no longer a danger still in the womb of time. It is already at our door. The people who feel concerned about the crisis ahead are ever growing in numbers. The search for a paradigm that can ensure economic development without jeopardizing environmental quality is thus intensifying. This search is, however, still trapped within a Western civilization frame of reference. In fact, there is no serious attempt to look beyond a dualist Cartesian world-view. We have not yet abandoned the neoliberal development paradigm currently in vogue. We appear to be afraid of the future as it is unfolding but also of the potential costs of an alternative, sustainable future.

Human technology is now enabling the rapid exploitation of both renewable and non-renewable resources, and this cannot be sustained. Earth today is vulnerable because of voracious use of resources and an unprecedented surge in greenhouse gases. The regenerative capacity of Earth and the social structure dependent upon it are in peril. Slowly but surely we are moving towards a collapse, wherein our ecosystem may suffer a drastic and possibly permanent reduction in its carrying capacity for all organisms, resulting in mass extinction. This environmental collapse hypothesis was first publicised by Jared Diamond in a 2005 book that identifies a set of mostly environmental variables that seem to account for the collapse of some past and present societies. It proposes a chain of causation whereby environmental change has led to, is leading to, and may lead to social collapse. Of course not all social collapses are due to the proposed variables. As Diamond writes, "It would be absurd to claim that environmental damage must be a major factor in all collapses" (2005:15). Jared Diamond's model of environmental collapse was based on five main variables:

- 1 Environmental damage, based on the following conditions:
 - Ecological problems (habitat destruction, deforestation, over-hunting/fishing, poor soil and water management, introduced species, human population growth and per capita impact)
 - Anthropogenic climate change
 - Build-up of toxic chemicals

- Energy shortages
 - Full use of Earth's photosynthetic capacity
- 2 Climate change
 - 3 Hostile neighbours
 - 4 Friendly trade neighbours
 - 5 Response to environmental problems, based on the following conditions:
 - Failure to anticipate a problem because of lack of previous experience with such problems or having forgotten a previous experience, or due to using solutions based on a false analogy with a similar problem
 - Failure to perceive a problem because the problem itself is imperceptible, because organizational managers are distanced from where the problem occurs locally, or because of slow trends in how the problem progresses
 - Failure to solve the problem because of rational behaviour (economic rationality, selfishness, and the "tragedy of the commons"), because of irrational behaviour (persistence in error, holding inappropriate values, the "it's someone else's problem" phenomenon, groupthink, and psychological denial) and because of failure in solving the problem (beyond present capacities of solution, prohibitively costly to solve, or solutions coming too little too late)
 - Environmental collapse often occurs when the environment of a species or its population changes in a way that destabilizes its continued survival. There are many possible causes of such crises. It may be that the environment quality degrades compared to the species' needs, after a change of abiotic ecological factor (for example, an increase of temperature, less significant rainfalls). It may also be that the environment becomes unfavourable for the survival of a species (or a population) due to an increased pressure of predation. Finally, it may be that the situation becomes unfavourable to the quality of life of the species (or the population) due to a rise in the number of individuals (overpopulation).

It is a given fact that our environment is in grave trouble. Although the window is now small, we still have the luxury to discuss it, and to change our wasteful behaviour. In the present scenario, due to human activities, environmental degradation is happening at an alarming rate and its effects

include global warming, ozone layer depletion, rising seawater, irregular monsoon and acid rain. Though science and technology have brought immense benefits, but we are still paying too high a price for it.

Science and advanced technology can help in a limited way to achieve a global sustainable environment but cannot deliver a solution on their own. The success of a technology lies in its implementation. In spite of conducting more conferences, seminars and world summits towards the protection of environment for the past two decades, the time has come to understand the simple fact that the present world is environmentally less sustainable than ever. What progress rich, developed countries have made toward emissions control so far has largely been achieved through the relocation of their dirty manufacturing facilities to developing countries. However the relocation of the manufacturing facilities in this way cannot address the problem of anthropogenic pollution – it merely changes the jurisdiction of the pollution from the ‘rich’ to the ‘poor’ world for accounting purposes. Therefore in order to achieve global environmental sustainability, citizens must be empowered with essential knowledge and information especially in developing countries like India.

For the past decade much effort has been expended at the global level to achieve sustainable development, which means “development that meets the needs of the present without compromising the ability of future generation to meet their own needs”. Such kind of development always ensures the wellbeing of the human population by integrating social development, economic development and environmental conservation and protection. So it is quite obvious that this kind of development always must involve active participation of local people to ensure that those who are affected by the changes are also the ones determining them. Such participation ensures equitable solutions, self-determination and empowerment across genders, races and cultural groups. Like other groups, *Indigenous people* have also the right to participate in such developmental process and to define their own priorities regarding development projects that affect their lives, beliefs, institutions, spiritual wellbeing and lands. They have the right to maintain control over their own social and economic development and also to participate and offer input to national and regional development plans that affect them. Indigenous people have the right to continual improvement of living conditions, and continual economic growth. They also have the right to expect from the government that it studies the impact of development projects on their culture before implementation. Above all they have the right to the protection of their natural environment.

The human-environment interaction has five major components, briefly described below:

Physical Environment – includes aspect of the natural environment such as climate, terrain, temperature, rainfall, flora, fauna, etc.

Social–Cultural Environment – includes all aspects of the cultural environment such as norms, customs, socialization, and all the ways of dealing with other people and their creations.

Environmental Orientations – refers to the beliefs that people hold about their environment. For example, some people hold the environment equivalent to God and therefore treat all its aspects with respect and reverence and try to maintain it in a perfect form and do not degrade it.

Environmental Behaviour – refers to the use of environment by people in the course of social interactions. For example, the environment may be considered as personal space or social landscape, where the individual or group identifies with the land.

Products of Behaviour – includes the outcomes of people’s actions such as building homes, cities, dams, schools, etc. These products or outcomes impact on the environment.

These are the most important interactions between environment and human beings. It is very important to understand that human beings are part of the environment and degrading the environment will result in the extinction of human beings and other forms of life. Therefore, it is the prime responsibility of human beings to maintain the environment in good condition; its destruction means the destruction of human life.

From an anthropological perspective it can be mentioned that a sustainable future does not demand a return to the distant past, nor does it require a neo-Luddite revolution. What is required is “balance”. Culture-led development includes a range of non-monetized benefits, such as greater social inclusiveness and rootedness, resilience, innovation, creativity and entrepreneurship for individuals and communities, and the use of local resources, skills, and knowledge. Respecting and supporting cultural expressions contributes to strengthening the social capital of a community and fosters trust in public institutions. Cultural factors also influence lifestyles, individual behaviour, consumption patterns, values related to environmental stewardship and our interaction with the natural environment.

Local and indigenous knowledge systems and environmental management practices provide valuable insight and tools for tackling ecological challenges, preventing biodiversity loss, reducing land degradation and mitigating the effects of climate change. Cultural resiliency is a key feature of successful long-term human adaptability. It is a cultural ability to minimize human-caused detrimental impacts to the environment, while smoothing out the human impact of natural environmental fluctuations. Cultural resiliency helps minimize destabilizing fluctuations in human population and human demands on the natural environment. The concept of resiliency is more than that of balance or equilibrium, because it emphasizes the dynamic aspects of human and natural systems. Thus our future depends on replacing ecocide with eco-sanity.

The Indian Coal Industry: A Case Study

The present study focuses on the eight coal mines of Mahanadi Coalfield Limited (MCL) where Bhuiyaan, Oraon, Munda and Gond tribal people are working as contractual mining labourers. Mahanadi Coalfield Limited is a subsidiary of Coal India Limited (CIL), and was established on 3 April 1992. It controls two coalfields in Odisha. The Talcher coalfield is approximately 25km from the district headquarter, Angul. M.C.L operates over 22 mines in Odisha in which 13 mines are open cast and the others are underground mines.

The present study covers eight mines. Four are Talcher area mines: *Nandira* is an underground mine and *Jagannath*, *Lingaraj* and *Bhrratpur* are open cast mines. The other four are located in the *Oriend* area, IB valley area, *Lakhanpur* area and *Vasundhara* area. Tribal coal miners working in the mines of *Nandira*, *Jagannath*, *Lingaraj*, *Bhrratpur* come from *Jilinda* and *Kalamunchuin* villages and those working in the *Oriend* area, IB valley area, *Lakhanpur* and *Vasundhara* area mines come from *Khairkuni*, *Tingismal*, *Kudaloy* and *Himgir* villages. The workers have to cover 2-3 kilometres everyday to come to their work places.

The study seeks to establish a paradigm for ensuring that economic development can take place without jeopardizing environmental quality. It also explores how cultural resiliency helps to minimize the destabilizing fluctuations in human population and human demands on the natural environment.

The Impact of Industrialization on Environment

Industrialization is a period of social and economic change that transforms a human group from an agrarian society into an industrial one. It is a part of a wider modernization process, closely related to technological innovation, particularly to the development of large-scale energy and metallurgy production. Today we see the Industrial Revolution as being responsible for the higher standard of living we enjoy. Yet there is a great and, sometimes, appalling price paid in human suffering to attain this standard of living. The use of factories and mass production has led to a depletion of certain natural resources, leaving the environment permanently damaged.

One example of this depletion is deforestation, which is the clearing of forest trees for use in production. When the trees are cleared, wildlife habitat is lost. The lack of trees compounds the problem of carbon emissions. Factories are emitting CO₂ and simultaneously such industrial development tends to eliminate the carbon capture capacity of forests. The pollution involves not only airborne emissions but land and water pollution as well. So, while the Industrial Revolution was the cause of positive change for the industrial world, there is no question that it has wreaked havoc on the environment. The depletion of natural resources, the carbon emissions, pollution and human health problems that have resulted directly from the Industrial Revolution's accomplishments has been disastrous for the world environment.

The mining industry has ancient origins and occupies a special position in India's economy. Like other states in India it is also an integral part of the economic activities and sometimes has been the only avenue of earning their bread to many native people in Odisha. But such mining of minerals, being an environmentally unfriendly activity, has attracted attention from the perspective of environmental impacts and their mitigation. A fact about mining worth noting here is that it is a site-specific activity. It is only an intermediate use of the land because it is done at the sites where the minerals exist, and this land is of no use to the mining companies in the pre- and post-mining period. Moreover, mining affects all components of environment and the impacts are at once permanent and temporary, beneficial and harmful, repairable and irreparable, reversible and irreversible. The coal industry is one of the core industries in our country, and played an important role in its industrial development. But such industries are different from any other industries because of its two special features: The hazardous quality of the work; and isolation of the working community from the rest of the population.

The environmental significance of the coal industry includes impacts on land use, waste management, water and air pollution, caused by the coal mining, coal processing and the downstream use of coal products. Coal burning produces hundreds of millions of tons of solid waste products annually, including fly ash, bottom ash, and flue-gas desulfurization sludge, that contain mercury, uranium, thorium, arsenic, and other heavy metals.

There are severe health effects caused by burning coal. According to the reports issued by the World Health Organization in 2008 and by environmental groups in 2004, coal particulates pollution is estimated to shorten approximately 1,000,000 lives annually worldwide, including nearly 24,000 lives in the United States. Coal mining generates significant additional independent adverse environmental health impacts, among them the polluted water flowing from mountaintop mining.

Historically, mining has been a very dangerous activity and the list of coal mining disasters is a long one. Underground mining hazards include suffocation, gas poisoning, roof collapse, and gas explosions. Open cut hazards are principally mine wall failures and vehicle collisions. Along with these, displacement of local residents, loss of livelihood, changes in population dynamics, increased cost of living, water scarcity and health impacts are an indispensable part of it. Along with its profound impact on human society, coal mining also has some distressing ecological impacts. Both opencast and underground mining has severe impacts.

Open cast mine impacts include:

- Removal of all vegetation (flora) and fauna from the area required for mining purposes
- Pollution of water in the surrounding water bodies due to leaching from overburdened waste dumps and pollutants from the other activities.
- Dust in atmosphere contributed by mining, when deposited on the leaves of plants in the surrounding areas, may retard their growth.
- Noise and vibrations due to blasting and operation of machinery drive away wild animals and birds from nearby forests.
- Water scarcity caused due to the demands placed by mining on the local water regime affects agriculture and ecosystems near the mine.

Underground mining impacts include:

- Clearing of area for developing shaft/incline complex, infrastructure, colonies, etc. may require removal of some vegetation and fauna.
- Water use for mining may affect surrounding areas.

- Topsoil in tensile zones of subsiding areas may lose its vegetation supporting capability.
- Pumping of polluted water from the underground mines into surface water bodies may affect their aquatic ecology.

In sum, it is evident that coal mining and associated activities have considerable impacts on the ecology of surrounding areas. These impacts are evident in most of the coal mining complexes in the country including the mines under Mahanadi Coal Field in Odisha. Before discussing those, it is imperative to look back to the scenario of Coal Mining industries in our country and the history of Mahanadi Coal field Limited.

Coal Mining in India and the History of Mahanadi Coal Field Limited

India has a long history of commercial coal mining starting from 1774 with the East India Company's Raniganj Coalfield, located on the western bank of Damodar Valley. However, for about a century it remained sluggish due to lack of demand. The introduction of steam locomotives to India in 1853 gave a fillip to it. With the advent of Independence the country embarked upon 5-year development plans and the need for increased coal production by systemic and scientific development resulted in setting up the National Coal Development Corporation (NCDC) in 1956. To meet growing energy needs, unscientific mining practices and poor working conditions were widespread among private mine owners, and so the central government took the decision to nationalize the coal mines in two phases (for the categories of cooking and non cooking coal mines) in 1971-72. The Government of India formed various subsidiaries to the first company, Bharat Coking Coal Limited founded on 1 May 1972, which was initially a subsidiary of Steel Authority of India Limited, to manage the take-over of mines. In 1975 Coal India Limited was formed as a holding company with five subsidiaries namely Bharat Coking Coal Limited (BCCL), Central Coalfields Limited (CCL), Eastern Coalfields Limited (ECL), Western Coalfields Limited (WCL) & Central Mine Planning and Design Institute Limited (CMPDL). In view of a projected increase in production and investment contemplated for the CCL and WCL groups, given their wide geographical spread, resulted in day to day administrative, technical and communication problems. Two more coal companies namely, Northern Coalfields Limited and Southern Coalfields Limited

were formed on 28 November 1985. Considering the prospects of Odisha Coalfields, being the centre for No. VIII and IX planning periods, a new coal company was incorporated, bifurcating South Eastern Coalfield Limited and the Mahanadi Coalfields Limited (MCL), with its headquarters at Sambalpur. The present study is focused on the eight mines of Mahanadi Coalfield Limited.

Coal mining in those areas has a profound impact on air, water, the health of the mining community and the forest environment.

Impact on Air

Air pollution in these coalmines is caused mainly due to emissions of particulate matter and gases including methane (CH_4), sulphur dioxide (SO_2), and oxides of nitrogen (NO_2), as well as carbon monoxide (CO). Mining operations like drilling, blasting, hauling, collection, and transportation in these mines are the major sources of emissions and air pollution. Coal left in the ground can catch fire easily, and as mine fires are difficult to control, they may keep burning for decades or even centuries, creating a major source of air pollution. The use of explosives, such as in mountaintop removal, releases carbon monoxide. Dust and coal particles stirred up during the mining process, as well as soot released during coal transport, contributes to emissions and respiratory problems. Such high levels of suspended particulate matter increase respiratory diseases such as chronic bronchitis and asthma, while gaseous emissions contribute to respiratory, cardiovascular, and cerebral problems. Coal also contains methane, a potent greenhouse gas that contributes to global warming, which is released into the atmosphere during mining. On average, the deeper a mine, the more methane it generates, although methane emission depends on the mining methods, depth of coal mining, coal quality, and entrapped gas content in coal seams. Coal-laden railcars blow coal dust into the air, causing breathing problems and dirtying the landscape of local communities.

Impact on Water

Water Pollution from Coal generally includes negative health and environmental effects from the mining, processing, burning, and waste storage of coal, including acid mine drainage, thermal pollution from coal plants, acid rain, and contamination of groundwater, streams, rivers, and seas with

heavy metals, mercury, and other toxins and pollutants found in coal ash, coal sludge, and coal waste. Across the studied mines these forms of pollution are consistent. Effluents from mines are discharged into nearby water bodies like the Brahmani, Mahanadi and Baitarani Rivers, including acid from the mines. Thus the overall hydrological system has been modified and results in a severe water crisis. This affects the availability of drinking water and water for irrigation in mining areas. Moreover there is tremendous strain on ground water reserves for catering to the needs of mineral processing plants of the area.

Open-pit mining requires large amounts of water for coal preparation plants and dust suppression. To meet this requirement mines acquire (and remove) surface or groundwater supplies from nearby agricultural or domestic users, reducing the productivity of these operations or halting them. These water resources are rarely returned after mining use, creating a permanent degradation in agricultural productivity. Underground mining has a similar (but lesser) effect, due to a lower need for dust-suppression water, however, it still requires water for coal-washing. Groundwater supplies may be adversely affected by surface mining. These impacts include drainage of usable water from shallow aquifers; lowering of water levels in adjacent areas and changes in flow direction within aquifers; contamination of usable aquifers below mining operations due to infiltration (percolation) of poor-quality mine water; and increased infiltration of precipitation on spoil piles. Where coal (or carbonaceous shale) is present, increased infiltration may result in increased runoff of poor-quality water and erosion from spoil piles, recharge of poor-quality water to shallow groundwater aquifers, and reduced water flow to nearby streams

This contaminates both groundwater and nearby streams for long periods. Deterioration of stream quality results from acid mine drainage, toxic trace elements, high content of dissolved solids in mine drainage water, and increased sediment loads discharged to streams. When coal surfaces are exposed, pyrite comes in contact with water and air and forms sulphuric acid. As water drains from the mine, the acid moves into the waterways; as long as rain falls on the mine tailings the sulphuric-acid production continues, whether the mine is still operating or not. Also waste piles and coal storage piles can yield sediment to streams. Leached water from these piles can be acid and contain toxic trace elements. Surface waters may be rendered unfit for agriculture, human consumption, bathing, or other household uses.

To mitigate these problems, water is monitored at these coal mines. The five principal technologies used to control water flow at mine sites are:

Diversion systems, Containment ponds, Groundwater pumping systems, Subsurface drainage systems, and Subsurface barriers.

Impact on Health

Most health problems in the mining regions of Nandira, Jagannath, Lingaraj, Bharatpur, Oriend area, IB valley area, Lakhanpur and Vasundhara are taking place due to unchecked pollution and high levels of toxicity of mine tailing and mine disasters. The health and safety problems in these mines vary according to the technology used, type of mining (opencast to underground) and the size of operation. The lands, water bodies, air and environment in these coal areas are getting polluted due to constant release of chemical wastes, dust generated by blasting and excavation, dumping of mine wastes and over burdening of them in the surrounding lands and rivers. For these reasons, metals like fluoride, manganese, nickel and sulphate are now found in the drinking water and soil of these mining regions at high concentration. As a result the longevity of the miners and communities living in the villages Khairkuni, Tingismal, Kudaloy and Himgir has been reducing drastically as per M.C.L. Hospital reports. Average longevity of men in this tribal mining community is 55 years, and 45 for women. Most children are reported to be lethargic from inhalation of toxic dust and consumption of contaminated water. Some of these most common mining-environment related diseases are black lung disorder, tuberculosis; noise induced hearing loss, irritation to eyes, and pneumoconiosis. But in these studied mines there is a somewhat specific disease pattern. The major diseases are respiratory diseases, skin diseases and orthopaedic diseases.

Respiratory diseases in these mining areas of M.C.L are mainly dust related diseases including bronchial asthma, severe asthmatic bronchitis and pneumoconiosis. Direct inhalation of various kinds of air pollutants emitted due to coal combustion in these mines of M.C.L are creating asthma attacks and prolonged exposure to coal dust causes pneumoconiosis among coal mine workers. The mineworkers of Nandiar, Jagannath, Lingaraj, Bharatpur, Oriend area, IB valley area, Lakhanpur and Vasundhara are mostly prone to asthma and pneumoconiosis. Pneumoconiosis is a very debilitating disease, according to the doctors of M.C.L hospitals, whereby the lungs lose their natural flexibility. Results show that, not only the coal mine workers are affected from this disease but also the women who are engaged in the secondary works in the mining

areas are victimized by such chronic disease. It is also observed that mothers, if they do not have elder siblings to take care of them at home, carry infants with them to their work place. These infants are easily affected with bronchial asthma which and gradually may leads to pneumoconiosis by the time they are grown up.

Skin complaints among the tribal coal mine workers of the 8 mines of M.C.L. are mainly due to polluted water as per the M.C.L. doctors. They said that water in these areas has a high iron and sulphur content. Tribal women workers in these mines are found to be more prone to these dermal diseases as they use water for domestic purposes, while cooking, fetching water and washing clothes. Apart from this the whole family suffer from severe problems of ulcers and gastroenteritis as they are using this water also for drinking water.

Impact on Forest

Coal mining is very intensive and destructive process (Mather 1991; Sands 2005). The on-going deforestation in Talcher area is posing a great threat to the human-environment relationship at present. The deforestation is a decisive indicator but also disastrous causal factor of environmental crisis. It is observed in the study area that, deforestation is responsible for the general deterioration both in the quantum and the quality of soil. This leads to soil erosion, which subsequently has affected the fertility of the land.

According to the 'State of Environment Report, Orissa, 2006' (Orissa State Pollution Control Board, OSPCB), out of total 1822.086 ha of forest land, including reserve forest in the Talcher-Angul coal belt, about 27 per cent was lost, and of that loss 38 per cent was due to mining activities. In the Talcher coal belt area there is actually no forest area left to be acquired for the future expansion of mining activities (The Times of India 2013; Choudhury 2011-12). It is widely speculated in the area that the MCL authority deliberately showed a standing of healthy forestland over actually mining degraded forestland in the official record, so as to avoid controversy. Further, due to massive deforestation in Talcher locality some wild animal like elephants come close to the village sites, and raid crops and disrupt human habitations and domestic animals inhabiting (<http://angul.nic.in/forest.htm> # district environment). Flora like piasal (*pterocarpus trijuga*), sisso (*dalbergia*), gambhari (*gmelina*), kurum (*Adina cordifolia*) and specially aonla (*phyllonthus emblica*), mahua (*bassia*

latifolia), kendu (*diospvros*) are disappearing fast while sal (*shorea robusta*) and other shrubs are increasing in proportion (Garada, 2012, <http://angul.nic.in/forest.htm#districtenvironment>). The affected people argue that their forest resources (timber, fodder, fuel-wood, bamboo, kendu leaf, and ayurvedic medicinal herbs like amla, char, etc.) have been destroyed by the mining operations.

Environmental Management and Development

Environmental management and its relationship to human development are in a period of dramatic change. Societies are now beginning to have serious discussions about ‘sustainable development’, but there is still a great deal of confusion over what this means and how to achieve it. Implicit in changing development strategies are differing philosophies of human-nature relationships.

‘Eco-development’ explicitly sets out to restructure the relationship between society and nature into a ‘positive sum game’ by reorganizing human activities so as to be synergistic with ecosystem processes and services, as opposed to the back-to-nature ‘simple symbiosis’ strategy advocated by deep ecologists. The use of ‘development’ rather than ‘growth’, ‘management’ or ‘protection’ connotes an explicit reorientation and upgrading of the level of integration of social, ecological and economic concerns. Eco-development also attempts to incorporate the social equity and cultural concerns raised in various schools of deep ecology. Greater recognition is given to indigenous knowledge and experience in the management of human-ecosystem interactions. Eco-development thus moves on from ‘economizing ecology’ to ‘ecologising the economy,’ or whole social systems. From the conflict between anthropocentric versus bio-centric values, it attempts to synthesize eco-centrism: refusing to place humanity either above nature or below it. In many cases, behavioural factors (be they individual, organizational-institutional, or political) are more important than economic and technological factors in influencing societal actions. It is thus likely that, by restructuring along the lines of eco-development, companies and nations will develop new comparative advantages that will help to make the most adaptable more competitive and prosperous in the long run, rather than less so, as is frequently feared today.

Some developing countries might even be able to ‘leapfrog’ over the ‘environmental protection’ phase to a much more sustainable, as well as

self-defined, state of development. Still on the fringes are small but growing pockets of advocacy for a more positive approach, be they through the ‘synthesizing-systems’ planning methodologies, or the contextual, philosophical and value-based approaches at the cutting edge of science. The co-evolutionary approach would require inclusion of all user groups, or stakeholders, in the development of future environmental management and development strategies.

Culture-sensitive approaches have demonstrated concretely how one can address both the economic and human rights dimensions of poverty at the same time, while providing solutions to complex development issues in an innovative and multi sectoral manner. Indeed, culture has a transformative power on existing development approaches, helping to broaden the terms of the current development debate and to make development much more relevant to the needs of people. Development interventions that are responsive to the cultural context and the particularities of a place and community, and advance a human-centred approach to development, are most effective, and likely to yield sustainable, inclusive and equitable outcomes. Acknowledging and promoting respect for cultural diversity within a human right based approach, moreover, can facilitate intercultural dialogue, prevent conflicts and protect the rights of marginalized groups, within and between nations, thus creating optimal conditions for achieving development goals. Culture, understood this way, makes development more sustainable.

The following are some measures that can build on culture’s contribution to sustainable development:

Integrating Culture into Governance

- Integrating culture in the conception, measurement, and practice of development with a view to advancing inclusive, equitable, and sustainable development.

Capitalizing on the Cultural Sector’s Contribution to Economic Development and Poverty Reduction

- Supporting sustainable cultural tourism, cultural and creative industries, cultural institutions and culture-based urban revitalization as powerful economic subsectors that generate decent employment, stimulate local development, and foster entrepreneurship.
- Culture-led economic development should take into account the protection of cultural assets that are often fragile and constitute a unique and non-renewable capital.

Capitalizing on Traditional Knowledge to Foster Environmental Sustainability

- Integrating traditional knowledge and practices in sustainable environment schemes and seeking synergies between traditional environmental practices and high technologies.

MCL's Policy for Corporate Social Responsibility (CSR)

Corporate Social Responsibility (CSR) is defined within a framework of corporate philosophy that factors in the needs of the community and of the region within which a corporate entity functions. Having a policy in CSR is mandatory for 'Central Public Sector Enterprises' as per guidelines issued by the DPE Ministry of Heavy Industries & Public Enterprises, Govt. of India. Pursuant to this, Coal India Limited has framed a policy for CSR applicable to CIL and its subsidiaries (including MCL). On implementation of CSR policy by CIL, the sum of Rs. 5 per ton,³ or 5% of retained earnings, whichever is higher, is being allocated for CSR activities, to be carried out in the following year. Prior to implementation of CSR policy by CIL, in 2010-11, Rs. 1 per ton was allocated towards community development, to be spent in the periphery, and these projects were carried out by the District administration and MCL.

The Mines of MCL are located in different parts of the Odisha, spread across four districts (including the studied mines) and in relatively isolated areas with little contact to the outside society. Mining of coal has profound impact on the traditional lifestyle of the original inhabitants and indigenous communities and also changes the socio-economic profile of the area. Hence, the primary beneficiaries of CSR should be people displaced from their land and those residing within a radius of 15 kilometres of the project. Poor and needy members of society in different parts of Odisha should be secondary beneficiaries. Moreover, MCL's CSR policy should be integrated with its business plan so that environment and social concerns are well addressed along with the desired growth in business.

Policy on Corporate Social Responsibility of MCL is broadly framed, taking into account the following four measures:

- 1 Welfare measures for the community at large so as to ensure the poorer section of the Society derived the maximum benefits.
- 2 It will take care of landless and project affected persons. Proper rehabilitation of the land oustees/displaced persons based on R&R

policy separately formulated and the expenditure on R & R issues would be included in the Project Cost.

- 3 Contribution to the society at large by way of social and cultural development, imparting education, training and social awareness specially with regard to the economically backward class for their development and generation of income to avoid any liability of employment.
- 4 Protection and safeguard of environment and maintaining ecological balance.

Concluding Remarks

Industrialization is the period of social and economic change that transforms a human group from an agrarian society into an industrial one. It is a part of a wider modernization process, where social change and economic development are closely related to technological innovation, particularly the development of large-scale energy and metallurgy production. It is the extensive organization of an economy for the purpose of manufacturing. Industrialization also introduces a different attitude towards and perception of nature.

Mining is a core industry in India and played an important role in its industrial development. But the environmental impact is considerable. In the mines of Mahanadi Coal Field Limited studied by the author, the air gets polluted due to emissions of particulate matter and gases, water pollution cannot be avoided due to acid mine drainage, and there is also thermal pollution, acid rain and contamination of groundwater, streams, rivers and seas with heavy metals, mercury and other toxins and pollutants found in coal ash, coal sludge and other coal waste. Health problems in the mining regions are directly due to unchecked pollution and high levels of toxicity. Though the health and safety problems in these mines vary with the technology used, the type of mining (opencast or underground) and the size of the operation, the environment in all these areas is polluted and the health of miners and communities is compromised. Moreover, the on-going deforestation in mining areas in Talcher & IB valley is posing a great threat, with no more forest actually left for the future expansion of mining activities.

Mutual understanding can help eradicate social and environmental injustices, and create a more balanced relationship between society, culture and the natural environment. In particular, we suggest there is a need to

promote intercultural dialogue and build social cohesion, thereby creating an environment conducive to development. These relationships are depicted in Figure 1, below. It is also possible to capitalize on the potential of the arts to promote social cohesion and develop entrepreneurship, especially among youth and in post-conflict and post-disaster situations.

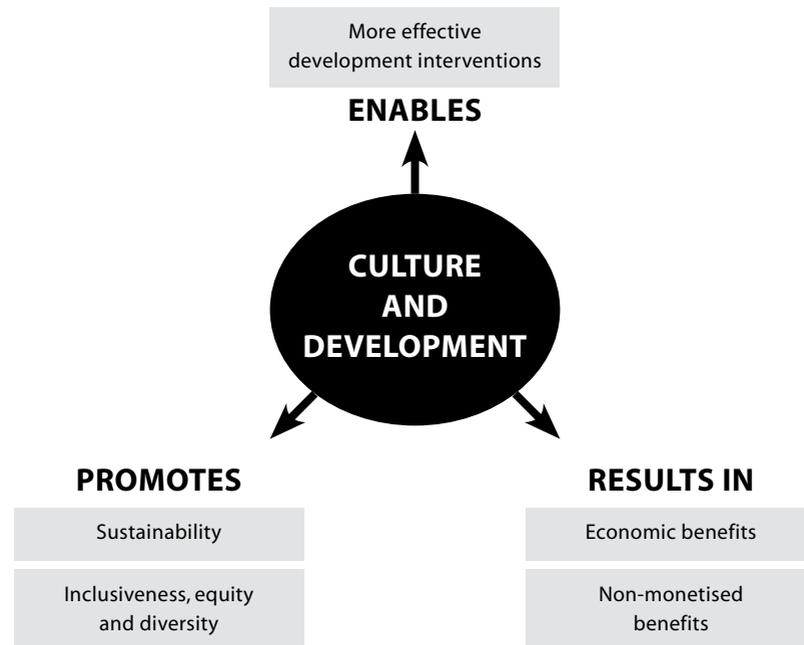


Figure 12-1: How culture contributes to development

Environmental and ecological anthropology as disciplines move beyond the dualism of nature-culture to a holistic view on ecological and cultural realities in their intrinsic connectedness. From an anthropological perspective we can think of how we can approach the urgent requirement for a cultural change of humanity towards sustainability. Eco-anthropology could greatly contribute to analyses and actions toward such a transformation, in regards both to aspects of nature (local environmental management) and aspects of culture (cultural resources for sustainability,

ways of living and of making a living). After all, it is a discipline that has been analysing both of these sides of the human-nature relationship, though only in terms of what has already happened or is happening now. It may also be necessary for eco-anthropology to expand its perspective towards “futures,” research, that is, toward achieving a sustainable future.

Notes

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References

- Diamond, Jared 2005. *Collapse. How societies choose to fail or survive*. London: Penguin Books.
- Dutt, R and K. P. M. Sundharam 2002. *Indian Economy*. New Delhi: S. Chand and Co.
- Frinkelman, R. B., W. Oram, V. Castranova, C. A. Tatu, H. E. Belkin, B. Zheng, H. E. Lerch, S. V. Maharaj and A. L. Bates 2002. ‘Health Impacts of Coal and Coal Use: Possible Solutions.’ *International Journal of Coal Geology* 50(1-4).
- Ghosh, M. K. and S. R. Majee 2003. ‘Status of Air Pollution Due to Opencast Mining and Its Control in Indian Context.’ *Journal of Scientific and Industrial Research*, 62(9).
- 2007. ‘Characteristics of Hazardous Airborne Dust around an Indian Surface Coal Mining Area.’ *Journal of Environmental Monitoring and Assessment* 130 (1-3).
- Hazra, M. Z. 2006. *CSE’s Study on Mining, People and Environment*. www.indeginousherald.com.
- Hindu Groups of Publications 2003. *State of Environment Report 2003: Health and Environment*. See www.cseindia.org.
- Karpagam, M. 1999. *Environmental Economics*. New Delhi: Sterling Publication.
- Mather, A. S. 1991. *Global Forest Resources*. Dehra Dun: International Book Distributors.
- Pandey, M. 2000. ‘Environmental Issues in Coal Mining.’ *Financial Daily*, Businessline, 7 May 2000.
- Sands, R. 2005. *Forestry in a Global Context*. CABI Publishing.
- Singh, G. 1987. ‘Mine Water Quality Deterioration Due to Acid Mine Drainage.’ *International Journal of Mine Water* 6(1).

- Tiwari, R. K. 2001. 'Environmental Impact of Coal Mines on Water Regime and Its Management.' *International Journal of Water, Air and Soil Pollution* 132(1-2).
- Yang, Y. 2007. *Coal Mining and Environmental Health in China*. A China Health-Research Brief produced as a part of the China Environment Forum's Partnership with Western Kentucky University.

CHAPTER THIRTEEN

RAISING AWARENESS AND
EFFECTING ENVIRONMENTAL CHANGE
IN DEVELOPING COUNTRIES:
A CASE STUDY ON SOCIAL RESPONSIBILITY
ENGAGEMENT IN LIBERIA

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Climate change and some of the other major environmental challenges that have emerged over the past few decades represent major social responsibility concerns for developing communities. Unfortunately, it is no longer a secret that abuses of power by key decision makers have been and continue to be an endemic problem in many developing countries and beyond. The present study, therefore, seeks to understand what affects the thought process of leaders who make environmental management decisions, using Liberia as an example. An exploratory case study approach was chosen by the researchers to understand the shared meaning and conscious awareness organizational leaders have of environmental management issues. The sample consisted of 21 managers of companies operating in Liberia with an average of 5 years of experience, and with different professional backgrounds, socioeconomic backgrounds and experiences relating to environmental management. Participants all believed that corporate leadership should pay attention to factors that influence their decisions in relation to environmental management and should raise awareness about protecting the environment, but without compromising organizational goals and profitability. Participants recognized many factors exist that influence their decisions as leaders, including perceptions, knowledge, training, feasibility, the state of the economy, technology, ethics, and, in particular, the availability of governmental support.

Environmental challenges are having increasingly significant impacts on health, human wellbeing, the economy and the direction of technological development (Harjula 2006; Mumford, Murphy, Connelly, Hill, Antes,

Brown & Devenport, 2007; Schepers 2010). Environmental management has come to be considered one of the most important social concerns for communities because of its many direct and indirect impacts on human life (Stuart, Mudhasakul & Sriwatanapongse 2009). Social and political reform movements initiated by environmentalists thus are calling for the creation of responsible relationships based on integrity among human beings and between humans and nature (Morton, Boncour, & Laczko, 2007).

Business leaders for the most part have failed to respond to critical environmental issues created by their organization (Brans & Kunsch 2010; Janice & Elizabeth, 2009; York 2009). The already substantial need for energy is still growing in many developing and developed countries (IEA, 2008; Rosenthal, 2007; UNEP, 2008), and maintaining environmental standards is a challenging task under these circumstances. It will require knowledge and understanding of the impacts of current and past unethical decisions on human wellbeing (Rosenthal, 2007; UNEP, 2008). Especially in developing countries, the lack of environmental knowledge and the race to achieve profitability are preventing leaders from making ethical decisions, which can have direct and indirect influences on health, technology and the economy in these countries (Gilleo 2001). It is in this context that the present study hopes to make a contribution.

Environmental Ethics and Corporate Social Responsibility

Environmental problems have increased rapidly over the past few decades and present serious challenges for companies and individual managers around the world (Jain & Chaudhuri, 2009). Health and environmental organizations, activists, and business leaders all realize the adverse impact industrialization has had on the environment, and media reports on environmental issues has heightened public awareness. Public scrutiny then spurred research to discover alternative methods for conserving the environment (Almer & Goeschl 2010; Basel Convention 1992; Morton, Boncour & Laczko 2007; UNEP 2008).

Ethical leadership has become increasingly important since businesses are expanding to different countries around the world. Leaders have different perspectives on ethics when making decisions related to profit, growth, and environmental management (Jain & Chaudhuri, 2009; Singhapakdi & Karande, 2001). Running successful businesses that comply with environmental standards is a difficult task for leaders and requires a high level of professionalism and technical and environmental awareness (Bigham &

Fisher, 2007; Harjula, 2006; Milfont, 2009). Managers have moral obligations toward their organizations: to adhere to laws and norms in their operations, increase profitability and growth, and satisfy stakeholders by driving organizations toward success (Beasley, 2008; Bert, 2007; Sandler, 2009). These obligations can come into conflict with the public or 'social' responsibilities of corporations.

There are different factors that drive the moral values of leaders and influence their decisions on subjects related to environmental protection and can explain the rationale behind leaders' decisions on environmental management. These include technology and economic development, and leadership and environmental protection, health and environment, centralized planning, and environmental education and awareness, as detailed below.

Technology and Economic Development

The battle for maintaining a pioneer position in the global energy market has encouraged some companies to ignore the negative impact that using their older, non-compliant technology has on current and future environmental health. There is also a growing need to produce energy to meet growing global demand, which can lead to a further increase in the volume and type of solid wastes (Punte, Repinski, & Gabrielsson, 2006). Jain & Chaudhuri (2009) found the leaders of some companies in developing countries used old technology and concentrated mainly on achieving fast growth and profit, which resulted in unethical decisions and adverse environmental impacts until today. Environmentalists have nevertheless shared with managers their concerns for stopping waste and inefficiency to safeguard resources for the future, and this is slowly changing attitudes.

Leadership and Environmental Protection

Leaders of environmental organizations might not be cautious about the importance of preserving the environment, the impact of their decisions on future generations, or the availability of resources around the globe (Harjula, 2006). Global climate change is a serious environmental problem and represents a challenge, which requires the interaction and cooperation of all nations worldwide (Wood, Pitta, Franzak, 2008).

The focus on ethical leadership is the result of a persistent challenge

to maintain and develop the economy and life of citizens, while balancing environmental protection and ethical decisions (Bert, 2007; Flynn, 2008; Stainer & Stainer, 1997; Tamminen, 1999; Zikmund, 2010). There is evidence that indicates an existing gap between individuals' attitudes and their actions toward environmental management, which then creates a need to study the factors that influence these attitudes and behaviours (Adler, 2001).

Health and Environment

Rapid increases in categories of dangerous and solid waste created through urbanization, industrialization and economic growth has resulted in the reconsideration of managerial decisions on environmental issues, and study the long-term impacts of hazardous wastes on health, human beings, and climate change (Gamble, Ebi, Grambsch, Sussman & Wilbanks, 2008; UNEP, 2008). Unfortunately, there is a lack of commitment to prudent long-term goals, which can result in increased levels of serious diseases, incorrectly processed litter from uncontrolled burning, and poor quality disposal of waste (Grambsch et al., 2009; UNEP, 2008; WHO, 2008).

Centralized planning

Some environmentalists believe in having centralized planning for all environmental activities to overcome problems that increasingly threaten human survival (Harris & King, 1988; Kilgour & Levy, 2009). Corporations tend to have different opinions about environmental management than members of the general the public and the governments officials who are meant to represent them, because their main intention is to maximize profit and use their property to generate more wealth and luxury (Harjula 2006; Johnson 2009; Singhapakdi & Karande 2001; Van Staveren 2007). It is therefore necessary to involve local and state governments in the planning of environmental strategies and to have at least some centralized authority over the uses and abuses of resources and land (Adler, 2006; Harjula, 2006).

Environmental education and awareness

Environmental education increases awareness of the ecological challenges we face, develops the ability to elucidate and minimize these challenges,

and offers information for everyone to prepare for and adapt to environmental challenges (Borck, Coglianesi & Nash 2008; Fryer 2009). Rapid development of industries, the race for developing advanced technologies in all areas of production and services, limited resources, and other factors have made it necessary for leaders and communities to learn measures to address environmental challenges without delay (Garg, Shukla & Menon-Choudhary 2007; Jain & Chaudhuri 2009).

It is important to increase public awareness and educate citizens about the impact of environmental challenges on their lives, build knowledge, experiences and values, and obtain additional skills that would help them make better decisions (Carpenter 2006; Fryer 2009; Garcia 2008; Hubbard 2007; Maharaj & Herremans 2008; Moslemi, Capps, Johnson, Maul, McIntyre and Melvin 2009; Wright 2009). Environmental education is essential for citizens and communities to gain the understanding, skills, values, experiences, and willpower to allow them to act individually and in groups so that they can resolve all outstanding environmental problems in the best possible way (Borck et. al. 2008).

Method

A qualitative, exploratory case study design was adopted to examine the insights and perceptions that influenced decisions made by leaders on environmental issues in Liberia, a developing country. The research was an exploration of how leaders made environmental impact decisions and provides an indication on how organizations balanced ethical considerations and profit in often very complicated decision-making circumstances. The goal of the study was to address increasing concerns about appropriate environmental management by exploring the shared perspectives that influence leaders' morality and decisions (Harjula 2006; McGarvey 2008; Morton et al. 2007). Identifying managers working in Liberia with different socioeconomic backgrounds, experiences, and professions ensured documentation of a broad spectrum of perspectives, and provided realistic information to integrate and compare with data from archives and media in order to understand the evolution of the changing morality of leaders under different circumstances.

The participants in the study were environmental managers working for different businesses and organizations in Monrovia City, Liberia. A majority of Liberia's industries and services are concentrated around this primary urban location. Invited participants were at least 25-year-old with

5 years of working experiences in a relevant field, related to environmental management. Twenty-one managers were selected to participate in the research because of their role and qualifications in the environmental management community.

A demographic survey was administered prior to interviewing the subjects. The participants represented diverse educational backgrounds, experiences, genders and ages. The contributors were from 14 different companies and represented six different nationalities and four continents. Table 13-1 provides a summary of all participant information.

Table 13-1: Participants: Demographic Breakdown

Field	Gender	No. in group	Age <50	Age >50	Nationality	No.
Business	Female	3	3		Liberian	5
	Male	8	7	1	Foreigner	6
Development	Female				Liberian	3
	Male	3	1	2	Foreigner	
Environment	Female	2			Liberian	5
	Male	3	3	2	Foreigner	
Social	Female	1	1	1	Liberian	2
	Male	1			Foreigner	

It was challenging to find female participants at the managerial level in Liberia who met the research criteria due to the gender gap in primary education and insufficient opportunities provided to women (Bekoe & Parajon, 2007; Hanna & Alfaro, 2012). Twenty-five percent of the research participants were females; the remaining 75% of the participants were males.

The interview questions were designed to elicit a discussion from research participants about the factors that influence leaders' decisions and ethical practices in environmental management pursuant to the primary research question. The discussions aided understanding about the experiences of business leaders in Liberia as they have made decisions related to environmental management. Questions were designed to (a) determine the factors that may possibly influence leaders' perceptions on environmental issues, (b) measure the environmental management performance, (c) define what constitutes efficient management of environmental challenges,

(d) and measure the fortification of environmental management process in business. Interview questions were as follows:

- 1 What factors influence your decisions on environmental issues?
- 2 What experiences have you had as a leader in trying to make sound environmental decisions? Please elaborate on any barriers you have faced in implementing such decisions.
- 3 What steps do you take to manage environmental challenges without compromising the company's goals of growth and profitability?
- 4 How do you suggest leaders enforce environmental management culture in their organizations?
- 5 How do you define good environmental management practices?
- 6 When presented with ethical decisions, what influences your decisions?
- 7 Are you satisfied with the results of your decisions on issues related to environmental management? Why?

Data Collection and Analysis

Basic information about potential candidates such as names, telephone numbers, and addresses were gathered through the Business Community of Liberia, the Ministry of Industry, and from organizing social events related to environmental management before participant selection occurred. Data were collected through the process of interviewing 21 managers from different organizations. During the interview, participants answered the open-ended questions, explained their perspectives and described related environmental management experiences within their areas of responsibility. They also defined their role in reducing and eliminating modern environmental challenges.

The data analysis was based on results from the use of Dragon12® transcription software, which was used to transcribe the audio recordings, which were subsequently coded for themes and patterns with NVivo8® software. Notes written by the researcher during the interviews were included in data analysis. Triangulation was engaged to ensure validity and reliability, which are discussed below. The open-ended questions were followed with probing and interacting questions to seek further clarifications, capture major data from the participants, and support the rationalization of common patterns and perspectives that were used later to endorse the conclusions of the study (Hamill & Sinclair, 2010; Husserl, 1931; Rubin & Rubin, 2005).

Findings

Five themes were identified after data were sorted for common words and phrases. These main themes were: (a) the need for better education on environmental concerns for business leaders and the community, (b) the need to consider the environment while planning economic and development strategies, (c) the allocation of funds to implement environmental standards, (d) profitability versus protecting the environment, and (e) solutions to enforcing environment management.

The need for better education on environmental concerns for both business leaders and the community

One of the problems business leaders noted was the lack of education about environmental issues. Subjects suggested they did not have the knowledge required to make informed decisions, and that the community too was unaware of environmental issues. As some respondents stated, implementing technology that would increase management leaders' decision-making skills is of utmost importance. Several participants noted that protecting the environment through recycling is considered a social and ethical responsibility for management leadership. Specifically in Liberia, war and a lack of knowledge about how to handle environmental issues are a problem for management leadership and change how they make decisions about environmental issues.

The need to consider the environment while planning economic and developmental strategies

Participants with a business background emphasized social, economic and environmental concerns, profitability, availability of funds and resources, and ethics as the major factors that influence their decisions on environmental issues. Three participants mentioned that environmental policies and social needs are linked to profitability and economic value, and represent the main drive for decisions. Some participants highlighted the government's role in setting and implementing appropriate environmental rules and regulations to preserve the environment.

The absence of strict environmental laws and strong leadership could lead to the same results; indicating the presence of corruption and bad ethics (Bassey 2008; Kessler & Abaza 2006). However, there were mixed opinions on how effective Liberia is when dealing with such issues. One

participant noted policies and regulations are set aside when it comes to environmental management in Liberia. Yet, another individual asserted his company is phasing out the use of some harmful gases and other materials that could damage the environment. Further plans were being made to keep their technicians trained on the use of hazardous materials and recycling processes and they have adopted strict environmental regulations and procedures when using tools and materials. Another environmental manager noted that regardless of what organizations are doing, there is a need to develop training programs and share international standards to change the environmental paradigm in Liberia.

Allocating funds to implement environmental standards

As several participants noted, good environmental decision-making requires having the funds necessary to implement positive environmental governance. The availability of funds and engaging the community and developers to be part of the process are major factors that contribute to finding a solution to environmental issues. One of the environmental managers asserted there is a need to increase transparency on issues related to the environment and availability of funds, to enable communities to plan and budget for the required machinery and resources needed to change the direction of environmental abuse. Another participant noted controlling funds and monitoring the progress of implementing environmental standards are considered as major challenges in Liberia.

Profitability versus protecting the environment

Participants noted one factor that they must consider in any environmental decision is whether or not they can maintain profitability (Borck, Coglianese & Nash, 2008; Janice & Elizabeth 2009). Some participants emphasized that profitability is their main motive to start any business while others mentioned objectivity and availability of resources as their focus. Three participants mentioned that environmental policies and social needs are linked to profitability and economic value and together represent the main drive for decisions. The existence of the Liberian Environmental Protection Agency (EPA) as one of the government bodies that guide policies on environmental management was among the factors that influenced most the participants with an environmental background.

Solutions for enforcing environmental management

Two participants mentioned raising awareness among colleagues and peers to ensure compliance was key to finding a solution to Liberian environmental issues. One of the managers claimed his organization disseminates environmental brochures and emphasizes following EPA standards on the disposal of hazardous materials, and frequently reminds employees on issues like paper and power saving, carpooling and optimizing the usage of materials. Another participant believes company leaders must keep their employees informed and updated on the impact of their work on the environment. Their company believes if employees are aware of their obligation to society then they will feel responsible and automatically share their ideas on how to reduce pollution of the air and water.

Factors such as experience, knowledge, health, people, planning, community benefits, ethics, leadership, and awareness were considered vital to participants with a background of social engagement. One environmental manager believes environmental issues still seem like a foreign topic to people in Liberia, so when managers are assigned to a given area, they should attempt to explain to their staff what an environmental issue is, and what the issues are in that particular area of company activities. However, educating people on environmental impacts is a lengthy process and requires resources to monitor progress and improve outcomes.

Government support to spread knowledge and educate their citizens is crucial because this requires planning for funds to educate people, facilitating recycling, developing infrastructure, reducing taxes on companies with good environmental practices, and engaging the media to increase awareness and reduce resistance to change when it comes to negative cultural practices. Table 13-2 represents the horizontalization of the all five areas.

Implications

The data revealed that there are different factors that influence leader decisions and perceptions about environmental issues in Liberia. The business leaders were not fully aware of how their decisions have or will change the environment. Participants agreed that current environmental awareness programs and training are less than adequate, and that there is a need to have advance tools and measures to deal with the environmental challenges without compromising their business's goals of growth and profitability.

An important factor discovered in the study was that management

experiences and awareness of environmental standards in Liberia have a direct correlation to the decisions of the participants because they may influence the tools, measures, and training necessary to build and protect the environmental culture. These issues require further discussion.

Support and training: Although Liberian business leaders realized the impacts of their decisions on the environment, the need for change in leadership support, additional training, building an environmental culture, and accountability in monitoring and evaluating the environmental standards were not clear. In addition, making initial assessments of environmental challenges in Liberia could assist managers in planning strategies and finding resources to mitigate current environmental impacts, and set the base for future financial and social benefit from recycling, energy and cost saving and optimizing resource use.

Awareness of problems: The implications of the different factors that influence environmental management leadership were significant in terms of finding the source of the problems before designing solutions to business objectives. It was evident in the study that awareness was significantly important to business leaders in Liberia as a prerequisite to discover ethical and practical solutions to business issues with environmental impacts. Building an environmental-focused culture, participants thought, is a reflection of leader's knowledge and awareness of environmental challenges.

Standards and rules: The existence of solid Liberian Environmental Protection Agency standards and government rules are essential to protect the environment, according to participants. Many business leaders stated environmental protection would be more effective if there were clear and strict rules to define duties and responsibilities of all stakeholders. With the absence of strict rules and environmental policies, business leaders found it easy to manipulate the rules and compromise the environment to achieve their goals.

Decision-making dilemma: Participants shared their quandary about making prudent choices to satisfy stakeholders, as opposed to sticking to their own ethics and allowing personal moral values to influence their behaviour. Business leaders in the study believe their environmental problems are unique and must be dealt with on a case-by-case basis, especially when expanding business has a direct link to the country's social or economic development.

Influence of leader's decisions: Implications of leader's choices pertaining to environment in Liberia are significant. Data from the interviews suggested that leaders react differently to environmental challenges based

**Table 13-2:
Horizontalization
Results**

Environmental education and awareness	Economic and development strategies		Finding funds and resources	Feasibility to protect the environment	Policy and regulations
Awareness training and development programs were less than adequate	Set clear environmental policies while planning economic and strategies		Protecting the environment require proper planning, moral commitment, and availability of funds	Ethical dilemma between profitability and protecting the environment	Pragmatic solutions to deal with environmental challenges
Spread environmental awareness and ethics training	The lack of policies and strict rules have resulted in damaging the environment		Having enough money	Fairness	Highlight wrong practices and their impacts on health, and prosperity
Environmental awareness and ethics training programs are feasible and save resources	Early environmental planning help to avoid wasting resources with expensive solutions		No funds results in compromising the environmental standards	High moral values and commitment to make a right decision	Highlight potential opportunities raising from positive environmental practices
Using environmental friendly technology to reduce health hazards	Involving community leaders in decision-making processes would have positive impacts		Moral understanding for the environmental challenges and its implications on health and prosperity	Engaging resources for environmental decisions is costly and time consuming	Motivate and educate people to interest in environmental subjects
Politics and regulations are set a side when it comes to environmental management	Reinforce the environmental standards		Transparency	Leaders' priorities are linked to social needs and environmental awareness	Environmental training must be prerequisite to the issuance of licenses and permissions to start a business
Keep employees informed about environmental standards	Setting standards without follow up turns to be chaotic		Commitment to build the environmental culture	Feasibility of a project is linked to the availability of infrastructure and resources	Disseminate environmental brochures and emphasize following EPA standards
Revise environmental standards	Introduce systematic way of review and improve the environment		Ability to control funds	Feasibility study assist leaders in planning and allocating funds	Environmental standards should be clear to public, and leaders need to be accountable for their actions
Building strong environmental culture	Adjust government taxes and incentives to reflect compliance with environmental standards		Corruption	Environmental assessments improve performance	Performance evaluation forms are highly recommended
Waste reduction and recycling			Availability of expertise	Implement environmental laws to streamline costs and enhance efficiency	
Quality production			Priorities change	EPA rules help to identify work standards and resources required to improve productivity	

on knowledge, circumstances, the existence of environmental laws, the availability of funds and resources, and the feasibility of environmental solutions that maintain profitability. Knowing what influences business leaders in Liberia can assist in the design of training programs to assist them in making decisions that do not compromise the environment.

Recommendations for Action: It is advocated that the government of Liberia support the implementation of environmental standards and counsel organizations on how to comply with environmental laws and standards. Incentives would help environmental leaders explore the use of alternative technology and products that could assist in implementing clearly stated environmental standards. These measures would help minimize and mitigate damage to the environment.

Implementation of standards: It is recommended that Liberian government leaders monitor the application of environmental standards and offer incentives to increase compliance with EPA regulations. Leaders should increase training and awareness programs and allocate funds to contend with on-going perceived environmental challenges. Senior organizational leaders should periodically evaluate environmental measures and standards, set and review organizational performance, share feedback with employees, and seek to ensure compliance with environmental standards. Leaders should lead by example and show interest in building in the organization an ethical culture relevant to protecting Liberia's environment for future generations.

Corporate responsibility: It is recommended that the moral responsibility of business leaders in building an environmental culture not be limited to the allocation of resources. Instead, senior environmental managers need to review feedback from employees to assure their understanding of ethical and environmental programs, environmental incentive programs, and organizational compliance. Business leaders and senior management should also incorporate into their organizational culture the outcome of training, surveys, feedback, and performance indicators in decision-making processes and performance evaluation processed for management to amplify the importance of maintaining the organization's reputation and standards.

Training: It is recommended that business leaders incorporate environmental and ethical training evaluation into the employee performance evaluation process to ensure their comprehension and compliance. The evaluation should focus on environmental, societal, economic, and developmental concerns rather than just corporate social responsibility. An environmental evaluation of the organization, as opposed to just the individual actions of the employee, should be tailored to be part of a

well-planned transformational process. Business leaders in Liberia should consider building a culture of change in their organization rather than approaching environmental change from the perspective of governmental obligation, risk management, or a check-the-box perspective.

Dissemination: It is recommended that stakeholders should engage the media, local non-governmental organizations, the Ministry of Education, and various relevant other government agencies to assist in the design of educational programs for children and adults to explain the impacts of unethical decisions on the environment. Educational and environmental programs should target ordinary people and address the consequences of unethical environmental related decisions on human beings, life expectancy, limited resources, and future generations. Raising environmental awareness should be one of the top priorities to protect the environment in Liberia.

Ethics: It is recommended that organizational leaders should promote an environmental culture that engages ethics and fairness as tools in evaluating the leadership and integrity of decision-makers. Leaders need to discuss unethical decisions with staff members and empower them to implement changes in the organization's environmental standards. Simultaneously, leaders need to monitor employee progress and reflect the outcome of their actions in performance evaluations, employment terms, incentives, and entitlements. The economy and development are driven by social needs, but should not result in compromising the implementation of environmental standards. Leaders are required to budget and allocate necessary funds to implement ethical environmental standards. Protecting the environment is the responsibility of all stakeholders in Liberia, and there is a moral obligation to preserve the environment for future generations. Leaders need to consider safety, health, and prosperity when implementing environmental standards and educating their followers to ensure a sustainable and safe environment for future generations.

Environmentally friendly projects: It is recommended that the government of Liberia support environmentally friendly projects that require strategic planning, budgeting for funds, raising awareness, and providing alternative solutions to projects that might harm nature. Strategic planning is necessary to protect the environment since it requires capacity building, knowledge, resources, specialization, and expertise. Implementing environmental standards requires commitment, genuine consent, and personal sacrifices. Involving communities, local councils, and social leaders in decision-making processes ensures compliance and commitment to the implementation of these environmental decisions.

Investment: It is recommended that investing in environmental programs and awareness be proportional to the size and scope of the environmental investment need in Liberia. Assessing environmental management should also be realistic and based on the existing knowledge and availability of business means and resources. Environmental assessments are necessary to determine the feasibility of any organizational investment. It is essential to motivate people by keeping them aware and interested in potential opportunities and advantages of implementing environmental standards. Implementing environmental standards and expanding recycling programs could be profitable for the organization by creating job opportunities for individuals and industries.

Mitigating risk. It is recommended that the Government of Liberia take a large role in mitigating environmental risk by spreading awareness, enforcing environmental laws, and providing financial and logistics incentives for those who comply. The monitoring of the implementation of environmental rules and standards should be a primary government priority to ensure compliance. Environmental rules and standards should be pragmatic and based on knowledge, expertise, and availability of resources, supported by technical and professional assessments, and separated from political influence. Defining and reinforcing environmental laws and standards could prevent individuals and organizations from making unethical environmental decisions. Spreading environmental knowledge and imposing disciplinary measures would assist in reducing substandard decisions on environmental management in Liberia. In addition, awareness programs should be made available to educate people on the impacts of wrong decisions on the environment.

Employee training: It is recommended that businesses educate employees on EPA standards and the impact of personal choices on the environment. In addition, business leaders in Liberia need to adopt a culture of saving the environment through reducing waste and recycling programs. Leaders need to empower their employees to implement a strong environmental stance in their personal behaviour in the workplace, identify unethical practices that are commonplace and need immediate attention, and discover pragmatic solutions to protect the environment rather than note there are areas that need to be addressed by the organization. Leaders should introduce the concept of reward and punishment to ensure better adherence to environmental standards, set clear policies on profitability, ensure proper environmental management, uphold prudent environmental business standards, make employees aware of the organization's environmental vision, consider plans that would limit diminishing resources, and

include future generations in the decision-making process of environmental protection.

Increasing transparency: It is recommended that business leaders in Liberia amplify their openness to make environmental change regardless of past performance or reputation, which might attract other organizations in their industry to also comply with existing environmental standards. This would require setting benchmarks and using tools in projects to gauge the proper implementation of environmental standards. Offering environmental training programs would be an option in spreading awareness to all stakeholders about environmental decisions being proposed. Education programs should not be limited to managers only, but also to associated employees, customers, communities, and other interested individuals to help distinguish whether the business planning decision could be categorized as a good or bad environmental practice.

Conclusions

This study has explored factors that influence leaders in performing environmental management decisions. These factors vary significantly among individuals and this contributes to different decisions and behaviours in the face of identical problems (Gilleo 2001). Leaders are primarily swayed by different sets of factors, and have different perspectives on ethical issues, especially when it comes to decisions that influence profit and growth (Harjula 2006).

The results of this study indicated that some factors have more of an overall impact on leaders than others (see also Gilleo 2001). Business leaders in Liberia, regardless of their education, background, gender and other differences, share similar concerns and perspectives on environmental management, and their views were translated into common themes.

Good environmental practices are ones that mitigate risk and environmental degradation. Adhering to environmental standards and Liberian EPA guidelines will help in protecting the environment (Chowdhury 2003). The level of citizen interest in bringing about a paradigm change in this area is crucial, because public protests determine the companies' commitment to the actual implementation of these environmental standards. Controlling funds and monitoring the progress of implementing environmental standards in Liberia will require transparent and ethical leadership (Jain & Chaudhuri 2009). Companies encouraging their senior staff to take personal moral responsibility and providing them with rewards for

responsible, proactive behaviour can have positive impacts on implementing new environmental standards in Liberia. Effective and fair management in turn inspires employees to maintain higher standards of ethics, and regular self-evaluation helps to improve business processes and maintain environmental standards (Harjula 2006; Milfont 2009) in emerging nations like Liberia, who want to effect change in environmental management.

The factors of development, economy, technology, availability of infrastructure and resources, training, culture and leadership together form the wheel of development and advancement for a country like Liberia. Each element contributes to the country's development and should include the implementation of environmental standards. The following are some suggestions for future research:

- 1 It is recommended that a future study assess the combination of factors cited in the present study at each stage of economic growth in Liberia, and other similar developing countries, to form permissible ratios that allow economic progress without compromising the environment. It is also recommended that future studies explore and compare the impacts of those same factors between rich and poorly developed countries.
- 2 It is recommended that a future study be made of the feasibility of allocating funds and designing different packages and programs to support the implementation of environmental standards in Liberia and other developing countries. Future studies might discover suitable programs to offer short and long-term incentives to individuals and business leaders to encourage compliance with Liberian EPA and environmental standards, as well as provide techniques to approach the United Nations Development Program, non-governmental organizations, and other stakeholders to support recycling programs and improved disposal of hazardous materials.
- 3 It is recommended that a future study be undertaken to determine the factors that influence leader's decision on environmental management at a regional level and to unearth culturally appropriate solutions and programs designed to overcome environmental problems in Liberia and other developing nations.
- 4 It is recommended that a future study be undertaken to determine why business leaders and employees engage in unethical practices

involving environmental management. The study should include factors that influence behaviour. The investigation could include studying stakeholders' reaction to unethical decisions and effects on customer loyalty when products and services are known to have resulted from unethical decisions.

Notes

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References

- Adler, J. 2001. 'Free and green: A new approach for environmental protection.' *Harvard Journal of Law and Public Policy*, 24:653-694.
- Almer, C. and T. Goeschl 2010. 'Environmental crime and punishment: empirical evidence from the German penal code.' *Land Economics* 86:707-726.
- Basel Convention 1992. *Basel convention on the control of trans-boundary movements of hazardous wastes and their disposal*. Retrieved from <http://www.basel.int/>
- Bassey, N. 2008. *The oil industry and human rights in the Niger Delta; Senate Testimony*. http://www.eraaction.org/publications/presentations/senate_testimony_24_09_2008.pdf
- Beasley, J. 2008. 'Eco-friendly manufacturing-the green path to profitability.' *Journal of Solid State Technology* 51(1):64-64.
- Bekoe, D. and C. Parajon 2007. *Women's role in Liberia's reconstruction*. United States Institute of Peace, www.usip.org. Retrieved on May 17, 2013.
- Bert, R. 2007. 'Green to gold: How smart companies use environmental strategy to innovate, create value, and build competitive advantage.' *Journal of Civil Engineering*, 77(2):68-78. Retrieved from EBSCO host database.
- Bigham, R. and S. Fisher 2007. 'The amazing tales of companies who turned environment consciousness into profit.' *Journal of Pollution Engineering*, 39(2):20-22.
- Borck, J., C. Coglianese and J. Nash 2008. 'Environmental Leadership Programs:

- Toward an empirical assessment of their performance.' *Ecology Law Quarterly* 35: 771-834.
- Brans, J. and P. Kunsch 2010. 'Ethics in operations research and sustainable development.' *International Transactions in Operational Research*, 17(4): 427.
- Carpenter, L. 2006. 'Leadership opportunities in environmental public health.' *Journal of Environmental Health*, 68(7): 52.
- Chowdhury, S. 2003. *Organization 21C: Someday all organizations might lead this way*. Upper Saddle River, NJ: Prentice Hall.
- Flynn, S. 2008. 'Environmental management.' *Environmental Management Research Starters Business*, p1-1. Retrieved from Research Starters-Business database.
- Fryer, K. 2009, May. 'Bringing balance to the debate.' *Fraser Forum*, 18-19. Retrieved from EBSCOhost database.
- Gamble, J., K. Ebi, A. Grambsch, F. Sussman and T. Wilbanks 2008. *Analysis of the effects of global change on human health and welfare and human systems*. Retrieved from www.epa.gov
- Garcia, A. 2008. 'Business continuity best practices.' *eWeek*, 25(33): 32-40.
- Garg, A., P. Shukla and D. Menon-Choudhary 2007. *Aligning energy use, air quality and climate change through sustainable development: A case study of Delhi*. University of the Andes, Bogotá, D.C., Colombia. Retrieved from EBSCOhost.
- Gilleo, M. 2001. 'Ethical issues in global economy.' *Bulletin of Science Technology & Society*, 21(4): 272-280.
- Grambsch, A., B. Hemming and C. Weaver 2009. *Assessment of the impacts of global change on regional U.S. air quality: A synthesis of climate change impacts on ground-level ozone*. Retrieved from www.epa.gov
- Hamil, C. and H. Sinclair 2010. 'Bracketing – practical considerations in Husserlian phenomenological research.' *Nurse Researcher*, 17(2): 16-24.
- Hanna, H. and A. Alfaro 2012. 'The future of development in Liberia: Keeping Women on the Agenda.' *Women's Policy Journal of Harvard*, Spring 2012, p. 79.
- Harjula, H. 2006. 'Hazardous waste recognition of the problem and response.' *Annals of the New York Academy of Sciences* 1076: 462-477.
- Harris, G. and L. King 1988. Reconsidering planning and environmental protection.' *Journal of Planning Literature*, 3: 373-385.
- Hubbard, B. 2007. 'Environmental public health leadership revisited.' *Journal of Environmental Health* 70(2): 51-52.
- Husserl, E. 1931. *Ideas: A general introduction to pure phenomenology* (B. Gibson, Trans.). London: Allen and Unwin.
- IEA 2008. *Environment*. Paris: International Energy Agency. Retrieved from <http://www.iea.org>
- Jain, S. and T. Chaudhuri 2009. 'The environmental kuznets curve: A reaffirmation.' *The ICAFI University Journal of Environmental Economics*, VII(2): 1-29.
- Janice, R. and W. Elizabeth 2009. 'Environmental education in small business: the owner-manager's perspective.' *Australian Journal of Environmental Education*, (25): 117.
- Johnson, R. 2009. 'Organizational motivations for going green or profitability versus sustainability.' *The business review, Cambridge*, 13(1): 22-28.
- Kilgour, M. and J. Levy 2009. 'A model of bargaining over hazardous waste cleanup.' *Group Decision & Negotiation*, 18: 335-347.
- Maharaj, R. and I. Herremans 2008. 'Shell Canada: Over a decade of sustainable development reporting experience.' *Journal of Corporate Governance*, 8: 235-247.
- McGarvey, M. 2008. 'Managing budget constraints in environmental protection programs to maintain organization objectives in the public sector.' *Dissertation Abstracts International*, 69 (10): 156A. (UMI No.3334977)
- Milfont, T. 2009. 'The effects of social desirability on self-reported environmental attitudes and ecological behavior.' *Environmentalist*, 29: 263-269.
- Morton, A., P. Boncour and F. Laczko 2007. *Human security policy challenges: Climate change and displacement*. Retrieved June 17, 2009, from FMR31, <http://www.fmreview.org/>
- Moslemi, J., K. Capps, M. Johnson, J. Maul, P. McIntyre and A. Melvin 2009. 'Training tomorrow's environmental problem solvers: An integrative approach to graduate education.' *BioScience*, 59: 514.
- Mumford, M., S. Murphy, S. Connelly, J. Hill, A. Antes, R. Brown and L. Devenport 2007. 'Environmental influences on ethical decision making: climate and environmental predictors of research integrity.' *Ethics and Behavior*, 17: 337-366.
- Punte, S., P. Repinski and S. Gabrielsson 2006, Spring. 'Improving energy efficiency in Asia's industry.' *Greener Management International*, 50: 41-51.
- Rosenthal, E. 2007. Dire climate warning linked to China and India. *International Herald Tribune*, , 15 November 2007, p. 2. Retrieved 11 July 2008, from www.unep.org
- Rubin, H. J. and I. S. Rubin 2005. *Qualitative interviewing: The art of hearing data* (2nd ed.). Thousand Oaks, CA: Sage.
- Sandler, C. 2009. 'The psychological role of the leader in turbulent times.' *Strategic HR Review*, 8(3): 30-35.
- Singhapakdi, A., & Karande, K. 2001. 'How important are ethics and social responsibility? A multinational study of marketing professionals.' *European Journal of Marketing*, 35(1/2): 133-151. Retrieved from *Emerald Library*.
- Smith, A. and M. Suero 2009. 'Communities in action for asthma friendly environment.' *Journal of Environmental Health* 71(9): 38-39.
- Stainer, A. and L. Stainer 1997. 'Ethical dimension of environmental management.' *European Business Review* 97: 224-230.
- Stuart, A., S. Mudhasakul and W. Sriwatanapongse 2009. 'The social distribution of neighborhood-scale air pollution and monitoring protection.' *Journal of the Air & Waste Management Association*, 59: 591-602.

- Tamminen, R. 1999. 'Ownership in environmental management.' *Leadership and Organization Development Journal* 20: 54-359.
- UNEP 2008. *United Nations Environment Programme 2008*. Nairobi, Kenya. Retrieved from www.unep.org
- Van Staveren, I. 2007. 'Beyond utilitarianism and deontology: Ethics in economics.' *Review of Political Economy*, 19(1): 21-35.
- Wood, V., D. Pitta and F. Franzak 2008. 'Successful marketing by multinational firms to the bottom of the pyramid: Connecting share of heart, global "umbrella brands," and responsible marketing.' *Journal of Consumer Marketing* 25:419-429.
- World Health Organization 2008. *Medical wastes*. Geneva: WHO. Retrieved from http://www.who.int/topics/medical_waste/en/
- Wright, K. 2009. 'Environmental public health leadership development.' *Journal of Environmental Health* 71(7):24-28.
- York, J. 2009. 'Pragmatic sustainability: translating environmental ethics into competitive advantage.' *Journal of Business Ethics* 1(85):97-109.
- Zikmund, N. 2010. 'Environmental Leadership.' *Minnesota Fire Chief*, 47(1): 18-18.

Part VI

Sustainable Resource Management



CAN SUSTAINABILITY BE RECONCILED
WITH THE ETHOS OF BUSINESS?
INSIGHTS FROM A STUDY OF THE
HANDICRAFT INDUSTRY IN JALISCO, MÉXICO

José G. Vargas-Hernández¹

Introduction

Globalization has changed the scenarios in which individuals, organizations and society as a whole operate, leaving them subject contradictory forces and rising uncertainties about the future. Establishing economic systems of cross-generational sustainability as a component of long-term competitiveness and survival is thus a major challenge of our times. More appropriate usage of natural resources is urgently needed. This will require a change in current business practices, so that available resources can meet the needs of both present and future generations. In contrast to this, however, the logic of economic rationality that still governs the functioning of many businesses demands maximum return in the shortest possible time. This ethos means that, if natural resources yield greater benefit under a regime of ruthless, short-term exploitation than if we were to take care of them, sustainability principles are sacrificed. In short, the demand for immediate profit is the enemy of the environment under the prevailing business ethos. How can this ethos be changed? This paper is an attempt to answer this question with specific reference to the case of a local handicraft industry in Mexico.

The ecological proposal for organizational change is that organizations should widen their model of interactions to integrate an environmental paradigm. Any approach to fostering the sustainability of organizations is affected by a combination of factors, including ambiguous environmental policies, and the difficulty of abrupt adoption of new production technologies and market practices. Delivering sustainability in business organizations requires a careful implementation strategy focused

on process re-engineering and the adoption of production technologies that are oriented toward avoiding waste materials, recycling trash and eliminating toxic by-products.

Due to a lack of acceptance of the role that business organizations must rightfully play in achieving sustainability, such organizations often influence the global debate by distracting from the real causes of pollution to safeguard the organizations' interests, for example by arguing that poverty is the main cause of environmental degradation. Inadequate regulatory policies meanwhile allow for the continuation of business practices that are less than friendly toward the environment. This suggests that studies of organizational sustainability must begin by establishing the facts about the sustainability or unsustainability of specific industries.

This paper aims, first, to determine the level of sustainability for the environmental and economic development of a local handicraft industry around Zapotlán Lake in Mexico, based on the cutting, processing and for profit exploitation of a reed grass called *tule thypa spp.* Second, the paper will analyse the economic benefits derived from the marketing of art craft made from *tule* and *palmilla* (a kind of palm that also grows spontaneously in Zapotlán Lake) to international businesses. To achieve these objectives, I shall develop a conceptual, theoretical, methodological and local context-based frame of reference, and apply it to the case of art craft micro enterprises processing *tule* in the locality of Southern San Sebastian. Finally, the results are analysed and some recommendations are put forward.

Organizational sustainability and organizational social capital

A sustainable organization integrates the ecological vision into its institutional theory and organizational values. Common sense is used to organize the production of goods and services with eco-efficiency and establish a friendly relationship between organizations and the environment, so as to achieve goals such as emission reductions and more sustainable exploitation of natural resources. The environmental variable in organizational culture is inserted as a rational interpretation of the useful function of environmental protection for reducing insecurity and social pressure. Environmental protection is a technical variable informed by environmental values such as environmental stewardship, environmental risk control, and also friendly relations with other groups and organizations in the social environment. It requires the setting up of working groups and permanent

staff structures dedicated to sustainability. External economic instruments are also important to tie sustainable development to the management practices and business plans of micro and small business enterprises. Instruments such as government environmental protection policies, setting low market tariffs (to diminish costs), creating incentives for employment opportunities, researching to detect new business opportunities all are important elements in a comprehensive sustainable business strategy. This is rather abstract, however, and often it can be more convenient to have a diagnostic of enterprises that have adapted well to a sustainability paradigm. Few micro and small business enterprises are capable of forming an environmental culture without such models. From the point of view of the general theory of organizations, according to studies on social capital by Baker (2000) and Burt (1997, both cited in Portes 1999:247) it is necessary for us to gain greater insight and understanding of market competitiveness mechanisms that can obstruct or support a shift to sustainability. Similarly, Joyce (1998) focuses his analysis of social capital on the leadership phenomenon. From these studies social capital two patterns emerge, the emphasis on public goods and the emphasis on private goods.

Leana & van Buren (1999) define organizational social capital as a resource that reflects the character of social relations within an organization, achieved through the levels of members' orientation toward shared objectives and mutual trust. Social capital is a collective attribute and thus more than just an aggregate of individual social connections. It constitutes an indispensable component for effective collective action. Social organizational capital is a joint asset that benefits both the organization and its members. A new organization has the advantage to be able to create its own organizational social capital in such a way as to maintain optimum equilibrium between stakeholders, between individual and organizational interests, in spite of their potentially conflicting nature. Social organizational capital is high in organizations characterized by relationships of trust that make behaviour predictable. The capacity of a community is thus reflected in its level of endogenous development.

The organizations are faced with a concrete reality wherein resources and ordinances are required for the pursuit of specific objectives. Members of an organization are thus expected to solve problems of collective action in order to produce a supply of certain goods and services. Organizations that follow well established business strategies and ones that follow niche strategies draw on different environmental resources. These different organizations also form inter-dependent connections across industries and with community structures. Processes of economic

structural change in a local economy thus require profound changes in trust levels and inter-relationships of cooperation fomented by arrangements of institutions and organizations. Thus, it is local government that must define action lines, which function as a catalyst of community and business efforts to achieve sustainability.

Finally, population ecologists suggest that the environment exerts a selective pressure, which favours organizations with structural features that provide the highest level of adjustment, emphasizing the role of competitive processes as a driver of institutional change. Population ecology suggests that the existence of organizations with different organizational forms, combined with differences in the survival rate of organizations with different organizational forms, produces institutional change.

The case of micro and small enterprises exploiting *Tule Reeds* at Lake Zapotlán

Similarly to the great majority of aquatic bodies localized in closed basins in Mexico, Zapotlán Lake is the receptacle of trash, sewage and 'black waters' from human settlements, in this case Cd. Guzmán and San Sebastián del Sur (Southern San Sebastián). The presence of these elements forms a nutrient blend that facilitates the growth and development of an abundant mix of aquatic plant species, which have covered almost the entire surface of the lake and extends beyond the shores to the extent that humidity penetrates the soil. The transformation of the environment at Lake Zapotlán has a strong negative impact on local socio-economic conditions, mainly in San Sebastián del Sur in the municipality of Gomez Fariás, and to a lesser extent to the settlers of Cd. Guzmán in the municipality of Zapotlán el Grande, who commercially utilize the lake despite the already high levels of pollution.

Deterioration of this lake-body has reached alarming levels as a consequence of the increasing population and urbanization processes, industrial activity, farming and agricultural activities. Specifically, one of the natural resources offered by the lake of Zapotlán, the aquatic *tule thypa spp* has been benefiting the settlers and inhabitants of San Sebastián del Sur mainly for its usefulness in the crafting of several handicraft products. The exploitation of *tule* and the production of handicrafts creates direct employment and constitutes the income base for around 300 families and their members, with approximately one thousand and five hundred individuals making a living out of these activities in the municipality of Gomez

Fariás alone. However, more are the benefits obtained from the thicker *tule* variety, than from the one known as *palmilla* (palm). In its natural habitat, the *palmilla tule* harms the thicker *tule thypa* variety's growth and propagation. This invasion problem, among others, adds to the problem derived from environmental degradation of Lake Zapotlán, and together these issues limit the economic activities derived from the extraction of *tule*. Current trends, if they continue into the future, threaten to lead to the disappearance of an important employment source and sustainable livelihoods for the inhabitants in San Sebastian del Sur. To aggravate this problem, The Pan-American Olympic Games committee in 2011 chose Lake Zapotlán as the location where the aquatic games will take place. For that reason, the lake is having a profound make-over, which entails the clearance and 'cleaning' of the lake's surface from any type of grass and bush, and includes the cutting off and removal of *tule*. Other factors contributing to limit the environmental and economic sustainability of development and the scope of benefits which can be derived from economic exploitation of *tule* include:

- (a) No orientation at all toward a sustainable exploitation of *tule* as a renewable natural resource;
- (b) Lack of organization between the cutters of *tule* and the handicraft manufacturers;
- (c) Weak infrastructure for the development of a more advanced handicraft production; and
- (d) Excessive involvement of hoarders and middlemen in the commercialization and distribution of value-added products;
- (e) Lack of mechanisms by which governmental institutions could foster and develop economic activities, such as credit schemes, training and technical assistance; and
- (f) No knowledge of techniques and systems to export the local products directly and fairly to international markets.

Until now, handicraft products derived from *tule* as the main raw material are elaborate, with a strong artistic element. Local, regional, national and international markets traditionally consume these products because they have had a strong historic presence in Mexican culture since pre-colonial times. In order to be organized to attend the regional market, a group of 42 craftsmen acting as partners within the Association of Craftsmen (Asociación de Artesanos) initiated the construction of the "House of Craftsmen" in the early nineties to operate as an outlet for selling their

products. This business still operates, now having only six partners, but it can be inferred from simple observation that the partners are subject to internal conflicts, dividing the building and infrastructure into small areas each to operate their own personal business.

Most of the craftsmen instead deliver their production to middlemen who act as hoarders and wholesalers, being a link in the distribution channel and contributing to the commercialization of the hand crafted products in the local, regional and national markets and incipiently in the international markets. These middlemen are the ones who gain the greatest proportion of profits. Given that production is oriented to meet the fundamental needs and wishes of our own local, regional and national market, which is a captive and non-competitive market, craftsmen do not perform product design and product development activities. The crafted products would need to have higher craftsmanship content in order to meet the more sophisticated demands of international markets, where consumers value and appreciate the artistic sensibility and good taste of skilful craftsmen.

The exploitation of *tule* from Lake Zapotlán has followed irrational patterns that affect not only the sustainability and equilibrium of the natural environment, but also generate problems of low family income and in the running time lesser employment for manpower. The rehabilitation of the Lake requires a more rational exploitation of *tule*, in such a way that does not affect the environmental sustainability and the economic activity derived and the treatment of *tule*, while on the other hand, also it is required to improve the family income who work *tule* and inclusive to generate new employments.

Delimitation of the problem

The inhabitants of the municipalities of Zapotlán el Grande and Gómez Farías have subjected Lake Zapotlán to environmental degradation. This and simple over-exploitation of *tule* are the two main factors contributing to the unsustainability of the economic activity and benefits of cultivation, treatment and elaboration of *tule* handicrafts. Thus the prospect of employment creation and increasing the income of the around three hundred families highly depending on this economic activity are seriously threatened. The industry faces a convergence of problems, among which we can mention:

- Increasing cost of raw materials (wood and *tule*)
- Increasing number of craftsmen in the region
- Reduction of output of hand crafted products

- Low level and slow commercialization of hand crafted products
- Little government support for the promotion of their goods.

This research has sought to address these issues by asking the following questions: What are the sustainability, economic efficiency and environmental development plans for commercial activities at Lake Zapotlán? What are the expected benefits of *tule* cultivation and exploitation for the 300 families involved, given the dysfunctional environmental conditions in which they operate? What are the potential economic benefits of introducing *tule* hand crafted products to international markets? The objectives were 1) to determine the level of organizational sustainability taking into account the economic and environmental development of *tule* cutting, treatment and processing, and 2) to analyse potential economic benefits of a marketing orientation toward international market. My hypothesis is that a commitment to a new orientation toward organizational sustainability in the making of *tule* handicraft goods will increase family income and economic benefits of workers and create more employment.

Handicrafts in San Sebastian Del Sur

Over the last decades, the main sources of income in San Sebastian del Sur, located in the municipality of Gómez Farías, have been agriculture, livestock, fishery and handicraft production. The handicraft products are made from different natural materials that were abundant in the region of Southern Jalisco. People from San Sebastian del Sur take advantage of Lake Zapotlán as a source of sustenance. Economic activities at the lake include commercial fishery and *tule* extraction.

Among the handicrafts made out of *tule* in the locality of San Sebastian del Sur, are chairs, curtains, armchairs, easy chairs, different types of containers for different purposes (such as storing tortillas), tables, blowers, bedrolls, matting (petates), baskets, etc. *Tule* grows spontaneously and wildly in the lake. The inhabitants of the municipality of Gómez Farías collect this natural resource. They are not required to hold permission from the municipal authorities to cut *tule*, to dry it and to sell it.

A study was conducted to analyse the economic and social development of handicraft producers. Data was obtained by means of a random survey based on the roster of handcrafters that are registered as such. The survey asked them about economic and social aspects of production. Thirty-three participants took the survey, and 33 workshops were held. Traders of

handicrafts and producers can be divided into four groups. Among the 33 persons surveyed, two were *tule* cutters, nine were manufacturing rustic furniture, and seven produced hand-woven furniture and handicrafts: and fifteen were manufacturing matting and bedrolls. The percentages of these *tule* related activities are shown in Figure 14-1:

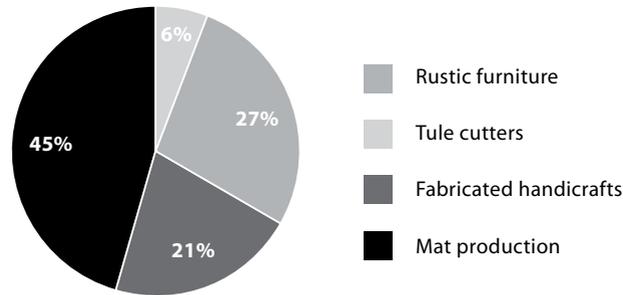


Figure 14-1: Percentage of families involved in different activities in the *tule* industry

At the location of San Sebastián I estimated the average weekly salary of workers in these different activities related to the processing of *tule*, leading to the following results showed in Figure 14-2:

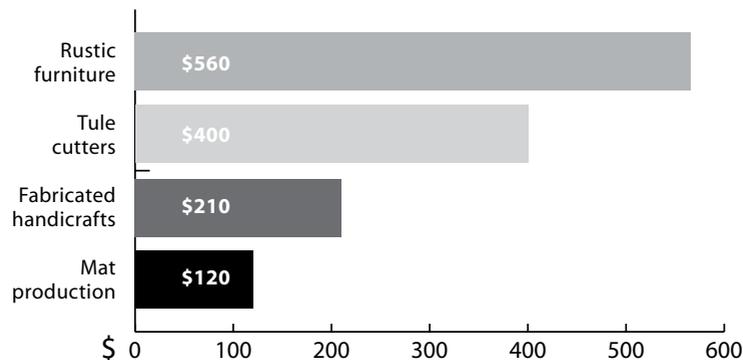


Figure 14-2: Average weekly salary of workers in different sectors of the *tule* industry

In San Sebastian, only six per cent of craftsmen were affiliated to any associations and organizations. The majority of craftsmen (94%) do not receive any type of support from any institution, while a small number of workers received economic support and promotion for their products and goods mainly from state and municipal institutions. 81% of the surveyed persons have the opinion that the market has benefited in the last years due to rising demand for their products and goods. Only 19% perceived that the market conditions were restricting the selling of their products.

Awareness of environmental pollution was limited. 45% of persons are sure that pollution has increased, 42% say that conditions have remained the same, while 13% believe pollution in Lake Zapotlán has decreased (Figure 14-3).

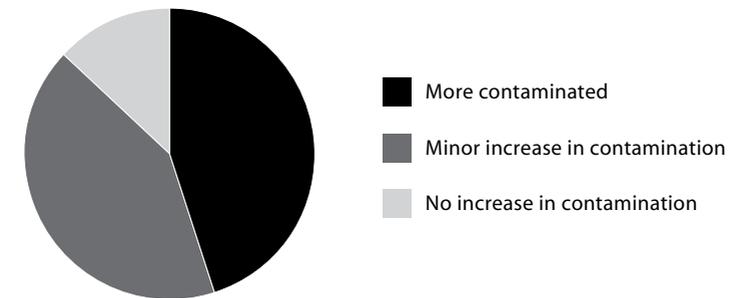


Figure 14-3: Perception of pollution at Lake Zapotlán

Discussion on organizational sustainability of the *tule* industry

The presence of bundles of *tule* covering around one third of the surface of Lake Zapotlán is important for the nesting, refuge and protection of several species of fishes, tilapia, and carps and also for several species of birds (Universidad de Guadalajara 1995). *Tule* plants serve as a food source for some species. Organic material that becomes detached from the roots floats on the lake and thus regulates water temperature and the environmental temperature overall. In November the plant becomes home to groups of birds known as *zanates*, who build their nest on the bundles of *tule* that these same birds also break down. The biggest problem is that bundles of *tule palmilla* (*tule* palm), used to weave chairs, invade and impede normal growth of the thicker *tule*, used to manufacture matting and bedrolls. This

problem can be addressed by manually removing the bundles of *tule palmilla* that invade the shoreline where the thicker *tule* grows whenever the level of water goes up after heavy rain.

The cutters claim that a major problem is the lack of any government institution to regulate the granting of permissions to cut and exploit the *tule*. Also, the cutters claim that they do not receive any financial support for the creation of facilities and infrastructure to carry on their activities and increase their productivity. One good example is the lack cutting tools, or motorboats to facilitate the harvesting of *tule* or the lack of land (patios or country yards) adjacent to the lake that is suitable for drying and processing of the cut *tule*. When *tule* is spread out in a yard or patio for drying, this can take from 3 to 4 days. There are some spells, mainly during the period of low tide, when *tule* is difficult to dry.

Cultivation and exploitation of *tule* constitutes an important economic activity for the community of San Sebastian del Sur because it sustains some three hundred families. About 80 families are economically benefited by income derived from the cutting, drying and transport of *tule*. Around 140 families benefit from handicraft production using both varieties of *tule*. Out of these 140 families, 120 self-describe as producers of matting and bedrolls (petateros).

Around half of the 55 handcrafters registered in the Trade and Commercial Association have their own workshops, while the other half only work in an assembling plant because they lack the instruments to properly equip a workshop. Around 70 families receive income as intermediaries, hoarding, stockpiling and trading products derived from *tule*. The cutters of *tule* dry their raw material and make up to two bunches per day. The two bunches are sold at an average price of 75-80 pesos each, making 150-160 pesos per day. Regularly, this sale represents the daily family income of around 13 US Dollars. *Tule palmilla* used for the manufacturing of chairs is sold to intermediaries; most of them are owners of small stores who stockpile it. Thick *tule* is sold to the craftsmen at a slightly lower price to be used in the manufacturing of matting and bedrolls (*petates*).

Most part of manpower employed in the cutting of *tule* is permanent and their trade was inherited from antecedent generations. According to the field research, due to the on-going environmental changes taking place every year there are less cutters. The cutting of *tule* was an activity that generated more employment in the past than nowadays. Some years ago they formed a formal association of *tule* cutters. Some of the actual cutters are temporary workers in this activity, more specifically when they do not find more lucrative employment elsewhere.

The craftsmen produce different goods from the main raw material *tule*, such as matting, bedrolls, hats, *chiquihuites* (wide baskets), shade screens, traditional chairs, high chairs, etc. From a bundle of *tule* craftsmen make up to seven pieces of matting which they sell for 30 pesos each, an equivalent of \$2.40 US, obtaining up to 210 pesos (almost \$17 US) from an original investment averaging 80 pesos, the cost of one bunch of *tule*. A bunch of *tule* is formed from 5 or 6 big 'hands' (*manotadas*) of *tule*. The cost of one large 'hand' is worth approximately 20 pesos and it is enough to manufacture one chair, which is sold at a price of 50 pesos to the intermediary or middleman. The cost of materials of one chair also includes some pine wood, which costs up to 15 pesos (cost used to be only 1.50 pesos several years ago). In one workshop with five craftsmen up to 70 chairs were produced per week, which are sold to the intermediaries and middlemen at a price of 70 pesos on average.

This price can improve depending on negotiations and trading with intermediaries and middlemen. Many cutters supply raw material to their own families who are in charge of the crafting of hand crafted products, widening with this strategy the economic benefits for their family by adding value. In other cases, there is an arrangement called half and half ("*medieros*") between the cutters and the handcrafters. That is to say, after the selling of products, the cutter and crafter share the benefits equally.

Nowadays, the membership of handcrafters registered in one association at the location of San Sebastian del Sur is 55. Approximately half of the 55 registered members sell or "*maquila*" their own manpower to the others, because they do not have the equipment, tools and facilities to establish their own workshop. The association was formed 16 years ago by 42 partners and set as its main aim the founding and building of a craftsmen's house (Casa Del Artesano) in the local market place where their hand crafted production can be exhibited and sold. The three levels of government, Federal, State and Municipal contributed with donations of materials to the construction, while the partners were expected to make manpower contributions. However, most of the members did not contribute manpower and finally only six active partners were left, and who nowadays exhibit and sell their hand crafted products in a separate way at the craftsmen's house. This craftsmen's house is located at one side of the Federal Highway Guadalajara- Cd. Guzman, adjacent to the Municipal Cemetery. The person in charge of the Association has also the ownership of the land and building. Originally the Municipal Government of Gomez Farías designated the land for the construction of the craftsman's house. However, recently it was found that this land did not have any registered owner according to the

Public Land Register. Thus, nowadays, the ownership of the house is the cause of several conflicts. Other craftsmen seek access to the facility with the support of the municipal government. One former municipal official sent letters to the Public Notary, in which he requested a change in the ownership regime and argued the house was municipal property.

According to our own research, interviewees assure us that sales are declining. Today, they argue, they sell less than 10 years ago. The middlemen are the one who profit from the commercialization of handicraft products. In order for these products to reach the final consumer, at least three levels of distribution are traversed, and this means there are two intermediaries between producers and consumers. The intermediaries are the ones who attend national markets and to a lesser extent export the products to the United States, Canada, Puerto Rico, England and Japan. Market disruptions such as the terrorist actions of September 11, 2001 are now affecting handicraft production.

Some of the problems craftsmen faces are related to a lack of training programs to preserve and develop handicraft techniques, financial support, and credit to extend basic production infrastructure. And of course, there is no support for direct exporting of their products to international markets. Remedying this lack of support would greatly benefit the economic income of the families involved in this industry.

Conclusions

The exploitation of *tule* represents an economic activity that supports approximately three hundred families in San Sebastian del Sur. In the last few years their income has been decreasing due to environmental changes and to the ‘rehabilitation’ of Lake Zapotlán to host the Pan-American Games. Both represent serious threats to the economic efficiency and environmental sustainability of the industry. To achieve equilibrium between environmental sustainability and economic sustainability must be one of the main goals of the rehabilitation programs. A systematic study is required to determine the most appropriate levels of resource use for environmental sustainability and economic efficiency. The limited social organizational capital and the lack of adequate forms of organization for increasing productivity, contribute to limit the scope and economic benefits of the industry. Poor organization of cutters and craftsmen of *tule* is the source of profound and increasing conflicts that not only limit the scope for greater productivity and family income, but also disrupt community life.

Lacking a consultancy program to help export hand crafted products keeps the income of the families of cutters and craftsmen low, because those who obtain the greater part of profits are the intermediaries who take part in the commercialization processes and control distribution channels.

Social and human capital involves relationships among individuals who are members of organizations, making effects highly complex. The ‘market’ is a social construction that operationalizes such relations. Both capitals can be important sources of competitive advantage Organizations with higher levels of social and human capital are more competitive than those with lower levels. This study suggests that a sustainable economy requires programs aimed at improving social and human capital.

Recommendations

Some recommendations can be made on the basis of this research, as follows:

- Design a program to promote handicraft activities derived from the exploitation of *tule* in parallel with a rehabilitation program for Lake Zapotlán, and aim to achieve equilibrium between economic efficiency and environmental sustainability.
- Set up a program for export consultancy with the support of volunteer technical staff (e.g. students of international business at University of Guadalajara) that can provide the knowledge, skills and contacts to allow craftsmen to directly commercialize and market their products to international markets. Set up a program for development of organizational and social capital and new forms of organization aimed at increasing the productivity and competitiveness of the craftsmen, thus creation employment, increasing family incomes and improving the quality of life of the whole community of San Sebastian del Sur.

Notes

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References

- Baker, W. E. 2000. *Achieving success through social capital*. San Francisco, CA: Jossey-Bass.
- Burt, R. S. 1997. 'The contingent value of social capital.' *Administrative Science Quarterly*, 42:339-365.
- Joyce, Paul 1998. 'Management and innovation in the public services'. *Strategy Change* 7:54-63
- Leana, C R. and H. Van Buren 1999. 'Organizational social capital and employment practices'. *Academy of Management Review* 24(3). Ohio.
- Portes, A. 1999. 'Capital social: Sus orígenes y aplicaciones en la sociología moderna.' In J. Carpio and I. Novaconvsky (eds.), *De igual a igual. El desafío del Estado ante los nuevos problemas sociales*. Ciudad de México: Fondo de Cultura económica-Siempro-Flasco.
- Universidad de Guadalajara 1995. *Ordenamiento Ecológico de la Cuenca de la Laguna de Zapotlán el Grande Jalisco*, Gobierno municipal, Cd. Guzmán, Jalisco.

CHAPTER FIFTEEN

EMBODIED EXPERIENCES AND THE GLOBAL GAZE: CONFLICTING PERCEPTIONS OF WATER IN THE JEQUITINHONHA VALLEY, BRAZIL

Andréa Zhouri and Raquel Oliveira

Introduction

Our research on environmental issues in the UK and Brazil has revealed different types of environmentalism, as well as hierarchical power relations between global views and local realities (Zhouri 2004; 2010). Sustainable development, as a global mantra, has underlined international policies heavily based on ecological modernization strategies. These strategies, in turn, are supported by a belief that technology, market initiatives and consensus building processes combined can solve the 'global environmental crisis.' The "environmental crisis" is thus constructed as a global reality now widely debated under the framework of climate change. Science and technology are called upon to prevent or ameliorate the consequences of global disasters. We have previously argued that such a global environmental perspective draws on global experiences disengaged, or thought to be disengaged, from the processes of one's own material life (Zhouri 2004). As Tim Ingold similarly points out, this global view is aligned with a specifically modern conception of "environment" which, "far from being the ambience of our habitat [... and facilitating the] reintegration of humanity in the world, signals the peak of a process of separation" (1995:31). In this paper we shall analyse some of the human consequences of such disembedded, albeit powerful and widely legitimised, perceptions of the environment.

We will focus on the construction of dams in Brazil, globally considered to be a sustainable source of energy and hence pointed to as a solution toward climate change mitigation. Drawing on our ethnographic research, we will chart the consequences of dam construction for downstream dwellers, people who are not technically considered "dam-affected people" by

planners, decision makers, dam builders, and those involved in environmental policy making, especially for project licensing purposes. Although much has been written on the impacts of dams upon ‘people displaced by the reservoirs’ (the most common ‘technical’ definition for dam-affected people), very little has been written about the effects of dams upon downstream dwellers. The research fills this gap by examining the fate of downstream dwellers of the Jequitinhonha River, in Minas Gerais State, Brazil.

A Brief Context

New mechanisms of capital accumulation within the context of globalization are derived from concomitant processes of decentralization of productive operations and centralization of capital, resulting in the relocation of investments and of productive activities to developing countries and a polarization of wealth (Chesnais 1996). Far from producing integration among the various regions of the globe, the selective logic of capital thus affects different regions and social strata differently, distributing impacts generated by productive activities in an unequal manner. Concomitantly, instruments of policy and power have proved effective in the transference of the responsibilities for environmental degradation to the most vulnerable classes and countries. In Brazil, for example, the effects of the transformation provoked by globalization processes are evident in the adoption of a conservative policy of ‘economic adjustment,’ which has relegated both environmental and social justice to the status of ‘obstacles to development.’¹ This is threatening crucial environmental regulatory advances obtained during the past three decades, with a new emphasis on the “flexibilization” of environmental licensing (Zhouri 2011).

Some critics have observed that the “liberalization of market forces” typical of contemporary globalization models requires the dissemination of a policy of deregulation capable of removing those obstacles that impede capital movements of large private groups (Chesnais & Serfati 2003). In fact what we see is a systematic compromising of environmental planning at the national level, thereby facilitating the implementation of large infrastructure projects. As a consequence of this roll-back of regulations, conflicts between local residents, entrepreneurial groups and state sectors are multiplied. This process is now evident in Brazil, where the official plan for the expansion of the hydropower generation sector projects the construction of approximately 60 large dams for Amazonia. In this situation socially and environmentally unsustainable policies are perpetuated,

while local, riverine communities struggle against a rationality that transforms them into mere objects within a “natural” landscape, making invisible their condition as social, political and legal subjects. Currently, these processes can be illustrated by the return to a previous government policy of building large development projects across the country, in particular, the Belo Monte Hydroelectric Dam on the Xingu River, in addition to hydroelectric dams on the Madeira, Teles Pires and Tapajós rivers, to cite just a few examples in the Amazon region.

Dams and Sustainability

Economists participating in the World Economy Forum’s self-appointed ‘Global Leaders for Tomorrow Environment Task Force’ argue that the level of hydroelectric power production of a country is an indicator of its environmental sustainability.² Such an affirmation in the Brazilian context may contribute to the belief that the country has taken the right path to sustainable development, since 70.5% of its installed power capacity comes from hydro-electrics.³

In Minas Gerais alone, 490 dam projects are planned (Ribeiro 2008). Considering the country as a whole, it is estimated that dams have already flooded about 3.4 million hectares of productive land, and displaced approximately one million people. This situation was aggravated by privatization of the Brazilian power sector in the middle of the 1990s, with increased investment by large multinational and international groups, in part through acquisition of older public enterprises and in part by the formation of numerous private and mixed consortia. Based on an extremely uneven field of power (Zhouri, Laschefski & Paiva 2005), the implementation of large industrial projects and landscapes (hydroelectric plants; soya bean, sugar cane and eucalyptus monocultures) has resulted in environmental deregulation and often given rise to violent confrontations and human rights violations.⁴ For example, in the process of compulsory expropriation for construction of the Candonga dam in Minas Gerais, residents who refused to leave the old village where they lived, due to delays in on-going processes of reparation, were forced to leave their homes under the threat and intimidating presence of a large contingent of police.⁵ Approximately 190 policemen were recruited to enforce a judicial order to evict the 14 families who were still living in the village.

A notorious example of environmental deregulation processes taking place in Brazil is the licensing of the Belo Monte Hydroelectric Dam on

the Xingu River. Following non-compliance with special conditions established by the national environmental agency IBAMA when granting the preliminary license and in the context of intense political pressure which resulted in the dismissal of presidents of that public agency, IBAMA granted a partial installation license for the central work area of the dam project, although that kind of license does not exist in Brazil's environmental regulatory system. Citing the absence of prior, informed public meetings that would have permitted indigenous communities to express their opinions, the Organization of American States recommended that Brazil suspend the license. Also of note were the more than a dozen civil law suits filed by the Public Ministry, and the continuation of licensing and local interventions that ignored the explicit opposition of indigenous leaders, social movements, scientific associations, and environmental and human rights entities. These groups organized a joint public protest in February of 2011, culminating in the submission to the Federal government of a petition with more than 600,000 signatures to cancel the Belo Monte project.⁶

As these examples illustrate, dam projects generally are granted licenses despite inadequacies in local impact research, legal restrictions and vehement objections from affected populations⁷. Decision-making processes instead rely on the prevailing environmental paradigm, with its strong belief in 'ecological modernization.' From this perspective, these processes constitute political actions in the realm of an economic logic that 'ascribes to the market the institutional capacity to solve the environmental degradation' through the application of technical mitigation and compensation measures (Acsehrad 2004). We have called this prevailing model a 'environmental adequacy paradigm' (Zhou et al 2005). Within this paradigm, the project takes central stage, and is therefore unquestionable and inexorable. According to this concept, the environment is viewed as an externality, a scenario that must be modified and adapted to comply with the objectives of the technical project. Supported by the belief in the technological capacity to preview and reduce risks and effects, the adequacy paradigm operates within terms of the prevailing paradigm of instrumental economic rationality.

Dams in the Jequitinhonha Valley

The Jequitinhonha Valley remains one of the poorest regions of Brazil. Under this condition, the Valley has inspired messianic political initiatives and a long history of developmental projects with an image of redemption. Since the 1970s, a variety of projects have transformed the diverse

landscapes of the *cerrado*, *caatinga* and *mata atlântica* ecosystem into the industrial settings of eucalyptus monocultures and hydroelectric dams. Justified and legitimated by negative images of economic stagnation and absolute poverty imposed on the Valley, current proposals for more hydroelectric dam projects retain this mark of salvation. The Irapé Hydroelectric Plant for example, despite 15 years of opposition, was inaugurated in 2005 on the Jequitinhonha River. The dam is 209 meters high, the tallest in Brazil, with a reservoir covering 137,16 km² in a region of irregular rainfall. The dam affects seven municipalities and has displaced approximately 1.124 families, or 5.000 people. The license for construction was granted in 2002, despite an unfavourable technical opinion of from the State Environmental Agency (FEAM), which cited non-compliance with 47 of the environmental and social special conditions that had been applied by the Power Utility of Minas Gerais State (CEMIG).



Figure 15-1: Minas Gerais and neighbouring states, Brazil.

Source: <http://d-maps.com>.



Figure 15-2: Jequitinhonha Valley in the State of Minas Gerais, Brazil

Source: GESTA files.

During fieldwork in early 2006 downstream from the Irapé dam, our research team was confronted with a critical situation involving local dwellers. They reported that at the time Irapé was opened, the water of the Jequitinhonha River had a very unpleasant odour, and most people were suffering with skin and eye allergies. Women who washed clothes in the river complained that the water left rust stains on their clothes and that even livestock refused to drink that water. Hence, they asked the team of the Environmental Research Group (GESTA-UFMG) to report their situation to the Public Ministry (Public Prosecutor), so that authorities would provide a solution to restore their environmental conditions of living. We collected samples of the river water for laboratory analysis and, after reporting alterations detected to the Public Ministry, a legal procedure to investigate the case and attribute responsibilities was initiated.

Within this context, as is usually in such cases, a well-known expert – a sanitation engineer – was appointed by the Public Ministry. The expert analysed documents of the lawsuit and data from the longitudinal studies performed by IGAM (Institute of Water Management of Minas Gerais) to monitor water quality. His report referred to a specific federal regulation (CONAMA Resolution 357/05), which presents a typology that places the water of the Jequitinhonha river as “class 2”, that is, water of “good quality”. From his viewpoint, complaints and questions raised by local communities were not the responsibility of the company or within the company’s jurisdiction since “the waters of the Jequitinhonha River were untreated and

already unfit for human consumption prior to the installation of the Irapé dam.”⁸ Furthermore, from his viewpoint, the State “was obligated to care for multiple water usage” and water resource management should have the participation of public authorities, of users and of local communities, in accord with the National Policy of Water Resources Management.⁹

We present this complex case in a rather brief manner to illustrate how the differential positions of social actors in the living world may render meanings of the environment (and of environmental problems) very differently. The case depicts the views and implications of at least two diverse actors: on one side, riverine dwellers, who never had sanitation from COPASA (Sanitation Company of Minas Gerais) and use water directly from the river, and thus, felt the changes in the water literally on their skins. On the other, the expert in sanitation who, from a technical and “objective” analysis – and as an urban citizen who was brought up in a social class that has access to treated water and public sanitation – attributes the use of the water from the river to the ignorance of the local population. Hence, for the sanitation expert, claims of riverine dwellers would not correspond to technical evidence legitimated by the relevant institutions, and therefore should not be considered by environmental agencies. This account suggests that perceptions of the environment and environmental ideas and practices should be analysed considering both the socialization of subjects during their life course and the primacy of science in our society, among other aspects (Bourdieu 1993).

In the case under study, a socio-technical controversy was established. Not yet convinced by arguments presented, the Public Ministry asked GESTA (as technical advisor to the affected population) to return to the area, some five years after presenting the complaints to the Public Ministry, to assess the current situation on the ground. Fieldwork was conducted in May 2011 to inform an updated analysis of living conditions of riverine communities downstream from the Irapé dam, with particular emphasis on their relation to the Jequitinhonha River and regarding direct and indirect usage of the river water. In the following pages we will address the issue in the light of our ethnographic notes.

Experience Embedded in the Environment: The Loss of the Riverine Dwellers

Comprehension of the magnitude of damages imposed on this population by the installation of the Irapé Hydroelectric Dam requires consideration

of local forms of appropriation, use and management of natural resources, highlighting, above all, the specific mode of organization of domestic labour in accord with ecological potentialities of the area. We emphasize the composition of a complex and delicate system of production in which 'pluriactivity' (Schneider 2003) and 'alternance of work' among landscape strata accompanies seasonal variations of the hydrological cycle in semi-arid zones, where production and labour are linked to the rate of flow of the so-called 'large rivers' (Jequitinhonha, Salinas and Vacaria). The compromising of this rate of flow, as will be demonstrated, weakens family farming by this population, resulting in considerable negative effects on the economy of these groups, their diet, food security and social reproduction.

Ethnographic analysis of interaction of these communities with local ecological conditions, particularly the fluvial waters of the Jequitinhonha River, highlights, then, the dependence of the productive organization of families upon the availability of hydro-resources, especially the natural rate of flow of the Jequitinhonha River. Riverine dwellers live under a very complex system of *vazante* agriculture. *Vazante* is the area located along the margins of the great rivers (Jequitinhonha, Salinas and Vacaria). It is subject to seasonal flooding. Diverse vegetables and greens, such as lettuce, cabbage, onion, garlic, tomato, potato, carrots, pumpkin, among others, are grown in the *vazantes*. This crop system is combined with cultivation in the *baixa*, flooded depressions that retains moisture from the rain; and can also be located in higher terrains, far from the riverbank, or in areas closer by, in which case they are called *tabuleiros*. Located in the *baixas* and *tabuleiros* are the *roças*, the cultivation areas, where the

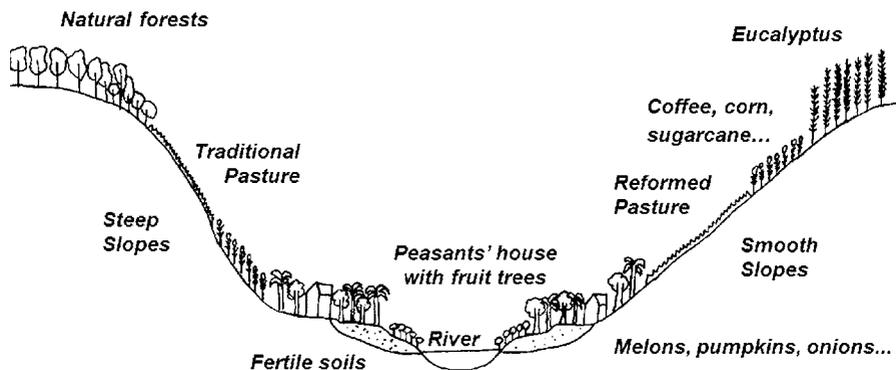


Figure 15-3: Diagram of local Landscape uses. Planting in the *vazantes* of the Jequitinhonha River, May 2004 and 2005. Source: GESTA files.

mantimentos, such as maize and beans and, sometimes, rice are grown. Finally, there are the *chapadas*, flat and higher areas with sandy soil now occupied by extensive eucalyptus monocultures. In the past, however, they were used for raising free-range cattle on common lands, as well as gathering fruits and other plants of the *cerrado*.

Vazantes, *tabuleiros* and *chapadas* constitute distinct, but fundamentally complementary, ecological units, whose different potentialities result in the temporality of a unique landscape in which *roças*, *hortas* and *mangas* alternate.¹⁰ A testimony by local inhabitants best explains this temporality:

There is the *vazante* area, which is a moist area. It's planted in this time of the month of April, a period when it doesn't rain. And there is the *tabuleiro*, which we plant; it always gives us our basic food crops because it also is near the moisture from water. *I mean that these two types of land go together* [...] Now that land which is also a part, which accompanies that area of the *tabuleiro*, is a third class area. I mean, it is an exhausted land, third class [...] Now the headlands above are good lands, it's not the same as the one below. *It's a matter of water. Now they're all productive. From those below to those above.* When the rain falls from the clouds, which God sends to us, the land produces. (Dweller from the community of Morrinhos, April of 2003, emphasis added).

[...] because we plant squash here, that is potato ... these greens here, it's squash. Now we plant these things practically in April, May, around here we're planting on the side of the river and *call it vazante, because it is when the river is low. When it's around April, May. When it's around July, August and later, the people start harvesting at the rivers edge; when it's around November, when we've finished the harvest, the river swells and overflows, making the land good again* (...) Then when we planted on the *tabuleiro*, which is just above here, where it's raining and the river doesn't reach. There we plant maize, what's planted there now is manioc, that's right ... there we plant maize, manioc, beans...

(Dweller of the community of Barra de Salinas, April 2003, emphasis added).

In this manner, the flow of work activities and the seasonal ecological crop rotations are articulated, producing living conditions inseparable from relations that the people have with their surroundings. We underline, then, the practices and knowledges that together compose a sophisticated system of resource use, with a fine adjustment between ecological capacities of the areas and the production patterns of domestic groups. It is in this way that the organization of spaces and classification of the environment are related to factors such as: soil qualities and their adequacy for particular crops, the

agricultural calendar and seasonal variation in rainfall, availability of the domestic labour force, as well as the capacity to allocate crops in accordance with current family necessities.



Figure 15-4: Planting in the vazantes of the Jequitinhonha River, May 2004 and 2005.

Source: GESTA files.

There is overlap between labour activities and seasonal ecological crop rotation, and various portions of the landscape mobilize distinct types of labour in different periods of the year. Cultivation in the *tabuleiros* requires that crops be planted in the “period of the waters” (rainy period, between October and March), providing families with the *mantimento* (basic food crops). In contrast, the vegetable gardens depend on the *vazantes* and only can be planted in the dry season (from April until September), when the volume of the river is reduced, making possible the use of the river margins for the production of the *mistura* during the critical dry periods.¹¹ One can observe here the concomitant variation between labour time and the ebb and flow of the waters composing a movement of the landscape in which each stage constitutes a preparation for the subsequent movement.

In the case of the Middle Jequitinhonha, the articulation between flow of work, productive uses of the landscape and the composition of domestic groups places masculine seasonal migration in step with the alternation between periods of abundant demand for labour or resources and periods of low demand. During the rainy season, men are at home helping in the preparation of the *roçados* and providing the home with resources obtained from temporary migration carried out during the dry season. It is in this period of the dry season that the draining off of the waters permits the formation of

the *vazantes* and, consequently, the production of vegetable beds, left for the women to manage, while the men return to work as migrant labourers.

The control, use and management of the land and its resources is carried out by means of practical knowledge and learning, by the development of abilities built upon the composition of a *savoir-faire* that derives from direct perceptive engagement with their environment, constituting a singular temporality given by the inter-relation and the continuous adjustment between the flow of the waters and the dynamic of labour and production. In this sense, it is the alternances and regularities of the hydrological cycle which order family labour, instituting temporal marks for the organization of productive activities. This is exemplified by comments made by a resident of the Lavrinha community when he needed to work in the *vazantes*: “Vegetable gardening is from March on, but sometimes the rain shortens this.” In this way, the articulation between ecological potentials and labour force availability points to a specific temporality of this landscape. This is expressed in the calculations of another resident of Lavrinha: “next year, when the rains begin, I’m going to increase the land I plant with basic food crops.” If subject and environment are mutually constituted here, to know the landscape is to know oneself, that is, it becomes a matter of identity, of self-recognition. The current feeling of unfamiliarity with the dynamic of the river reveals the seriousness of the disordering and insecurity imposed by the dam project.

Changes Caused by UHE Irapé: The Loss of Vazantes

In the Middle Jequitinhonha, the peasant farm as a productive unit consists of a system composed of functional sub-units that correspond to landscape strata. An important characteristic of the local productive system is the complementarity of these ecological sub-units of the peasant farm. In this case, these are not interchangeable but rather interdependent units, since they follow each other in the productive cycle, requiring labour and furnishing food in distinct periods. The connective, rather than substitutive character of these units is apparent when we consider the differences in relation to the type of resources which they provide to the families: *mantimento* and *miudeza*, products for subsistence and for sale (Oliveira 2008).

In this system, strategies employed by the families to facilitate their social reproduction are guided by a knowledge and logic that necessarily include local ecological potentialities, given the interdependence of these

spaces and their substantive and necessary role in the ordering and economic maintenance of the families.

In our fieldwork (May 2011) we noted that changes in the natural rate of flow of the river have resulted in the loss of the most important areas for *vazante* agriculture. The rainfall dependence of production on *tabuleiros* produces restrictive effects on family economy, in particular, in the case of families unable to use their *vazantes*. Furthermore, when we consider the articulated and interdependent character of this productive system, we understand the role of the *vazantes* as functional unit. They help create a *replacement fund* (Wolf, 1966) at the same time as they constitute an indispensable means to attain an important reproductive strategy, or what Woortmann calls the “internalization of reproductive conditions of the system” (1983:201). The *vazantes* furnishes the mix produced by the family itself, providing elements of intermediate consumption that sustains small animals (pigs and chickens) and, occasionally, allows for a cash income, given crop rotation.¹²

The *vazantes* constitutes a productive space that does not rely on rainfall, furnishing families with a complementary means of production to the *roça-horta*, which is reflected in complementary masculine and feminine labour spheres. The *vazante* provides, above all, what locals call ‘*agricultura certa*’ (guaranteed cultivation). The loss of this domain compromises small animal breeding and the replacement fund of families, and leaves them in a condition of vulnerability as a result of the productive de-structuring and ecological disequilibrium.

We emphasize, therefore, two factors: the interdependence of the *tabuleiro-vazante* and *roça-horta* domains of agriculture and the indispensable character of the *vazantes*, considering that the irregularity of rains in the Semi-Arid Zone makes production on *roças* a risky undertaking in which the investment of resources and family labour may not correspond to the expectations and family calculation of benefits. The *vazante* constitute a productive domain independent of rainfall since its fertility is linked to the dynamic of river drainage and rainwater. As one resident of the community of Prexedes explained, while contrasting production in the *vazantes* with that of the *tabuleiros*, evaluating the changes to their productive system caused by alterations in the rate of flow of the Jequitinhonha River since the commissioning of the Irapé dam:

Because the process is the following, the land became wet and here we planted and harvested [...] But on the higher land what happens is that if it rains, you harvest, if it doesn't rain, you don't. So, since the river soaked

the land and that land remained moist, you could plant and be sure to harvest, and now we lost this ... *we lost our guaranteed cultivation*. (Interview with resident of community of Prexedes, May, 2011, emphasis added).



Figure 15-5: Absence of *vazantes* on the margins of the Jequitinhonha, May, 2011.

Community of Prexedes.

Source: GESTA files

The importance of *vazantes* for the composition of the *replacement fund* and the attainment of the strategy of internalization of conditions of reproduction of the productive system itself made evident in an interview of a resident of the community of Prexedes, as he comments on the link between *vazante* and livestock production, as well as the quality of alternativity of that production:

—We had *vazante*, you see. I could plant *vazante* all the way up, but now [he shakes his head negatively], this year, even last year, we didn't plant anything. Now this year I didn't even bother to plant anything there because it's just a waste of time. *What we planted and harvested here in the old days lasted the whole year. We raised pigs, chickens, had foliage for the cows and horses, things like that, but now we've lost practically one hundred per cent.*

—And now, to feed the livestock, how can we do it?

—We have just about nothing left here because we don't have enough money to buy maize, feed, that kind of thing. So we had to stop raising pigs, chickens, *we have much less now. It's really tough now. Do you see over there, when it was this time of year* [he points to the other margin of

the river] *all of that area, from that strip near the river, going all the way up, it was all vazante.* (Interview with Senhor D., resident of Prexedes, May, 2011, emphasis added).

To summarize, the loss of the vazantes results in the disarticulation of the peasant farm as it is structured in the Middle Jequitinhonha. Such changes have a direct impact on the nutrition and food security of dwellers, since many do not have any way to increase labour and income. These transformations also affect local food sovereignty, which is dear to the families and manifested in the manner in which they manage and control the conditions of production within the domestic group. They are ashamed to admit that they need to buy food at the market.

—And now, do you plant and harvest from the vegetable garden?

—Now practically no one is able to do this [...]

—And what you had from the vegetable garden, what you said, squash, onions, where do you get these foods now?

—Practically not at ... (the interviewee became silent and was unable to complete the sentence).

—Do you buy them?

—(nods affirmatively) Now we buy from street vendors of Coronel Murta.

—You have to buy them?

—We have to buy them. It's really difficult. Having to go out and buy them. [...] It's better when you have to harvest them right at your own door. Now we practically are at the mercy of others.

(Resident of Prexedes, May 2011, emphasis added).

As we have shown above, the riverine communities of the Jequitinhonha Valley possess a profound knowledge of the environment, which they apply to the articulation of spaces and the structuring of productive activities. It is the management of their activities in accord with the spatial-temporal ordering that guarantees the allocation of labour and provides food during the entire year. However, one can observe that these complex strategies for social reproduction become compromised with the loss of the natural ebb and flow of the rivers. The construction of the Irapé Hydroelectric Dam caused the interdependent production system of countless families who live downstream from the dam to become impractical, also making impossible the provision and management of the replacement fund, as well as

de-structuring routine activities conducted in farming, animal raising and also panning for gold in the river.

It is worth adding that animal raising functions not only to complement families' diet and as a reserve value. It is also the domain of women, who obtain income from this activity. According to Scott, animal raising operates in the peasant economic system as "one of the most traditional safeguards against economic difficulties (2009:36). Thus, the elimination of *vazantes* imposes deprivation since it limits the land available to work, eliminates a realm of cultivation which does not depend on rainfall, restricts the means of production which assures the social reproduction of the family and reflects the loss of control over the domestic labour force. It thereby seriously alters a specific model of family farm organization based on practices and knowledges developed in strict and continuous interaction with the environment and its diverse, complementary potentialities. These characteristics were highlighted by one resident of the community of Morrinhos in a previously cited interview, who said: "the lands depend on one another".

Another impact is the increase in permanent migration with the loss of the family's capacity to retain the labour force at home. The loss of access to *vazante* lands implies a reduction of the capacity of families to control and manage domestic labour, which, as we have seen, is a central element in the social organization of the peasantry. The loss of functional articulation among productive units that compose a complete farm thus reduces the possibility of allocating domestic labour in the critical dry period, thereby compounding losses and privations. Such losses refer to the importance of the *vazantes* for animal raising, as well as to the impossibility of prospecting for gold and diamonds in the river bed, which is sometimes cited by those interviewed:

—I remember that sometimes there was also work prospecting for gold and silver here in the river, did that continue?

—Well, that ended, it practically ended ... it used to be work that could be done in, what they call, the dry period. And the water level in the river would get lower enough over there ...(pointing to the other side) there they took advantage that the edge of the river was dry and they'd go down to prospect for diamonds, plenty of gold was also found, but now, since there's no definite level, sometimes it's high, sometimes it's dry, sometimes a person digs a hole to take out the gravel and the water comes down and covers the hole. It fills too much. So now folks practically stopped trying to do prospecting work. (Interview with D. Morador of Prexedes, May 2011).

Furthermore, alterations in the natural flow rate of the river eliminate many reference points that provide spatial and temporal guidance for the conduct of productive activities. The regularity of the river accompanies the hydrological cycle with its regime of seasons, alternating between dry and wet, which in turn organize labour and structure the annual cycle of the domestic group with its successive temporary migratory flows in the dry period. Prevented from being guided by the flow of the river, downstream dwellers seek to understand once again a landscape that is changing in a manner beyond their control and in which they seek, unsuccessfully, to produce spaces to live and work in. One resident of the community of Prexedes points to the interrelation of the themes of loss, privation and dis-orientation in his testimony:

—Because of the work, the edge... which is unpredictable, if you plant right on the edge where it's moist... and then the water, they let the water flow swiftly [...] If M. [neighbour whose house is on the opposite side of the river] wants to plant, even if he plants there on the edge of the river [...] just last year he planted more or less forty seed beds and just when the seedlings sprouted they opened the floodgates, the water level rose, flooded everything, he lost practically the entire vegetable garden.

—He lost everything, the forty seedbeds?

—(nods affirmatively) The forty seedbeds. The water kept coming, rising and some banks that he had made there to protect the seedbeds, they were washed away... so ... he lost practically everything. What I mean is, you just can't plant. And before the dam you could plant all along the water, *you knew when the river swelled and when it went down [vazar]. More or less the period that it swelled and went down, you had a basis. Now it's unpredictable, it rises up to some level, you plant on its edge, but then the water comes up even higher, too high, you just can't plant.*

(Interview with E., resident of Prexedes, May 2011, emphasis added).

It can be seen that the articulation between the dynamic production of this domestic economy and the rise and fall of the waters constituted a predictable field or panorama, derived from a long historical engagement of the local people with the environment. This provided the foundation for farming projects, which constructed their “horizon of generations.” The rupture of this articulation disorganizes, consequently, the entire productive system of the families, resulting in the inefficacy of traditional forms of management of their patrimony. Affluence and the abundance are now substituted by multiple losses due to the restriction of agricultural

production and labour and an imperative and constant pressure to try to comprehend the temporality of an unpredictable landscape. Residents of the community of Limoeiro point out the negative consequences of the Irapé Hydroelectric Dam:

We planted onions, garlic, things like that. *After the dam was built, things got worse. You plant, you plant, but you don't harvest. So we stopped planting.* My husband is in Nanuque, he comes once every 30 days. Sometimes we even have to pay for day labourers. My brothers-in-law went to the South to work. *Before, everyone had a vegetable garden, a vazante.* We used to harvest an abundance of onions: 30, 40 restia. Now we try to plant sweet potatoes and we can't harvest them. *Until last year we planted and always harvested them, now I've stopped trying.*

(Senhora S., dweller of the right margin of the Jequitinhonha River, 2011, emphasis added).

—[I plant] maize, cow peas and pigeon peas. We stopped eating rice because it's not raining enough. We used to plant a lot, harvest a lot. If we plant manioc, we still can harvest it.

—The problem is the dam. After it was built, we had no more vazante. The water is coming... With no more vazante, you can say that we have no more river.

—We planted potatoes, maize, squash, onions, garlic. Whatever we planted we harvested. Sometimes there was more than we needed and we were able to sell it. Now if you want to eat, you have to buy. It's very difficult. There was plenty of fish. All you had to do was put out the net and you'd get about four fish.

(Senhor F. and Senhor M., dwellers on the left margin of the Jequitinhonha River, 2011, emphasis added).

The technical expert's conclusion, that restoration of an “ecological rate of flow” of the river eliminates the claim for damages by the downstream population, is shown to be flawed by the ethnographic data cited above. For the families, and considering their model of social and productive organization, the damage and the problems persist in that they refer not to the restitution of “an ecological rate of flow,” but rather to the transformation in the very ebb and flow of the river. The new conditions make social reproduction impossible in the parameters and perspectives traditionally developed.

Final Remarks

During our fieldwork in 2011, locals frequently expressed feelings of suspicion about the presence of metallic substances in the water. They often spoke of some ferrous material in the river waters following the filling of the reservoir of the Irapé Dam. Such accounts reveal the suspicion, the mistrust, and the insecurity with which dwellers now consume water from the Jequitinhonha River. The water that comes from the reservoir and passes by the turbines before reaching the communities downstream from the Irapé dam and the changes of the drought and flood system of the river represents a departure from what is commonly taken as “normal” and “natural water”. Hence, the water is believed to be “filthy” or “not natural”.

Attributions of the water, that it “stinks of iron”, “tastes like aluminum”, “tastes different”, “is greenish”, “tastes like corroded wire”, made in interviews, reflect their daily experience of water contamination. Their assessment of the current state of the water comes from the knowledge they have developed in their continuous relation to the dynamics of the river and its seasonal alterations. The parameters that move such an assessment are based on sensory factors such as colour, temperature, smell, and taste. These parameters of analysis are immanent to the ways of using the physical dimension of the environment, as a condition of knowledge. Attention is directed to the signals that indicate a departure from the usual state of the environment (Ingold 1995).

On the other hand, for the technical expert, perhaps, who acts as a sort of subject disembodied from the environment that is under analysis, it is possible to read through the mediation of labs and the “sensorial organs of science” (Beck 2010) the physical and chemical changes as “transitorial inconveniences” derived from “alterations of aesthetic order” (Sperling 2006: 1393-1414). It is worth mentioning that changes in the environment can only be expressed in such terms by a knowing subject, who thinks about this environment with a mind set apart from it (Carvalho & Steil 2009). In this perspective, we can cite the role of graphs which compose the historical series of monitoring the quality of the water of the Jequitinhonha River, referred to as an efficient inscription device,¹³ which divorces subjects from their contextualisations by means of apparatuses (rodent bioassays, reflectors, electronic instruments) which aim to convince through visual exposition (Latour 2000:112).

In effect, reflections about the dialectic of expert and counter-expert reports raise some questions: what resources can best produce effects of efficiency? What are the definite statements that really count when

decisions are made, responsibilities attributed and resources allocated? How are recognition, authority and legitimacy attained? Our discussion points to some key factors to be considered, such as: who is speaking, from where he (she) is speaking, with whom he (she) is speaking, and what the discursive alignments are that support the authority of each speaker. We can take the contributions of Latour (2000) to better understand the homology between relations of force in the argumentative realm of risk definition and the relations of power that constitute the “field of social positions” (Bourdieu 2002:11). That homology explains why competing validity claims do not exercise the same effects and why the very symbolic struggle terminates by reproducing in a transfigured manner the asymmetries and relations of domination. We should ask questions about who are the legitimate spokespersons, questions about what counts as scientific knowledge, for whom, and at what cost. In the case under study, demands of expert objectivity are made together with the production of other effects with evidently political implications, that is, the denial of damages, the non-responsibility of the dam-builder, the insertion of the use of water as a mercantile relation in which the user is the consumer of the service, and the explicit blaming of the victimized communities themselves, as expressed in the following conclusion:

It is our understanding that direct impounding of water for use by riverine communities is an absolutely inappropriate procedure, justifiable only in situations of catastrophe, which fortunately have never occurred in the region. *The risk associated with this procedure is, therefore, the sole responsibility of the user and may not be imputed to the power company* (Sperling 2011, emphasis added).

We find here, once again, the global perspective – urban, technical, scientific and in harmony with the ecological modernization paradigm –, which has as its starting point not a living environment but a landscape conceived as an external object of assessment, management or contemplation, set apart from the subject; that is, a stage where efficient management supposes the invisibility of the real subjects, the people who dwell in and produce their livelihoods in such environments.

Notes

- 1 President Luis Inácio Lula da Silva declared in November 2006 that the first priority of the Brazilian Government has been to reach an annual

- economic growth of 5%. In this speech during the ceremony of inauguration of a biodiesel plant in the State of Mato Grosso the President said: ‘During the months of November and December I will be devoting a lot of time examining the difficulties we’re having in dealing with issues related to environment, Public Prosecution Service, quilombolas, Indians and the Audit Court to design a package ...’ (Sources: Agência Carta Maior, Carta Maior Publicações, Promoções e Produções Ltda <www.cartamaior.com.br>, viewed on 20/03/2007 and Ambientebrasil, Ambiente Brasil S/S Ltda, <www.ambientebrasil.com.br>, viewed on 20/03/2007).
- 2 Environmental Sustainability Index, Switzerland: 2000 and 2001.
 - 3 Data supplied by the National Electric Power Agency (ANEEL). Viewed on 20/03/2007, <www.aneel.gov.br>.
 - 4 The public hearing organized by DHESC – Human, Cultural, Social and Economic Rights Platform – at the Minas Gerais State Legislature on August 6, 2004 brought up for discussion several instances of human rights violations in a number of areas of the Minas Gerais State. In 2010, a report about the violation of human rights in the case of dams in Brazil was published by federal authorities. See http://www.agb.org.br/documentos/GT_Agraria_Relatorio_Final_CDDPH_2011.pdf
 - 5 Hydroelectric dam built on the Rio Doce in Minas Gerais by the Candonga Consortium with the exclusive objective of generating electric energy for the companies which were part of the consortium, namely, ALCAN Aluminum of Brazil, now known as Novelis and the Vale do Rio Doce Company. See BARROS & SYLVESTRE (2004).
 - 6 A dossier of the Belo Monte case can be accessed at the electronic portal of the Associação Brasileira de Antropologia (ABA), which, in 2011, conducted various events and seminar to debate the issue, in particular, the seminar Belo Monte e a Questão Indígena, Brasília, February 7, 2011 (www.abant.org.br).
 - 7 For other case studies, see Zhouri et al. (2012), Zhouri et al. (2011); Zhouri, Laschefski & Pereira (2005); Rothman (2008).
 - 8 According to the expert’s report. See SPERLING, E. *PERÍCIA Processo 2006.38.13.012165-7, Classe: 7100-Ação Civil Pública*. Plaintiff: Ministério Público Federal; Defendant: Companhia Energética de Minas Gerais – CEMIG. (s.D.) fls. 1393-1414.
 - 9 According to the expert’s report. See SPERLING, E. *PERÍCIA Processo 2006.38.13.012165-7, Classe: 7100-Ação Civil Pública*. Plaintiff: Ministério Público Federal; Defendant: Companhia Energética de Minas Gerais – CEMIG. (s.D.) fls 1393-1414.
 - 10 “Mangas” or “mangueiros” are spaces reserved for cattle grazing, where grass is planted to feed the herd. Closed pastures become more common as wide-open spaces for common use, where cattle are free to roam, become scanty.
 - 11 Mistura is the name of a variety of vegetables and greens from the vegetable gardens. It results from female work and is a relevant complement to the main dish called massa, a primary compost of manioc or mayse flour, rice and beans, as observed by Brandão (1981) among other peasant communities in the Brazilian State of Goiás.
 - 12 According to Wolf the replacement fund constitutes the required amount produced for the consumption of the cultivators, the replacement of the seeds and the repair of the production tools: “the amount needed to replace his minimum equipment for both production and consumption was his replacement fund. It is important that we think of this replacement fund not merely in purely technical terms, but in cultural terms as well” (1966: 6).
 - 13 According to Latour’s definition: “I will call an inscription device any structure (whatever its size, nature or cost) which makes possible a visual exposition of any type in a scientific text” (2000, p.112) and adds: “the instrument, whatever its nature, is what takes us from the article to that which provides foundation to the article, among the many resources mobilized in the text to the many more mobilized to create the visual expositions in the texts” (2000:115).

References

- Achselrad, Henri 2004. ‘As Práticas Espaciais e o Campo dos Conflitos Ambientais.’ In Henri Achselrad (ed.), *Conflitos Ambientais no Brasil*. Rio de Janeiro: Relume-Dumará; Fundação Heinrich Böll, p. 13-35.
- Barros, J. N. and Marie-Eve Sylvestre (ed.) 2004. *Atingidos e Barrados: as violações de Direitos Humanos na Hidrelétrica Candonga*. Rio de Janeiro: Justiça Global, MAB.
- Beck, Ulrich 2010. ‘No Vulcão Civilizatório: os contornos da sociedade de risco’. *Sociedade de Risco: rumo a uma outra modernidade*. São Paulo: Editora 34, p. 21 – 60.
- Bourdieu, Pierre 1993 [1977]. *Outline of a Theory of Practice*. Cambridge: Cambridge University Press.
- Bourdieu, Pierre 2002. ‘Sobre o Poder Simbólico’. *O Poder Simbólico*. Rio de Janeiro: Bertrand Brasil, p. 7-15.
- Brandão, Carlos 1981. *Plantar, Colher, Comer: um estudo sobre o campesinato goiano*. Rio de Janeiro: Edições Graal.
- Carneiro, Éder Jurandir. 2005. ‘Política Ambiental e a Ideologia do Desenvolvimento Sustentável’. In A. Zhouri, K.Laschefski and D. Pereira (eds.), *A Insustentável Leveza da Política Ambiental: desenvolvimento e conflitos socioambientais*. Belo Horizonte: Autêntica, p. 27-47.
- Carvalho, Isabel and Carlos Steil 2009. ‘O Habitus Ecológico e a Educação da Percepção: fundamentos antropológicos para a educação ambiental’. *Educação e Realidade*, 34(3):81-94.
- Chesnais, François 1996. *A Mundialização do Capital*. São Paulo: Xamã.
- Chesnais, François and Claude Serfati 2003. ‘Ecologia e Condições Físicas da Reprodução Social: alguns fios condutores marxistas’. *Revista Crítica*

- Marxista*, Campinas: Centro de Estudos Marxistas, No.16. Available at: <http://www.unicamp.br/cemarx/criticamarxista/16chesnais.pdf>> Access on 30/11/2011.
- Ingold, Tim. 1995. 'Globes and Spheres: the topology of environmentalism'. Milton, K. (eds.) *Environmentalism: the view from anthropology*. London: Routledge, p. 31-42.
- 2000. *The Perception of the Environment: essays in livelihood, dwelling and skill*. New York: Routledge.
- Latour, Bruno 2000. *Ciência em Ação: como seguir cientistas e engenheiros sociedade afora*. São Paulo: Editora UNESP.
- Oliveira, Raquel. 2008. 'Dividir em Comum: práticas costumeiras de transmissão do patrimônio familiar no Médio Jequitinhonha'. Dissertation. Master in Sociology, Belo Horizonte: UFMG.
- Ribeiro, Morel 2008. 'O Licenciamento Ambiental de Aproveitamentos Hidrelétricos: o espaço da adequação'. Dissertation, Master in Geography. Belo Horizonte: UFMG.
- Rothman, Franklin (ed.) 2008. *Vidas Alagadas: conflitos socioambientais, licenciamento e barragens*. Viçosa: Editora UFV.
- Scott, Parry 2009. *Negociações e Resistências Persistentes: agricultores e a barragem de Itaparica num contexto de descaso planejado*. Recife: Editora UFPE.
- Schneider, Sergio 2003. *A Pluriatividade na Agricultura Familiar*. Porto Alegre: Editora da UFRGS.
- Sperling, Eduardo von and Processo Perícia 2006. 38.13.012165-7, Classe: 7100-Ação Civil Pública. Requerente: Ministério Público Federal; Réu: Companhia Energética de Minas Gerais – CEMIG. Fls 1393-1414.
- Zhour, Andréa. 2004. 'Global-Local Amazon Politics: conflicting paradigms of the rainforest campaign'. *Theory, Culture & Society* 21(2):69-89.
- 2010. 'Adverse Forces in the Brazilian Amazon: Developmentalism versus Environmentalism and Indigenous Rights'. *The Journal of Environment and Development* 19:252-273.
- (ed.) 2011. *As Tensões do Lugar. Hidrelétricas, Sujeitos e Licenciamento Ambiental*. Belo Horizonte: Editora da UFMG.
- (ed.) 2012. *Desenvolvimento, reconhecimento de direitos e conflitos territoriais*. Brasília: Associação Brasileira de Antropologia (ABA).
- Zhour, Andréa, Klemens Laschefski and Angela Paiva 2005. 'Uma Sociologia do Licenciamento Ambiental: o caso das hidrelétricas em Minas Gerais'. In A. Zhour, K. Laschefski and D.Pereira (eds.), *A Insustentável Leveza da Política Ambiental: desenvolvimento e conflitos socioambientais*. Belo Horizonte: Autêntica, p. 89-116.
- Wolf, Eric 1966. *Peasants*. Foundations of Modern Anthropology Series. Englewood Cliffs, New Jersey: Prentice Hall.
- Woortmann, Ellen. 1983. 'O Sítio Camponês'. *Anuário Antropológico* 81:164-203. Rio de Janeiro: Editora Tempo Brasileiro.

NATURAL RESOURCE MANAGEMENT POLICY: A CHALLENGE FOR SUSTAINABLE DEVELOPMENT IN INDONESIA

Syaifudin Zakir¹ and Restu Juniah²

Since biodiversity is medicine, food, and life support system all in one, not only for the present time but also for future generations, we may not destroy or pollute it. If only we use more reason the result will be amazing, since it is a miraculous economic resource.

(Emil Salim, at National Workshop on Forestry Statement Forum in Jakarta, December 2005).

Appropriate natural resource management is a basic requirement for any sustainable development plan. This paper argues that natural ecosystems and their biodiversity need to be protected, and must therefore be considered carefully by policy makers as a key parameter in making decisions about natural resource exploitation. Development paradigms that overemphasize economic parameters and short-term material gain have tended to ignore the destructive aspect of resource extraction on the ecosystem and biodiversity. This short-sighted approach must give way to more responsible policy making and policy implementation. Indonesia is now considering how best to proceed towards a sustainable development paradigm, and how best to fulfil its role in global efforts to mitigate global warming and other forms of environmental change.

Indonesia's geographical condition as an archipelago makes the country particularly fragile to the climate change. Indonesia's total landmass of 1.9 million km² consists of 17,000 islands and islets, and 5.8 million km² of the ocean. Most capital cities and provincial cities are located in coastal or riverine areas, and 65 % of population live in the vicinity of the 81,000 km long coastline. Indonesians are becoming more and more aware of research indicating that the concentration of CO₂ in the atmosphere has risen from 265-285 ppm in 1750-1800 (before the Industrial Revolution)

- Marxista*, Campinas: Centro de Estudos Marxistas, No.16. Available at: <http://www.unicamp.br/cemarx/criticamarxista/16chesnais.pdf>> Access on 30/11/2011.
- Ingold, Tim. 1995. 'Globes and Spheres: the topology of environmentalism'. Milton, K. (eds.) *Environmentalism: the view from anthropology*. London: Routledge, p. 31-42.
- 2000. *The Perception of the Environment: essays in livelihood, dwelling and skill*. New York: Routledge.
- Latour, Bruno 2000. *Ciência em Ação: como seguir cientistas e engenheiros sociedade afora*. São Paulo: Editora UNESP.
- Oliveira, Raquel. 2008. 'Dividir em Comum: práticas costumeiras de transmissão do patrimônio familiar no Médio Jequitinhonha'. Dissertation. Master in Sociology, Belo Horizonte: UFMG.
- Ribeiro, Morel 2008. 'O Licenciamento Ambiental de Aproveitamentos Hidrelétricos: o espaço da adequação'. Dissertation, Master in Geography. Belo Horizonte: UFMG.
- Rothman, Franklin (ed.) 2008. *Vidas Alagadas: conflitos socioambientais, licenciamento e barragens*. Viçosa: Editora UFV.
- Scott, Parry 2009. *Negociações e Resistências Persistentes: agricultores e a barragem de Itaparica num contexto de descaso planejado*. Recife: Editora UFPE.
- Schneider, Sergio 2003. *A Pluriatividade na Agricultura Familiar*. Porto Alegre: Editora da UFRGS.
- Sperling, Eduardo von and Processo Perícia 2006. 38.13.012165-7, Classe: 7100-Ação Civil Pública. Requerente: Ministério Público Federal; Réu: Companhia Energética de Minas Gerais – CEMIG. Fls 1393-1414.
- Zhou, Andréa. 2004. 'Global-Local Amazon Politics: conflicting paradigms of the rainforest campaign'. *Theory, Culture & Society* 21(2):69-89.
- 2010. 'Adverse Forces in the Brazilian Amazon: Developmentalism versus Environmentalism and Indigenous Rights'. *The Journal of Environment and Development* 19:252-273.
- (ed.) 2011. *As Tensões do Lugar. Hidrelétricas, Sujeitos e Licenciamento Ambiental*. Belo Horizonte: Editora da UFMG.
- (ed.) 2012. *Desenvolvimento, reconhecimento de direitos e conflitos territoriais*. Brasília: Associação Brasileira de Antropologia (ABA).
- Zhou, Andréa, Klemens Laschewski and Angela Paiva 2005. 'Uma Sociologia do Licenciamento Ambiental: o caso das hidrelétricas em Minas Gerais'. In A. Zhou, K. Laschewski and D.Pereira (eds.), *A Insustentável Leveza da Política Ambiental: desenvolvimento e conflitos socioambientais*. Belo Horizonte: Autêntica, p. 89-116.
- Wolf, Eric 1966. *Peasants*. Foundations of Modern Anthropology Series. Englewood Cliffs, New Jersey: Prentice Hall.
- Woortmann, Ellen. 1983. 'O Sítio Camponês'. *Anuário Antropológico* 81:164-203. Rio de Janeiro: Editora Tempo Brasileiro.

CHAPTER SIXTEEN

NATURAL RESOURCE MANAGEMENT POLICY: A CHALLENGE FOR SUSTAINABLE DEVELOPMENT IN INDONESIA

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the need of different environmental components (natural and human, community government and business) must be based on environmental laws and ecological principles. In brief, some of the fundamental principles in environmental science are: Interaction, Interdependency, Diversity, Harmony, and Sustainability.

The application of these principles to the development of agriculture, urban planning and even mining will contribute to the sustainability of the environment and of the development itself. According to Harris and Goodwin (2001), the three aspects of sustainability are economics, social environment, and ecology.

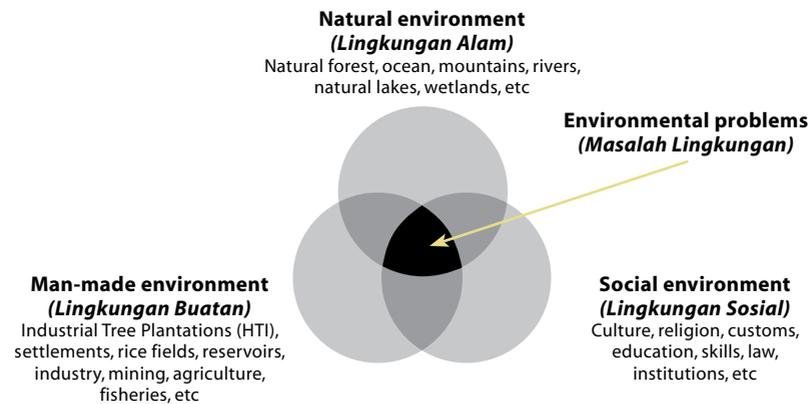


Figure 16-1: Environment Components.

Trends and Causes of Biodiversity Degradation

In theory some cases biodiversity loss can be due to natural processes, but in reality the sharp depletion rate and environmental destruction we are witnessing today is caused by human activity. The Indonesian Ministry of Environment 2009 Report informs us that 1/3 of Indonesia's "forest area" is has no more trees on it, with the area of critical deforestation approaching 60 million hectare. Meanwhile in Indonesia's ocean, only 30 per cent of coral reefs remain in optimal condition, 40 per cent show medium-level damage, and the remaining 30 per cent are in the worst condition category.

In general, the main challenges in salvaging Indonesia's biodiversity consist of: (a) the increase of population; (b) deforestation and forest fire; (c) over-exploitation of the forest and marine resources; (d) habitat

fragmentation and destruction. These four challenges place pressure on the ecosystem and accelerate the biodiversity depletion rate (Salim 2010).

If we observe deeply, these challenges could be further analysed as causal factors (*underlying causes*) and associated push factor (*drivers*) in the extinction of the biodiversity, including:

- 1 A development policy that prioritizes economic growth and abandons the principle of ecosystem balance, and is reluctant to adopt ecosystem integrity measurements. For more than four decades Indonesian economic development has been ignoring the ecosystem balance. The government still does not want to acknowledge fully the depletion of natural resource (including minerals, forest and marine products and biodiversity) because rapid economic development remains its main goal. This policy tends to be exploitative and permits the irresponsible utilization of the natural resource. Businesses thus never ask what may be the most responsible way of managing the natural resources according to the principles of sustainability, undermining their own long term activity, and also causing rapid ecosystem and biodiversity degradation.



Figure 16-2: Exploitation of Natural Resources.

- 2 Development that prioritizes the capital owner and marginalizes the poor and traditional/local community, jeopardizing their role as key stakeholder in sustainable ecosystem and natural resource management. The government is reluctant to take the necessary steps to give the maximum benefit to the, local community and traditional landowners, preferring to displace people instead in order to expedite commercial resource exploitation according to the company preference. This goes hand in hand with a tendency to ignore the

ecosystem and allow reckless exploitation of the forest and the sea in areas with rich mineral deposits.

- 3 Excessive exploitation of natural resources in the forest and sea, and ignorance of the sustainable principles are reflected in the government policy in the regulation of logging concessions. Permissions for logging by far surpass the forest's ability for recovery. In addition, illegal logging is an organized criminal activity operating with impunity on a massive scale in Indonesia, which has contributed to forest destruction and makes up a large proportion of the timber industry.

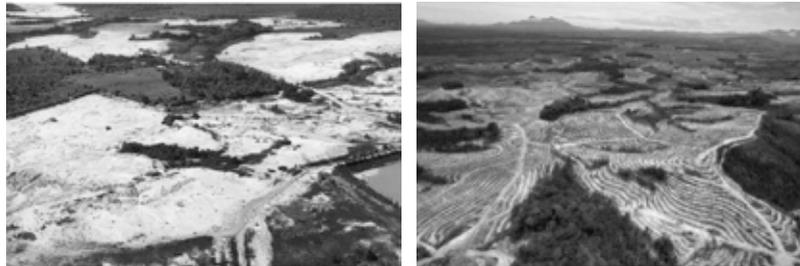


Figure 16-3: Forest Destruction and Mining Activity.

Source: WWF Indonesia, 2005-2010.

- 4 Corruption and bad natural resource governance in dealing with matter such as forest conversion and the allocation and distribution of sources have also obstructed Indonesian communities' efforts to move forward toward a better level of social welfare. One could say that Indonesian is on under a "resource curse," whereby the plunder of natural resources is closely associated with corruption, dehumanization of local people and poverty. Corruption is a key component in this irresponsible natural resource exploitation pattern, and thus a major driver of ecosystem and biodiversity destruction.

A Rescue Strategy

A strategy for sustainable natural resource management into the future should consider two aspects of resource use: consumers as the users of resources, and producers as the service providers who convert natural

resources into products. Both groups must have a stronger commitment to biodiversity conservation and sustainability. There are two strategies to prevent biodiversity loss and ecosystem destruction due to development, namely the principle of "no net loss" in biodiversity and ecosystem integrity and the principle of supporting businesses and economic activity. From the government side, the "no net loss principle" can be exceeded, by promoting conservation initiatives with a positive impact on biodiversity ("net positive impact on biodiversity principle"), thus reversing the trend from a decline in ecosystem quality to an improvement.

This strategy can be applied in stages globally, regionally, nationally and locally, through different layers of government, with cooperation from international and local companies, and with involvement of local communities and conservation organizations within a multi-stakeholder plan. Such a strategy would include:

- 1 Agreement on the measurement that will be used as an indicator of biodiversity (*matrices*) in anticipation of complaints from business people who always say it is impossible to govern unmeasurable items. The terms of any deal, specifying a balance between biodiversity and business profitability, should be calculable, and performance should be evaluated periodically. Concrete measurement should be performed even if the modelling is not yet perfect at the beginning. The measurement would include forest density and biodiversity assessment. (The absence of concrete measurement of biodiversity has been a major challenge in its governance.)
- 2 Pricing mechanisms and efforts in biodiversity rescue based on international agreements and initiatives. The market so far has not been a good instrument for pricing natural resources appropriately, with corporations often treating ecosystem damage as an externality. Ecosystems and their biodiversity, including the services derived thereof, are a public good and must not be destroyed with impunity by vested interests. Agro-forestry activity in upstream water catchment areas, for example, contributes to flood risk prevention for downstream settlements (as a side benefit from the cultivation activity). Without positive externality compensation, ecosystem services such as flood prevention initiatives will not be sufficiently valued. Government can set a price for biodiversity to reflect the internalization of ecological destruction costs. Government also can directly allocate revenue from taxation on activities causing biodiversity

degradation, such as pollution taxes, to biodiversity rescuers (such as national park management, whose work to protect the ecosystem provides a service enjoyed by surround businesses and communities). This can be achieved by legislating to impose an obligatory biodiversity offset payment on companies whose activities have an unavoidable, negative impact on biodiversity.

- 3 Expansion of instruments, mechanism and institution to ensure environmental fringe benefits are paid for (payment for ecosystem services, PES) through taxation or a compensation obligation channelled to and utilized by biodiversity rescue services. The instruments consist of:
 - (a) Credible measurement, reporting, and monitoring mechanism (MRV: measurable, reportable and verifiable).
 - (b) Credit certification mechanisms on biodiversity (biodiversity credit), such as have been applied by some palm oil plantation in Sabah, Malaysia. This mechanism can be applied in conjunction with REDD (Reducing Emissions from Deforestation and Degradation) initiatives because forest protection to minimize emission simultaneously tends to benefit biodiversity.
 - (c) Development of a biodiversity banking scheme to facilitate the biodiversity credit trading.
 - (d) Implementation of regulations relating to biodiversity offsets for mining company, forestry, and real estate or housing developers (in Australia, USA, Netherlands etc.).
 - (e) Transfer mechanism for direct payment or compensation at a local level.
 - (f) Effective local organization for community-based ecosystem governance.
- 4 Full government support, especially in counties mega-biodiversity, for a *No Net Loss* or *Net Positive Impact on Biodiversity* Policy.

Conclusion

Policy on natural resource management in the context of sustainable development should not ignore the ecosystem and biodiversity, that is, the earth and the whole web of life on which every human community depends. Without healthy ecosystems and biodiversity we cannot maintain national

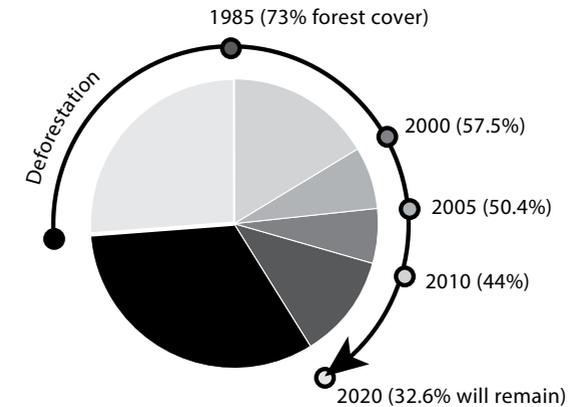


Figure 16-4: Forest Destruction Rate in Kalimantan.
Data from WWF 2005, mongabay.com

resilience, because we depend on the ecosystem for water, food and soil nutrient availability, and energy. Climate change, natural catastrophes and outbreaks of transmissible diseases are all related to biodiversity issues.

Development paradigm which over emphasis on economy and material wealthy aspect had ignored and destructed ecosystem and biodiversity, based on this reason the policy system formulation should be in accordance with the global system which the approach more enacted to the living environment and natural resource and should able to preserve biodiversity from extinction.

Value, or economic expectation, should be attributed to biodiversity and other environmental services as a competitive incentive for greater conservation activity. The private sector should participate actively to biodiversity conservation and ecosystem restoration on this basis.



Figure 16-4: Mine Tailings Pond
Source: WWF 2005, mongabay.com

Notes

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References

- Ahmad, Mubariq 2010. 'No Net Loss! Biodiversity Preserve Strategy.' In Iwan J. and et. al. es. 2010. *Sustainable Development: The Role and Contribution of Emil Salim*. Jakarta: Kepustakaan Populer Gramedia.
- Azis, Iwan J., Lydia M. Napitupulu et. al. (eds.) 2010. *Sustainable Development, Role and Contribution of Emil Salim*. Jakarta: Kepustakaan Populer Gramedia.
- Harris, Jonathan M., Nova R. Goodwin et.al (eds.) 2001. *A Survey of Sustainable Development Social and Economic Dimensions*. Washington DC, USA: Island Press.
- IUCN 2014. 'The IUCN Red List of Threatened Species, 2014.2.' <http://www.iucnredlist.org/initiatives/mammals/analysis>
- Juniah Restu, Syaifudin Zakir 2010. *A Study of Mining Management Reclamation in Post Mining Area Model: Mitigation of Climate Change Mining Sector as Effort of Environment Protection on Sustainable Post Mining*. Jakarta: University of Indonesia and University of Sriwijaya.
- State Minister of the Environment 1998. *Policy and National Strategy in Environment Management: In Second Long Term Development (1994/1995-2019/2020)*. Jakarta: Office of State Minister of Environment. Salim, Emil 2000. 'Reflecting Earth.' In Emil Salim 2000, *Back to The Right Way, Essays 1966-1999*. Jakarta: Alvabet.
- Soelarno, Soemarno and Witoro 2007. *Development Planning of Post Mining Area to Support the Sustainable Development (Case Study on Coal Mining by PT Kaltim Prima Coal in East Kutai Regency, East Kalimantan Province)*. Unpublished dissertation. Jakarta: PSIL, University of Indonesia.
- World Wildlife Fund 2005-2010. *Photo documentation of environment degradation in Indonesia*.

Web References

- <http://www.greenmining.info/detail.php?x=kegiatan&y=4b0442930f7790199ce6539c70f9fd82>
- <http://www.pme-indonesia.com/news/?catId=5&newsId=442>

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