Urban Environmental Management and Governance

Challenges for the 21st Century

Pedro Roberto Jacobi and Ursula Dias Peres

Pedro Roberto Jacobi is a Full Professor at the School of Education and the Graduate Program of Environmental Science at the Institute of Energy and Environment at the University of São Paulo. He is Head of the Division of Management, Science and Environmental Technology at the Institute of Energy and Environment, and Coordinator of the Research Group on Environmental Governance. His research focuses on water governance, urban environmental governance and social participation, social learning, and education for sustainability, cities and climate change. He has authored books and articles on environmental governance, social learning and water governance, and education for sustainability. He is also editor of the Journal *Ambiente e Sociedade* and President of the Board of ICLEI-Brazil.

Ursula Dias Peres holds a PhD in Economics. She is a Professor and Researcher on the Master's and Undergraduate Programs in Management of Public Policy and Social Change and Political Participation at the School of Arts, Sciences and Humanities at the University of São Paulo. She is former Assistant Secretary of Planning, Budgeting and Management of the Municipality of São Paulo (2013). Her research focuses on public management, social participation, public finance and budgeting. She has written articles on public finance, budgeting, public policies, management and social participation.

Abstract: In the Brazilian metropolitan context, environmental problems have been increasing. The growth of metropolitan areas in recent decades has transformed Brazil into, primarily, an urban country, with 84% of its population living in cities. This, together with a lack of urban management, has led to an increase in floods, inadequate sanitation, difficulties in solid waste management, among other effects harmful to the health of the population. It has also resulted in conflicts and shaped land-use practices, leading to dual cities, where the segregation of the poorer population forces them to settle in places where environmental risks are high. Given this scenario, what factors should be emphasized so as to address urban sustainability? Environmental governance of urban space is key to achieving sustainability and reducing vulnerability to disasters. The concept of environmental governance opens up a stimulating space to rethink innovative management approaches that involve a range of actors, institutions and inter-relationships. It also provides an opportunity to reflect on topics, where agents are able to articulate specific arrangements and negotiation possibilities, ensuring that the good common prevails (Jacobi 2012).
Thus, this paper aims to address the main difficulties in urban environmental management, and in particular, one of its biggest challenges: intergovernmental integration and the creation of innovative spaces for dialoguing with the various sectors of society.

1 Introduction

In the Brazilian metropolitan areas, urban environmental problems have increased and are compounded by the slow manner in which solutions have been sought, and this is a cause for concern. The increase in the incidence of floods, lack of sanitation and difficulties in the management of solid waste, together with air pollution and the deterioration of the quality of water resources, are having an ever greater impact on the health of the population. These issues generate conflicts, which are manifested in different ways, such as the appropriation of land and its resources, aggravated by numerous other factors, turning the sustainable management of cities into a very complex task.

The urban growth of recent decades has transformed Brazil into an essentially urban country where 84% of the population now lives in cities (IBGE – Brazilian Institute of Geography and Statistics 2010). Urban concentration is particularly visible in Metropolitan Regions (MRs) and in cities now transformed into new regional hubs. Metropolitan Brazil is made up of 413 municipalities and home to 70 million people, almost one third of the Brazilian population (Observatório Das Metrópoles 2010).

Metropolitan challenges require public administrators to implement policies to ensure residents have adequate living standards, and introduce programs and projects for recovering areas degraded by changes in land use and occupation. It is important to increase the amount of green areas and improve air quality, as well as implement policies to improve urban mobility and the universalization and quality of sanitation, particularly in the most deprived areas.

In face of these challenges, environmental governance of urban space is key to achieving sustainability and reducing vulnerability to disasters, especially those linked to extreme events resulting from global warming, which are expected to get worse. The concept of environmental governance opens up a stimulating space to rethink innovative management approaches, involving a wide range of agents, institutions, interrelations and topics. Different agents tend to articulate specific types of arrangements, which emerge from the demands at hand and the possibilities of negotiation, expressing the interest of collectives and ensuring that the common good prevails (Jacobi 2012). Thus, it is possible to say that environmental governance could be used to address the "unsustainable" models of metropolitan

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urbanization, characterized by a process of expansion and occupation of intra-urban spaces that, in most cases, reflects the dramatic reality of low living standards for many segments of the population.

Cities are marked by an inherent duality, where deprived areas, lacking all essential urban services, have seen much greater growth than the so-called "formal city". The urbanization process of periphery areas intensifies socio-environmental problems, including the illegal settlement of environmentally fragile areas (such as hillsides and flood plains), sanitation problems due to low levels of sewage collection and treatment, as well as problems related to high levels of consumerism, e.g. air pollution and increasing volumes of solid waste (Costa, Braga 2004).

However, the settlement of periphery areas was not part of the urbanization pattern of previous decades. Until the mid-20th century, occupation processes in many Brazilian metropolitan areas shunned the most difficult or vulnerable terrains, such as steep slopes and fragile soils or land susceptible to erosion, often far from central areas. But from the 1950s onward – and much more so in the last 30 years – with the exacerbation of "peripherization" processes and social problems, the occupation of periphery areas with little infrastructure began. In addition, there was also an increase in the number of interventions in the drainage network such as the rectification and canalization of rivers, and the draining of flood plains. These areas were then incorporated into the urban fabric and have become more susceptible to the explosion in residential land plots in the periphery.

Lack of planning in land use and occupation leads to settlement in periphery risk areas, resulting in a growth in the number of people who become vulnerable to natural processes (Maricato et al. 2010). The reduction in rainwater runoff capacity, linked to soil impermeabilization and precarious urban drainage infrastructure, increases the likelihood of flooding, landslides and other erosion-linked phenomena. All these problems – which could have been avoided, or at least neutralized or reduced – only increase the likelihood of catastrophes. However, it is worth highlighting that, in the risk society, "disasters waiting to happen" cannot be called catastrophes because most can be predicted and prevented (Beck 2010).

The situation described above has been further aggravated by a surge in extreme events, expanding the panorama of threats and urban calamities. In view of this scenario of growing threats and calamities, and a lack of metropolitan governance planning and mechanisms that would allow for the proactive and collaborative management of public spaces and resources, what should be emphasized when addressing issues of urban sustainability? This paper argues that the construction of sustainability necessarily depends on the interrelation between social justice, living standards, environmental balance and development.

The article is divided into four sections, including the introduction. The following section sets out a brief diagnosis of the situation and the impacts of current urban environmental management, focusing on three main aspects, namely, water management, mobility and air quality. The third section presents a reflection on the importance of environmental governance in addressing urban environmental issues. The fourth section sets out final reflections and is followed by bibliographical references.

2 Urbanization in dual cities: urban environmental management and threats

In Brazil, the main cause of socio-environmental and economic calamities in many cities is the uncontrolled growth of population in urban areas over the past 50 years, exposing the social cost of natural catastrophes. Urban, functional and social inequality have been deepening and the result is broken and segregated cities (Grostein 2001; Bonduki 2011). Urban areas have grown horizontally and make up a large part of the ever expanding periphery areas, through the occupation of empty land by low-income groups, the establishment of plots of land that are illegally developed and sold, local authority-built housing complexes to shelter the more deprived population, as well as precarious and informal settlements such as favelas and other poor neighbourhoods (Jacobi 1999; Nakano 2011). The lack of sanitation infrastructure and community facilities to provide education, health and leisure is a common feature of most of these settlements, often stigmatized because of their precariousness. The result is the significant degradation of environmental resources and an increase in social problems and conflicts. The main factors driving the uncontrolled growth of illegal urban areas is the constant neglect by public authorities over the years,

both in terms of regulation and monitoring, and adequate provision of urban infrastructure and quality public services.
The uncontrolled urbanization process and a lack of urban planning and mechanisms to promote the governance of resources in Brazilian cities have jeopardized environmental and urban management at different levels. In this section, we will present the main causes and effects of this phenomenon, based on a risk analysis of water management, urban mobility and air pollution.

3 Urban environmental management and risks to water management

Natural disasters due to flooding have become commonplace in the Brazilian urban metropolitan environment. Flooding and landslides in large urban centres are the result of climate change. Considering the accelerated rate of urban expansion in risk areas and the lack of development of appropriate infrastructure at a similar pace, cities are not prepared for the effects of climate change. Main events relate to an increase in the amount of rainfall, resulting in the overflow of rivers and flooding, as well as landslides in risk areas.

International studies reveal an increase in the incidence of heavy rainfall, aggravating socio-environmental impacts and further threatening the precarious infrastructure of cities and the health of the population, causing untold material damage and human loss. Tropical cyclones, gale-force winds, floods, gravitational mass movements and the overflow of rivers associated with higher rainfall, as well as the reduction and drying of navigable rivers in the Amazon region and the rise in forest fires, are some of the phenomena likely to increase in the next few years (IPCC 2007). Studies by the Brazilian National Institute for Space Research (INPE) reveal that the São Paulo Metropolitan Region (SPMR) may see temperature rises of 2°C to 3°C this century. This is likely to cause significant changes to the rainfall regime, doubling the number of days of heavy rainfall (NOBRE 2010).

According to Tucci (2006), socio-environmental threats and the higher vulnerability of populations and housing are linked to the surge in higher-intensity natural events in urban areas, due to the occupation of riverside areas and urbanization processes which are also responsible for localized flooding. The recurrence of these problems is due to a lack of planning concomitant with urban development, inherent to the uncontrolled growth of cities. As well as a lack of initiative on the part of public authorities, the inappropriate occupation of the main beds of rivers and streams can also be linked to other factors such as: a lack of funds and a lack of technical, structural and human capacity to develop, implement and monitor intervention measures to reduce the impacts of overflow and flooding (Jacobi et al. 2013b).

There are over 12 million people living in favelas in Brazil (IBGE 2013), equivalent to approximately 6% of the Brazilian population, and they are mainly concentrated in landslide and flood risk zones. The overlap between private interests and social demands for land in large cities, where authorities have no resources to build or purchase properties in safe zones closer to the centre, means that the poorer population are forced to live in areas of difficult access and/or without a consolidated urban infrastructure. It is these people who will suffer more profoundly from the effects of increased rainfall, and – if current patterns of urbanization continue – new threats are likely.

Uncontrolled urban growth, the canalization of rivers, ineffective waste collection, the local authorities' disregard for illegal settlements, the occupation of hillsides and large-scale deforestation are factors driving floods and other dramatic events, resulting in the loss of life and material damages. The following factors also contribute to the worsening of floods: the higher speed of rainwater runoff down hillsides and its accumulation in the lower areas of the city, and the build-up of solid waste in watercourses, contributing to river silting, increasing the risk of overflows in the rainy season (Maricato et al. 2010, Miguez et al. 2011, Jacobi et al. 2013a). All these risks are considered preventable, but they require investment so that authorities can relocate communities, monitor occupations and illegal waste disposal, protect hillside vegetation and preserve watercourses. In addition, most drainage systems have design flaws and maintenance problems and are therefore vulnerable to heavier rainfall caused by climate change (Nobre et al. 2010). Urban floods are directly linked to failures in the various stages of the drainage system, either due to design flaws, lack of maintenance or because systems have become obsolete or, more generally, as a result of uncontrolled urban growth. The rise in the occurrence of extreme events is likely to overload systems and cause more frequent failures, as heavier rainfall increases the flows produced by urban impermeabilization (Miguez et al. 2011).

Although there has been an increase in extreme events, Ribeiro (2011) argues that problems caused by heavy rainfall are due to a common model of city management where planning, regulation and routine actions are substituted by emergency operations when the administration bodies are more vulnerable. In today's urban management model, predictable problems caused by equally predictable climate events can only be dealt with by emergency actions. Ribeiro (2011) argues that this plays a decisive role in the reproduction of the precariousness of cities and perpetuates an inadequate model of environmental interventions, further amplifying the negative effects of extreme events.

There is a degree of consensus among specialists in that many of these catastrophes could have been minimized or even prevented if Brazil had a reasonably efficient catastrophe prevention system to deal with heavy rainfalls in its cities. This requires introducing and modernizing meteorological devices, such as radars and rain gauges, capable of predicting heavy rainfall with precision, as well as mechanisms for alerting the population, and the geological mapping of risk areas. After the multiple calamities of recent years, the Federal Government decided to "federalize" this issue. It is now responsible for taking the initiative for preventive actions and consequently announced the creation of the National System for Early Warnings and the Prevention of Natural Disasters (Ribeiro 2011). However, there is still an absence of intra-governmental civil defence actions on a permanent basis in regions where calamities are recurrent. The fear of losing votes leads authorities to initiate emergency operations, mobilizing engineers, firemen, the police and technical emergency experts to attenuate negative impacts and reduce the population's feeling of abandonment. However, these events also reveal the authorities' lack of preparedness in calamitous situations to alert, relocate and guarantee shelter in face of imminent threats.

Municipalities' master plans set out instruments to promote a model of urbanization that is fairer in socio-environmental terms. However, as can be observed, these instruments are constantly undermined. Most local authorities capitulate to economic interests and reinforce processes which promote uncontrolled occupation. It is also worth highlighting the failure of urban policies to adequately address land use and occupation issues, and the fact that the departmentalization of environmental policies negatively affects land-use planning. Various mechanisms can be used to identify vulnerable areas and strategies for prevention, mitigation and adaptation in face of extreme events in coastal areas and river basins (Steinberg 2006; Schult et al. 2009).

4 Urban environmental management and its effects on urban mobility and air pollution

In recent years, Brazilian metropolitan areas have been facing an urban mobility crisis. This is mainly the result of the predominance of individual modes of transport over collective mobility. For many years, the mayors of large cities have invested in road systems and very few administrations have directed investments toward populations living in periphery neighbourhoods. Cities invested in road network policies in order to adapt the social fabric to a growing motor vehicle fleet, based on a car-centred rationale. This led to a drop in efficiency and the reliability of public transport, namely, buses – the result and consequence of inappropriate urban expansion policies.

Between 2001 and 2011, the number of cars in the 12 Brazilian metropolitan areas grew from 11.5 million to 20.5 million, and the number of motorcycles from 4.5 million to 18.3 million (Rodrigues 2011). Expensive and poor public transportation has led to social exclusion. The motorized vehicle fleet in Brazil's 12 main capitals practically doubled in ten years, with an average growth in the number of vehicles of 77%. However, essential road infrastructure and traffic control bodies were unable to keep up with the pace of change.

Figure 1 shows a reduction in the use of public transport and a rise in individual transportation in the last 50 years in the metropolitan area of São Paulo.

Given the increase in urbanization and, most notably, the disproportionate amount of cars, metropolitan regions face an increase in greenhouse gas emissions and slow traffic, negatively impacting on the flow of both people and freight. Growing levels of congestion in large cities affect public transport users more, despite existing services and ongoing investments.

One of the main characteristics of the urban mobility crisis in Brazilian metropolitan areas is

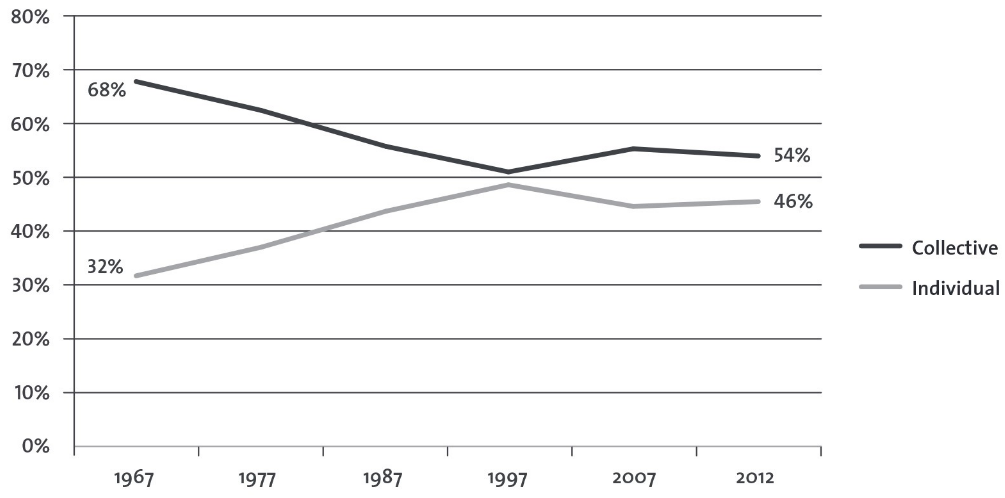

Fig. 1: Participation of the different modes of transport: Collective and Individual Transport in São Paulo (%). (Source: Survey on the Mobility of the São Paulo Metropolitan Region, 2012)

the rise in unsafe and insecure forms of public transport. Urban and metropolitan bus systems are the predominant means of public transportation in Brazil, operating in 85% of Brazilian municipalities. Alternative transport systems comprise of vans and motorcycle taxis. These have proliferated in the last 15 years and are now commonplace. Vans and motorcycle taxis are present in over half of all Brazilian municipalities. High capacity systems such as trains and subways are not very widespread and are found in only a few metropolitan regions, whilst waterborne transportation is only significant in the north of the country (IPEA [Institute of Applied Economic Research] 2011).

Against this critical backdrop, research shows that in recent years investment in projects to accelerate the reduction of cars represents only a fifth of what is required (IBGE 2012). Recent protests on the quality of public services and the increase in public transport fares brought thousands of people onto the streets across the country, placing urban mobility at the centre of the public agenda.

The central importance of individual transportation generates negative externalities for the community at large and, above all, for the cities' environment. The rise in the use of fossil fuels and demand for road transportation have led to a surge in pollution from motor vehicle emissions. Air pollution is a serious problem, particularly in metropolitan regions with large fleets of motor vehicles. Impacts are felt in terms of health problems, especially in children and the older population. A combination of longer commutes and the lack of quality public transport has resulted in a rise in the use of individual transport and, consequently, an increase in mobile source emissions associated with respiratory and cardiovascular diseases.

Within this context, the Brazilian National Policy on Climate Change (PNMC) (Law no. 12.187/2009) is committed to the voluntary adoption of mitigation measures to reduce greenhouse gas emissions (GHG) by between 36.1% and 38.9% by 2020, in relation to projected emissions (BRASIL 2013b). This is a significant challenge considering the model of mobility policies implemented in most Brazilian cities.

5 Future scenarios for urban environmental governance

Given the Brazilian urban scenario presented here, there is an immediate and unquestionable need to implement policies geared towards making cities more socially and environmentally sustainable in order to combat further deterioration in quality of life. An urban sustainability agenda is needed to increase the level of socio-environmental awareness and encourage the population to take part in decision-making processes in order to enable the sharing of responsibility for monitoring the agents accountable for socio-environmental degradation.

Advances in environmental governance must be steadily incorporated into processes involving both decision-makers and non-decision-makers and, in particular, the economic agents responsible for environmental degradation. The building of as inclusive a consensus as possible must be a common objective in order to address the ever increasing number of environmental issues and to develop policies for sustainability. Decentralized and shared responsibility is key to this process. Thus, environmental governance should involve networking, integrated actions and the empowerment of actors involved in management, who must continuously interact with decision-makers using an inter-federative approach (Jacobi 2013). Therefore, socio-environmental policies should be strengthened through their integration with other governmental spheres, imbuing them with transversality. Indeed, it is important to stress that environmental policies must be developed to address problems at the metropolitan level, in line with policies on employment, income and economic development, taking account of urban living standards.

When urban settlements disrespect the environment the consequences are well-known, and problems are likely to increase if radical measures are not taken to address three specific areas: precarious housing and the lack of infrastructure; insufficient public transport and the excessive use of individual transportation; and uncontrolled land use and occupation by the poorest segments of the population.

In terms of local sanitation governance, it is important to develop, implement and support social monitoring of Sanitation Plans and the Integrated Plans for the Management of Solid Waste. These are management instruments developed with the participatory involvement of different actors. For domestic solid waste, reductions in quantities produced, transported and disposed of in landfill sites depend on the shared responsibilities of producers, importers, distributors, traders and citizens, in accordance with the Brazilian National Policy on Solid Waste. In cities, selective waste management, reverse logistics and recycling are strategic activities because they contribute to human and environmental health. They also promote better living standards by generating income, as well as formal and informal jobs. When these activities are connected to the production process they result in savings in raw materials, energy, natural resources and in the reduction of greenhouse gas emissions which cause global warming (Adedipe et al. 2005; EPA 2010; IPEA 2010).

However, improving municipal management requires well-qualified administrators, supported by governments willing to develop a strategic plan for their municipalities, so that public actions can be underpinned by a long-term vision and be highly proactive and preventive, rather than just responsive to emergency situations. Organized civil society requires well-qualified representatives who can effectively contribute, with new spaces and processes for building dialogue. Responsible prevention measures and actions can only be achieved through shared responsibility and the integration of different levels and sectors of society. This allows for the possibility of opening up stimulating spaces to participatory democracy alternatives, most notably, to guarantee access to information and consolidate the channels opened for plural participation.

The path toward a sustainable society is strengthened by education and guided by complexity. Educational practices should imbue the learning environment with a reflexive attitude toward environmental issues so that the concept of environment and complexity can assist in the development of new mindsets, knowledge and behaviour. This means it is necessary to promote new social practices, steered by the aim of gradually changing the prevailing logic of unsustainability. This involves stimulating and promoting a critical perspective vis-à-vis the logic of unsustainability, opening up channels capable of propagating ideas and practices, presenting alternative visions and promoting shared responsibility in society.

Cultural transformation is essential for closing the existing gap between recognizing the current social and environmental crisis, and building real practices capable of forming the basis of a sustainable society. Cultural transformation also reminds us of the importance of strengthening communities of practice[1] and social learning[2] as processes and public spaces which allow the involvement of an ever greater number of people to practice this knowledge, and to enable communication between individuals so as to improve interactions capable of bringing substantive advancements to the production of new repertoires and social mobilization toward sustainability (Wenger 1998; Glasser 2007; Sterling 2007).

6 *Final considerations*

Brazilian cities are facing ever increasing and complex environmental urban management challenges. The scenario depicted in this article reveals the existence of extremely damaging environmental, social and economic effects. They are the outcome of the uncontrolled use of natural resources in the absence of planning, without cooperation and integration between public and private actors. The result is that resources and assets are unevenly allocated in sub-optimal conditions across society.

Taking as a guiding principle the fact that the State has a central role in mediating the interests of those involved in environmental urban management, this article argues for the adoption of governance as the founding principle, model and instrument in the use of the environmental resources of Brazilian cities which should be adopted in conjunction with the concepts of strategic planning and cultural transformation.

Based on the governance-strategic planning-cultural transformation triad, the allocation of natural resources should be achieved so as to maximize the common interest. Thus, actions to deal with natural disasters could be conducted in a more integrated manner, involving all sub-national bodies and civil society. In addition, the mobilization toward socio-environmental sustainability should be driven by the establishment of a knowledge and expertise network.

When successful local sustainability experiences are analysed it can be noted that local authorities act as incubators for innovation and large-scale implementation, and as agents for change. In these experiences, local authorities are the closest governmental sphere to people and are therefore able to address global issues through localized systemic solutions (ICLEI 2012). Thus, cities can play a decisive role by:

- strengthening decentralized cooperation models;
- supporting the establishment of local regulation frameworks to promote urban solutions;
- developing actions based on resilience and adaptation to climate change;
- creating new markets for the inclusive green urban economy;
- promoting the structural dismantling of the current logic of urban mobility;
- strengthening networks and associations that connect local leaders so as to facilitate the exchange of knowledge;
- enabling and promoting collaborative participation;
- setting the conditions for a transition toward a vigorous and inclusive green urban economy capable of reducing poverty and promoting socio-environmental justice.

Transport modes, land use and planning, access to sanitation and basic infrastructure are the urban topics associated with sustainability par excellence. They are all linked to increased environmental threats which inflict profound changes, impacting on issues related to the inappropriate settlement of risk areas, the prioritization of public transport and the prevailing ideas of urban cleaning systems, waste reduction, recycling, selective waste management and waste disposal policies.

Brazilian cities need to reduce the risk of disasters, particularly those associated with heavy rainfall. Therefore, it is essential to rethink the governance of urban space, both in terms of disaster prevention and warning, and post-disaster actions. More importantly, it is also necessary to avoid projects that increase the degradation of fragile areas, whilst stimulating those that ensure environmental systems work appropriately. Responsible prevention mechanisms will only be achieved through shared and integrated action across the different spheres and sectors of society.

Notes

1 According to Wenger (s/d): "Communities of practice are groups of people who share a concern or a passion for something that they do and learn how to do it better as they interact regularly". "They develop a shared repertoire of resources: experiences, stories, tools and ways of addressing recurring problems – in short, a shared practice".

2 Glasser (2007) highlights the multiplicity of approaches to social learning. In this article, the term indicates the learning processes of individuals and groups who, through social interaction, acquire new ways of understanding and acting on reality. It focuses on social learning as a process of cultural change (Sterling 2007), geared toward addressing current socio-environmental problems.

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Prof. Pedro Roberto Jacobi
Universidade de São Paulo
Instituto de Energia e Ambiente
Divisão de Gestão, Ciência e Tecnologia Ambiental
Avenida Luciano Gualberto 1289
05508-010 São Paulo, Brazil
prjacobi@gmail.com

Prof. Dr. Ursula Dias Peres
Universidade de São Paulo
Escola de Artes, Ciências e Humanidades – EACH
Avenida Arlindo Bettio, 1000
Ermelino Matarazzo
03828-010 São Paulo, Brazil
uperes@usp.br