In-between environmental risk and protection

Globalisation and environmental transformation in the city of São Paulo

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Abstract. The spatial order of metropolitan cities is undergoing a rapid transformation in the era of globalisation. From place to place, the urban tissue is seeing a process of verticalisation and densification with the growth of 'transnational urban spaces' such as business districts. This is entailing a number of pressures on the local environment and infrastructure, which are emerging as hidden costs of development and besetting major cities in a burgeoning way – e.g. the decline of green areas, heat island effect, vehicular atmospheric pollution, sanitation and energy inefficiency, and so on. Nowhere in the world are these pressures so accentuated as in third world metropolitan cities, where the rush for meeting a competitive edge in the global economy – so to attract the establishment of headquarters of multinational firms and banks and turn into a global city – is taking place at the cost of a rapid spatial transformation and environmental disruption.

The aim of this paper is to explore the links between globalisation and the disruption of the urban environment, but to also go one step further. By looking at the case of São Paulo's transnational spaces our objective is to investigate not only how globalisation is triggering urban environmental pressures, but also inducing to urban environmental management solutions. The paper finishes by making a number of suggestions on how globalisation may be put at work for catalysing local environmental restructuring processes.

Key words: globalisation, urban development, urban environment, environmental restructuring, São Paulo

Globalisation, urban space, and urban environment

The city has traditionally been analysed as a contiguous urban space undergoing its own dynamics and problems. Since the mid-1980s, however, authors as David Harvey (1989), Manuel Castells (1996), and Saskia Sassen (2001, 1994) have started to forcefully include the dynamics of globalisation in studying the city, claiming that it is now necessary to embrace a wider societal space to understand urban change. For these authors globalisation can be deconstructed as a worldwide reaching 'space of flows', emerging in a 'network society' and allowing a massive dispersal of flows of capital, information, and other physical streams around the world. And cities, conversely, have become sites where this new dynamics is re-centralised, serving as agglomeration centres where the space of flows is coordinated and managed from. Sociologists claim that with globalisation major cities as London, New York, Kuala Lumpur, and São Paulo have become 'nodes and hubs' at the crossroads of global circuits of people, information, capital, and goods that traverse them.

As a result, the urban space has also been undergoing marked transformations in the era globalisation. Certain 'transnational spaces' are emerging, spaces which while located within a national territory, provide a direct and continuous link between the 'local' and the 'global'. These are for instance business districts, export-processing zones, airports, shopping malls, offshore banking centres, and corporate headquarters interconnecting key cities via information exchanges. Consequently, amid such cities a new urban management context is now developing, as numerous social practices from 'above' and from 'below' are now *fusing* in the urban space, affecting its metabolism and shape. Transnational urban spaces lying in-between the local and the global are no longer only influenced by the politics of the place but also by those emerging from the global, from the 'space of flows'. This takes place via in-house management concepts disseminated by multinational firms and banks that occupy and manage them, via construction approaches developed by foreign designers, developers, and manufacturers that too often create them, and via the diffusion of urban management policies worldwide, in addition to other mechanisms.

There is an increasing need to improve the environmental performance of major cities. Besides their longstanding environmental problems and related institutional and financial weaknesses to deal with them – such as vehicular pollution, sanitation deficit, infrastructure limitation, and so forth (Cohen, 1996) – in the process of turning into major tertiary sector agglomeration centres metropolitan cities are also being sub-

ject to new environmental stresses. In the first place a process of *verticalisation* and densification of core regions is witnessed, resulting from their transformation into international business centres and national economic engines. The presence of corporate headquarters of both national and foreign firms, jointly with the presence of high-income workers, have contributed to sharp increases in urban commercial and residential property prices, particularly during the past decade. This has led to the proliferation of high-rise buildings and high-density land usage so to increase the capitalisation over land assets, which has resulted in the formation of 'urban canyons' putting at stake issues such as natural ventilation and lighting inside the buildings. Therefore, more indoor artificial lighting, refrigeration/heating and ventilation are frequently required to operate such buildings, with higher energy consumption implications. Such high-rise buildings also imply increased wind speed at pedestrian level due to the formation of such urban canyons, leading to reduced outdoor activity and increased use of indoor space. The less friendly the outdoor environment, the more people rely on indoor comfort, resulting in more energy and other resources consumption (Santamouris, 2001; de Schiller, 2000; Melchert, 2001).

Secondly, as urban land prices have significantly risen, these cities have also been undergoing a rapid process of *expansion* and suburbanisation – as peripheral areas are more affordable, hence attractive particularly for residential developments – entailing more energy use and pollution from transport for commuting. In this context, economic and real estate pressures too often prompt alterations in the local building and urban planning codes so as to facilitate construction permits. And in this process, environmental considerations usually fall short, leading to a type of 'spontaneous' urban growth trend. Many metropolitan cities nowadays suffer from heat island effect as the expansion of urban areas implies a decrease in green areas, more vehicular pollution, as well as paving and other heat absorbing/reflecting materials – which in combination increase urban heat sharply. Temperatures may reach up to 10^{o}C higher than those of adjacent non-urban areas, severely increasing the need for air conditioning in buildings and aggregating energy consumption of these cities. Further, more complex and environmentally intensive systems of water supply and treatment are required to pump water over longer distances in expanding cities. Finally, difficult drainage solutions are required to cope with urban flooding problems, making their environmental and energy load tremendous (EA.UE, 1997).

The third environmental stress results from a general *discontextualisation* of buildings, particularly of commercial buildings. The presence of foreign firms – active investors, buyers and users of real estate – has contributed to the internationalisation and homogenisation of property developments. This, in addition to the worldwide, converging architectural preferences of the local managerial élites, has led too often to the reproduction of similar buildings within the network of global cities. As a result, transnational urban spaces are now seeing a process of homogenisation – translating too often into a discontextualisation of the adopted architectural approaches vis-à-vis the local environment and architectural tradition, as more and more they respond to international standards of design, construction techniques, and building services, usually employing glass and hermetically isolated façades (e.g. curtain wall). Though often seen as an appropriate solution to avoid the external polluted environment of major cities, the extensive and indiscriminate use of such 'environment rejecting' techniques – which many times does not correspond with the local climatic context – end up provoking further environmental problems as buildings require more and more energy to be cooled and lightened, and their glass façades contribute to increase urban heat. Irrespective of the location, this is trapping the urban space into a vicious circle of worsening exterior environment and a spiralling consumption of energy, while turning such transnational urban spaces into 'sources' of environmental risks concentrating polluting exhausts, heat absorbing materials, reflective surfaces, and so on.

On the other hand, and contradicting the terms above the rise of transnational urban spaces is to some extent also contributing to homogenise a worldwide 'race to the top' in urban environmental management standards. First, multinational construction products manufacturers as Siemens, American Standard, Lucent, etc., are now diffusing environmental technologies worldwide to such spaces. And second, international developers, contractors, architects, engineers, as well as building occupiers (e.g. multinational companies), which are more and more operating on a transnational way, are bringing in and/or adapting environmentally sound construction techniques developed in certain locations to others, providing thereby a dense, worldwide exchange of new, state-of-the-art construction technologies and building management approaches.

Third world metropolitan cities constitute an intriguing backcloth to explore this interplay between environmental disruption and reform, among which São Paulo makes a prime example. The economic engine of Brazil, São Paulo has since the mid-1900s onwards also grown to be the leading business capital of the Southern Hemi-

sphere, expanding and transforming sharply its physical setting and urban environment. A paradoxical city, São Paulo's size and economic importance are contradicted by a general absence of official urban or environmental planning. As a result, disorderly changes in the urban space – and their environmental side effects – have made of São Paulo a cacophonic cityscape, or, as some say, a 'bomb primed to go off'. The assimilation of corporate headquarters contributing to the city's verticalisation and expansion has thereby taken place at the interface between a rush for meeting a competitive edge vis-à-vis other cities for the establishment of businesses and, on the other hand, a large discard for the environment.

As I shall suggest in this paper, however, the ecological restructuring of São Paulo's office stock is in its *status nascendi,* an embryonic process. Although transnational spaces have grown to be a highly speculative property market in the city seeking short-term profits (commonly at environmental costs), some developers have recently started to introduce the concept 'green building', indicating that a more efficient use of resources is bound to be triggered. My argument starts with an overview of the place describing the geographical distribution of São Paulo's transnational spaces, some characteristics of the property market, occupancy, buildings' typology, environmental problems and emerging environmental regulations. Although this information seems to provide little evidence that an ecological reform of São Paulo's office stock is arising, this paper concludes with some general observations, and other evidences, that point at an emerging ecological restructuring process, discussing thus the conditions and actors that are favouring, or may favour, it.

São Paulo's transnational spaces

São Paulo was founded by Jesuit priests in 1554 on a hill nearby the confluence of the Tietê and the Tamaduateí rivers. This location would afterwards reap benefits from the proximity to the Serra do Mar and the harbour of Santos, and develop into an intermediary point for transportation routes between the coast and inland plains. Remaining among the poorest rural centres of the colonial period, and mostly colonised by adventurous settlers coming from the south of Portugal, São Paulo's early origins provided few clues of what the town would look like in the ensuing centuries.

Its growth took place at a slow pace until the end of the nineteenth century, a period during which coffee plantations started to soar over the state of São Paulo (of which São Paulo city is the capital) conferring on the city a new role, that of the

world's main coffee export centre. São Paulo has since then bloomed at an extraordinary rate, attracting investments in industrial sectors and urban infrastructure, in addition to a strong migratory influx. A population of no more than 30,000 inhabitants of late 19th century surpassed one million in the 1940s (Emplasa, 2000), quickly altering the city's topographic constitution with the development of residential and industrial complexes, the canalisation of rivers and streams, and the creation of dams for energy provision. In the process, a type of gap in environmental preservation started to widen, as public services – such as waste collection, sewerage disposal, street cleaning, paving, and urban drainage – too often failed to cope with the speed of the city's growth (Rincón, 2000).

Nowadays, São Paulo has become a high-rise city, facing a strong urban decentralisation trend and high levels of pollution, with a total metropolitan area of more than 8,000 square kilometres inhabited by around 20 million people (Emplasa, 2000). With an intense economic dynamism supported by governmental incentives to further attract industries and the services sector, the Great São Paulo has become not only Brazil's 'command centre' – generating about half of Brazil's gross national product – but also the economic and financial capital of Mercosul, in addition to Latin America's main industrial and service pole (Emplasa, 2000; Seade, 2002). The city represents thereby the link between the national and international economies, concentrating headquarters of numerous national and multinational corporations, decision-making institutions, banks, as well as telecommunication and service firms.

The evolution of São Paulo's transnational spaces started in the old city centre, particularly since the construction of the Martinelli building in 1929, the city's first skyscraper, which in fact triggered the city's verticalisation process. For decades the old centre remained the city's financial nucleous, growing from the capital accumulated by the coffee industry and boosting São Paulo's industrialisation and modernisation. As its area became packed with high-rise buildings by the late 1950s and early 1960s, new developments started to move south, first to the Paulista Avenue, located at the highest topographical point of the city, then to the Jardins region (Emplasa, 2000).

Still in the 1960s, service activities (e.g. information technology, advertising, and consultancy) started to develop along the Faria Lima Avenue, an avenue at the southern edge of the Jardins. As this region also became saturated with high-rise buildings by the late 1970s, other service sector nuclei were founded further towards

the south – first in the Berrini region, including the Centro Empresarial complex and the Berrini Avenue, where the World Trade Centre building would be constructed in the mid-1990s, and later on in the Marginal Pinheiros (also referred to as Nações Unidas) and Verbo Divino regions, the latter being the latest vertical occupation of the city largely profiting from Brazil's economic stabilisation since the mid-1990s (Emplasa, 2000).

Nowadays, São Paulo's transnational spaces are concentrated on two main regions – a 'centralised' one, including the old centre and the Paulista, Jardins, and Faria Lima regions, and a 'decentralised' and expanding one, comprising of the Marginal axis which links the old centre to the Verbo Divino region. The old city centre, in this context, although still concentrating around 40 percent of financial activities of the city and remaining an eminent financial pole, has been losing its importance due to a strong deterioration process, where an obsolete stock of buildings, unsafe and difficult to be accessed, has been further beset by a poor environmental quality. The Paulista Avenue, in contrast, has during the past few decades assumed the role of the city's (as well as of the country's) most influential economic centre due to the high concentration of high-rise buildings mainly maintained by banks. But it is especially the southern business districts along the Marginal axis that have been gaining attention during the past years due to the speed at which they expand, which in turn requires massive adaptations in the urban infrastructure, particularly concerning the road network.

São Paulo's transnational spaces are characterised as a highly speculative property market, where new developments too often push for an extremely dense land use as well as an indiscriminate demolition of existing buildings long before the end of their useful lives, where overall preservation issues usually fall short. This fact, in addition to a vulnerable economic context, continuously exposes São Paulo's property market to economic fluctuations. Overrated after 1994, the market has significantly devalued since 1998 due to the economic downturn propitiated by the Asian crisis, coupled by a surplus in office space. Recently it has started to present a vacancy of around 10 percent, proving an increase of vacancy as compared to the 1990s, with a (decreasing) prime rental basis of USD 390 m^2/year (CB Richard Ellis, 2002).

Environmental challenges

São Paulo, as a highly speculative developer-oriented market, counts with a growing number of foreign developers. Yet, much of the commercial developments are still carried out by local developers, often using local architects, which largely reproduce examples carried out in the USA responding to a market largely influenced by the North American culture. Much value is given to the façade design and large open lay-outs, seeking the maximisation of space use. Architectural approaches are thereby many times fostered from the outside to the inside, where the 'glass box' concept (e.g. curtain wall) is highly praised, and where environmental performance issues are usually marginally considered. In addition, being a car-oriented city, buildings offer an impressive rate of parking facilities (one parking space for every 30 square metres of rentable area) so as to respond to the commercial demand. In fact, a high rate of parking space is one of the most relevant prerequisites for the building to be labelled as grade A (top segment) in the city, so that commercially developed buildings which do not comply with this feature inevitably face market constraints.

It goes with saying, as in any large city in a developing country São Paulo has a tremendous car fleet and therefore suffers from high levels of urban atmospheric pollution. Back in 1995, the fleet already consisted of 5.16 million vehicles – 3.3 million gasohol fueled light-duty vehicles, 1.5 million ethanol fueled light-duty vehicles, and 360,000 diesel-fueled heavy-duty vehicles – a number that has grown approximately at 5 percent annually (World Bank, 1997). This fleet is responsible for 96 percent of CO emissions, 90 percent of HC, 97 percent of NOx, 86 percent of SO_2, and 42 percent of particulate matter, making urban atmospheric pollution the city's main environmental priority, particularly during the winter, when these gases are trapped in the atmosphere due to thermal inversion, reaching highly toxic concentration levels (Secretaria do Verde e do Meio Ambiente do Município de São Paulo, 1998). Indirectly, the fleet also brings about economic losses of more than USD 6 million daily due to the city's extremely intense traffic congestions. These congestions are, in turn, giving rise to a large alternative helicopter fleet (currently estimated the second largest after Tokyo) also promoting another distinctive infrastructure feature of the city: the large number of helipads in top segment buildings.

Ecologically, São Paulo's metropolitan area is surrounded by a green belt with a broad hydrological network, including the rivers Tietê, Tamanduateí, and Pinheiros, and the reservoirs Guarapiranga (27,2 square kilometres) and Billings (37,9 square

kilometres). Although constituting one of the city's most important ecosystems, serving at the same time for energy generation purposes, this hydrological network has been seriously affected by untreated urban sewerage and industrial wastewater emissions (World Bank, 1991). Nowadays, the water that used to be pristine suffers from severe eutrophication (algae bloom following a high increase in nutrient concentration in water), making water scarcity a recurrent environmental problem and affecting a significant share of the population with related diseases and periodic rationing.

In terms of energy, the city is predominantly supplied by hydropower sources with an additional oil-fired thermoelectric plant, which is occasionally used to provide peaking or emergency power for water pumping. Such network of hydropower supply is deemed to have caused a regional environmental impact, as the reversal of rivers towards the reservoirs has contributed to their pollution and degradation.

There are limited assessments regarding the environmental footprint of the city's transnational spaces, e.g. concerning the volumes of energy, waste, and water directly consumed by commercial buildings in São Paulo. But according to official evaluations of the city's overall environmental profile (e.g. provided by the World Bank, 1991; Emplasa, 2000; Secretaria do Verde e do Meio Ambiente do Município de São Paulo, 1997, 1998) some trends can be remarked. In the status of 'global city', São Paulo is continuously undergoing a verticalisation process coupled by an urban expansion trend, where more and more high-rise towers are being constructed as the city further grows, putting a massive pressure on the existing infrastructure, such as the road network, water and energy distribution and sewerage, and also affecting the urban microclimate.

As a result, São Paulo has increased urban runoff levels and serious flooding problems due to a diminished absorptive capacity of the soil and impermeability of the clay – following the high level of impermeabilisation of the city with the excessive use of asphalt, concrete, and constructions, among others, and decreased green areas – particularly during the summer when heavy rains occur. There are 400 areas identified within the city as being at risk from flooding, where around 75,000 people are periodically affected. This problem has become so serious in São Paulo that the local government has instituted a 'Urban Drainage Management Plan', with a budget of BR 5 billion (1998 prices) to be spent over the next 30 years (Secretaria do Verde e do Meio Ambiente do Município de São Paulo, 1998).

In addition, the temperature differential between the centre and the periphery is of 5^{o}C, proving the existence of heat island effect (Emplasa, 2000), a phenomenon related to the excessive use of low albedo (reflective capacity) surfaces, such as asphalt in addition to the decline in green areas. This prompts a kind of vicious circle, putting more and more burden on the existing urban infrastructure resulting, for instance, from an important increase of the cooling demand of buildings, with increased energy consumption implications. As a result, São Paulo started to be threatened also by energy scarcity, parallel to the recurrent problem of water scarcity, having to undergo a rationing programme in 2001.

Moreover, São Paulo also presents excessive levels of noise pollution, having over 80 percent of its population continuously exposed to it; a significant part of which deriving from the construction and demolition of buildings. Visual pollution stemming from the number of construction sites has also become another serious environmental problem of the city, and the areas surrounding construction sites also present an increased presence of ambient dust and street rubble levels (World Bank, 1991).

Finally, forestland has significantly decreased in São Paulo between 1930 and 1990. São Paulo has also low indexes of green land per capita, having back in 1991 only 4.5 square metres per inhabitant, a figure that has probably decreased ever since (World Bank, 1991). Nowadays only about 2 percent of the city's surface is assigned for agricultural purposes.

Contradictions of the regulatory framework…

São Paulo's urban planning and construction codes are comprehensive and complex to be followed. The city counts with three main local governmental bodies responsible for urban planning and regulation: the Planning and Housing Departments (deciding over the issuing of laws and norms) and the Metropolitan Planning Company of the Great São Paulo (articulating policies in the three metropolitan regions of the state of São Paulo: São Paulo, Santos, and Campinas). Traditionally characterised by the lack of official urban planning, the city currently holds however a complex set of instruments for the regulation and enforcement of urban construction activities – ruling extensively over physical standards of buildings (through the Código de Obras do Município de São Paulo – the building code of São Paulo – having a last revision in 1992) and land use issues (mostly through the Lei de Zoneamento Urbana do Mu-

nicípio de São Paulo, São Paulo's urban zoning legislation, first introduced in the city in 1972, and intended to be modernised in the coming years) – their effectiveness is actually quite ambiguous (see for instance Rolnik, 1997)

Likewise, finding environmental management practices promoted by local public institutions for the greening of São Paulo's office stock is also a meticulous task. Environmental policy in the city is determined by a wide range of actors – including the federal government, state authorities, municipal government agencies, private sector enterprises, non-governmental organisations, the communication media, and informal sector enterprises – and is characterised by a problematic coordination, ill enforcement, and frequent infractions, resulting largely from such extensive, rather complicated, legislative culture that exists in the country (World Bank, 1991).

At the national level, the main institutional body dealing with environmental issues is the Ministry for the Environment. At the state level, the main agencies are Cetesb (the state agency for environmental protection), Sabesp (the state company for drinking water supply and sewerage), and DAEE (the state department of water and electric energy). At the local level, the main institutions are the department for the environment (Secretaria Municipal do Verde e Meio Ambiente) and the metropolitan council with representatives of the state and the mayors of the municipalities that altogether constitute São Paulo metropolitan area (38 in total, including São Paulo city). In addition, the Metropolitan Planning Company of the Great São Paulo conducts studies and has certain responsibilities in implementing environmental rules at the urban development level, while the Planning and Housing Departments are responsible for issuing norms that may also have an environmental character geared to the building level. Finally, the energy and water utilities Eletropaulo (acquired by AES Corporation after its privatisation) and Sabesp are responsible for the implementation of rules set up at higher governmental levels.

In terms of environmental management of construction activities, São Paulo is primarily influenced by the municipal legislative framework, comprising of a building code and a zoning law with, however, a limited environmental content. The latter, for instance, includes environmental protection norms for certain areas of the city, e.g. environmentally or culturally sensitive neighbourhoods, which nevertheless frequently tend to be broken in view of economic pressures. The former, the building code, includes some norms with an environmental character – particularly concerning (mandatory) levels of natural ventilation, lighting, water capacity, ratio of green area,

and so forth – which are nevertheless considered not to go beyond what can be reasonable in terms of environmental comfort, and thereby do not really promote an environmental upgrading of buildings.

Ironically, instead of a greening process, an opposite trend can be noticed in the city of São Paulo: the 'institutionalisation of law infringement'. This practice takes place following the local power structure, where economic interests too often prevail the urban legislative framework. In certain cases, municipal bodies issue new laws to allow alterations in the city's existing construction and urban planning regulations. As an example, the recently passed Lei de Operação Urbana (Law of Urban Operation) allows changes in the zoning code – e.g. the verticalisation of new areas. Such changes are offered to developers at certain fees during the application for an 'irregular' building permit. This fact further favours the speculative trait of the city's property market – where marketability and construction efficiency issues from the investor's viewpoint (e.g. capitalisation over land values, gross-to-net ratios, occupation efficiency, and so on) turn bioclimatic architectural approaches, which demand certain 'losses' of space, through for instance buffer zones, uneven shapes, or use of vegetation, practically unconceivable. In this regard, and in order to attain an optimal occupation proportion, spaces tend to be rather deep, requiring thus more and more the use of artificial lighting and acclimatisation.

In terms of energy efficiency, some proposals have been made during the past few years for the construction of self-sufficient buildings via co-generation equipments. But with no governmental subsidies of any kind, however, some of them proved to be economically unfeasible, such as for instance the Villa Lobos shopping mall, while others have managed to be carried out, e.g. the Plaza Iguatemi building, completed in 2002, in fact the most expensive office space currently available in the city. The same limitation of public incentives seems to apply for water issues. Buildings that use for instance underground water resources – and thereby contribute to reducing the overburden of the mains grid – still have to pay the water company a fee for the use. The decentralisation of wastewater treatment, in this respect, also receives few, though growing incentives; but sometimes the contrary can also be remarked, as biotechnologies, for instance, in wastewater treatment systems are apparently forbidden.

…And emerging environmental regulations

But there are, however, certain environmental management programmes fostered by other local networks, which one way or another promote the outset of an ecological restructuring process of São Paulo. In the first place, the municipality has been seeking to promote a better management of both public and private green land through the Department for the Environment, the latter through the reinforcement of existing laws – e.g. those of the zoning legislation – or concession to fiscal benefits, and the former by maintaining quotas for the implantation of green areas. The Department for the Environment has also expanded the access of urban farmers to better technologies and trade structures, created a 'green incentive', benefiting sponsors of environmental education, research, documentation, and preservation actions. It has also developed a report on Local Agenda 21, including a series of environmental ambitions, tackling the issues of hydraulic resources, solid waste, hazardous waste, pollution (air, noise, and visual), and green areas, among others (Secretaria do Verde e do Meio Ambiente do Município de São Paulo, 1997). Environmental impact assessments, in this context, are mandatory to constructions on sites within protected areas, stipulated by the zoning law, and do mostly concern general environmental preservation (such as trees, natural topography, contamination of aquifers, and so on), but do not extend to water and energy efficiency in buildings.

In terms of energy management, an innovation that has taken place stems from the concession contract signed in 1998 during the privatisation of the energy market in Brazil. It determined that one percent of the company's net annual income is to be spent in energy conservation projects. For Eletropaulo, São Paulo's utility, this represents around BR 50 million (approximately USD 17 million, 2004 prices), a volume that is distributed into two kinds of projects. The first one corresponds to projects of the kind 'research and development', constituting of different programmes such as the expansion of transmission lines' capacity and development of electric energy plants to be run on solid waste, among others. The second is termed PACDEE (Programa Anual de Combate ao Desperdício de Energia Elétrica – annual programme against electric energy waste) involving, among others, projects to improve the efficiency of public lighting, of the energy supply chain, and projects related to the distribution of low energy lamps to low income households. The selection of programmes is to be decided by the general public and eventually approved nationally. Besides these pro-

jects geared towards energy efficiency issues, Eletropaulo has also started an environmental management system to ensure a continuous improvement of its operations.

However, there are at the moment limited specific programmes of energy efficiency directed to commercial buildings, despite the critical energy rationing programme instituted during 2001, and neither energy advisory services in this respect are being offered so far. Despite the overall privatisation process, consumers are still somehow 'captive' in the sense that they still rely on one single company within the municipality of São Paulo, to whom they directly pay their related bills, sometimes intermediated by facility managers. Yet, Eletropaulo initiated several informative campaigns to alert consumers of how energy can be saved, also including the commercial building sector, indicating that energy waste in offices may reach up to 15 percent of the total consumption, leading to increased bills, infrastructure overload and compromising the efficiency of office equipments. It also called attention to the fact that, in average, air-conditioning takes around 48 percent of the total energy consumption of the commercial space in São Paulo, while lighting accounts with 24 percent, pumps and elevators with 13 percent, and office equipment with 15 percent (Eletropaulo, 2002). But these informative campaigns have so far not yielded substantial results from the consumers' side.

Accordingly, the energy rationing of 2001 did not result in radical behaviour changes or significant, large-scale technological improvements. But it did, however, initiate an awareness raising process of the overall population, as early indications demonstrated that a voluntary reduction was having a surprising impact in the elimination of waste, through for instance the replacement of incandescent bulbs by energy saving ones. And it did also lead to an opposite direction, as many companies, office building complexes, and other large facilities started to achieve the required reduction by switching on an on-site energy generation equipment, usually powered by diesel (clearly nothing like a co-generation plant), which not only consumes energy excessively but also contributes to urban pollution. As apparently no monitoring was done during the period in terms of avoiding such behaviour, nowadays new commercial buildings dedicate a significant space in the machinery rooms for the possibility of a future energy generator.

Finally, in terms of water management, the main agencies related to water regulation, distribution, and treatment are administered at state level, through the companies Cetesb (the state agency for environmental protection) and Sabesp (the

state company for drinking water supply and sewerage treatment, which is in fact on the largest sanitation companies of the world in terms of consumers served). While the former is responsible for the regulation, enforcement, and monitoring of the raw water supply and treatment cycle, the latter deals with the distribution and treatment of commercial water, operating eight water production systems within the metropolitan area of São Paulo. Both companies are government-owned. Consumers, in this respect, and as within the energy network, are considered to be captive as in the case of energy supply.

In terms of environmental protection programmes, and while Cetesb has been seeking to better monitor the illegal occupation of areas nearby water springs so as to avoid such contamination (Secretaria do Verde e do Meio Ambiente do Município de São Paulo, 1998), Sabesp has been investing in the expansion of the collection and treatment systems, although both companies work in close cooperation. Sabesp is also promoting the partial removal of pollutants through on-site installation in certain buildings, industries, and public facilities. At the treatment stations, attempts are made to separate pollutants from the water before they are returned to the environment, where the treatment is conducted in two cycles, a solid and a liquid one. Nowadays there are five stations in São Paulo metropolitan area, treating nearly 91 percent of all wastewater volume (Sabesp, 2002).

As for water supply, Sabesp has also been developing programmes geared at the optimisation of the system. The first one is related to water loss reduction (given that 22.5 percent of the volume of water is lost through leaks and 21.5 percent through illegal consumption) through which it intends to control water losses throughout the supply chain. The second, the water reutilisation programme, currently involves only the industrial sector through the encouragement of on-site secondary water quality treatment and reutilisation. The third programme, concerning among others office buildings, is the rational use of water (referred to as PURA – Programa de Uso Racional de Água). It has been initiated in collaboration with the IPT (Institute for Technological Research of the University of São Paulo), where a series of pilot-projects and action plans have been implemented in certain hospitals, public schools, industrial kitchens, and commercial and residential buildings. Although somehow still in its outset, the objectives of this programme are to maximise the supply of water in São Paulo in view of the existing capacity, reducing thereby investments in the expansion of the capturing capacity of the water sources, the volume of water to be treated, and

the city's aggregate energy consumption. These objectives are to be achieved primarily through the elaboration of laws, regulations, and norms towards the rational utilisation of water in buildings, including, among others, the technological development of sanitary devices (and eventually their standardisation in the building code), the implementation of modern monitoring techniques, as well as the introduction of educational programmes in the curriculum of public schools (Sabesp, 2002).

Putting globalisation at work in the environmental restructuring of São Paulo

As the case of São Paulo demonstrates, we witness that globalisation is prompting a number of changes in the constitution of the urban tissue with related environmental side effects. In the process of turning into a 'global city', São Paulo has during the past two decades also turned into a 'high-rise city', where the environmental footprint of each square meter on the surface is tremendous. As a result São Paulo has to deal with a number of challenges related to the environment and infrastructure provision – e.g. declining green areas, heat island effect, the formation of urban canyons, energy and sanitation inefficiency, and so on – challenges which are growing continuously while trapping the city into a vicious circle of environmental disruption.

At the local level, management practices promoted by local organisations such as urban planning and environmental departments, and energy and water utilities trying to tackle such environmental side effects of urban growth are emerging only marginally in São Paulo. The water company introduced a demonstration programme aiming to show how water use in diverse kinds of facilities may be used more rationally, while the energy company, after being privatised, has a R&D budget to be allocated in energy efficiency projects, which may be applicable to commercial buildings. These programmes seem to suggest only an 'intention' of local agencies to change the behaviour of actors, via for instance the substitution of polluting, environmentally intensive technologies in buildings towards more efficient ones. However, at the moment there seems to be a mismatch between such intentions and the environmental performance of transnational spaces, as the former are rather incipient, if not insignificant, to influence the latter. In São Paulo, the main constraining, command-and-control policy to deal with environmental externalities is limited to the request of environmental impact assessments for buildings to be constructed in environmentally sensitive areas. The local building code and master plans do not have standards beyond what can be considered 'reasonable' in terms of energy and water efficiency in

buildings. Apparently there are no covenants regarding environmental topics being applied in the city; on the contrary kinds of covenants acting 'against' environmental protection seem to be emerging. All in all, local agencies give the impression of not significantly interfering in the environmental dimension of building activities in the city.

On the other hand, however, they are also not hindering the implementation of environmental protection innovations: Bank Boston, for instance, has recently completed the construction of its headquarters in the city following the American green building LEED principles, which puts forward a series of environmentally sound recommendations. Decisions have been made at the bank's global headquarters level; locally, the bank is now promoting itself through the media as an institution caring for the well being of the city. Apparently approvals for the construction, also regarding the electrical and hydraulic projects, were easily obtained, despite its unusual environmental features.

Another example is the Rochaverá office building – initiated and being constructed by the developers Tishman Speyer Properties, working jointly with the local construction company Método. This building is bringing in the technology utilised by the developers in the Sony Centre and the Messe Turm, located in Berlin and Frankfurt respectively. Although designed by local architects, the Rochaverá is applying in São Paulo the German legislative framework for key environmental issues – i.e., relating to natural ventilation, lighting, high performance technologies, and so forth – without facing impediments from local planning and environmental agencies or utilities. When completed in 2004, it will add 60,000 square metres of green office space to the city.

These two examples seem to provide evidence that certain global economic actors may instigate or induce to the ecological restructuring of São Paulo's transnational spaces. It is possible that in the coming years these two buildings shall serve as benchmarks of environmental management and performance – in terms of technology as well as legislation – for other commercial buildings and local planning agencies to follow and adopt. If this proves to be indeed the case, environmental innovations stemming from the global sphere may catalyse a new market dynamics in the city towards a self-regulatory paradigm, a paradigm in which the market starts performing environmental change fairly autonomously. In this case, globalisation will also be serving to do good on the local environmental sphere as is already the case with these

two examples. But to make this work it is also probable that local public agencies need in the short term to refine their political approaches in the sense of canalising on large scale such innovations stemming from the global space into the local environment. This will probably require a combination of adequate incentives and constraining regulations so to foster this environmental leapfrog and render globalisation and urban environmental reforms two interrelated movements.

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