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The Environmental Restructuring of Beijing's Office Stock in the Light of China's Economic Opening

LUCIANA MELCHERT
PhD Candidate, Wageningen University, Environmental Policy Group
Bode 175 - Postbus 8130 - 6700 EW Wageningen - The Netherlands
email: lucianamelchert@hotmail.com

Abstract. *The spatial constitution of major 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 rise of 'transnational urban spaces'. This is in turn 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 Chinese cities, where the country's economic reform has prompted an urban 'modernisation rush' without precedents in history, contributing to turn the once cleanest cities of the planet into the most polluted ones.*

The aim of this paper is to explore the links between globalisation and the transformation of the urban environment, but to also go one step further. By looking at the case of Beijing's office stock – and focusing on its water management – our objective is to investigate not only how globalisation is triggering urban environmental pressures, but also how it may introduce urban environmental management solutions. The case of the China World Trade Center building is described to illustrate how the conceptualisation of environmental innovations in Beijing may be linked to the same processes of economic opening that are contributing to introduce them.

Introduction

As many scholars have explained, we are now living in an era of pronounced transformations. Information technologies have revolutionised the means of production, changing labour relations, and allowing a dispersal of economic activities around the globe. This is an era also marked by the liberalisation of financial markets and basic services and by a sharp accentuation of foreign direct investments and international trade activities. Companies, too, have internationalised their activities

along global assembly lines, as their factories, deposits, and head offices are now dispersed among the continents. And cities, conversely, have become sites where this new dynamics is re-centralised, serving as agglomeration centres where the complex web of activities of global economic institutions is coordinated and managed from. Sociologists claim that with globalisation major cities as London, Paris, New York, and various others have become 'nodes and hubs' at the crossroads of circuits of people, information, capital, and goods that traverse them (Castells, 1996; Smith, 2001).

As a result, the urban space has also been undergoing marked transformations in the era globalisation. Certain 'transnational spaces' have emerged, which, while located within the national territory, provide a direct and continuous link between the local and the global. These are for instance business districts, export-processing zones, offshore banking centres, and corporate headquarters connecting key cities and creating, in turn, a network of simultaneity in which local, translocal, and transnational ideas, images, technologies, and management practices navigate. And consequently, amid such cities a context of transnational urbanisation is now developing, as numerous transterritorial connections of social practices – from above and from below – are now *fusing* in the urban space, homogenising to some extent, worldwide, its metabolism and shape. More and more we see that major cities are growing alike – insofar as they are now composed and occupied largely by the same architects, investors, suppliers, developers, and other global economic agents.

It is in this context that a paradox seems to be developing in major cities in the era of globalisation. On the one hand, the influences of the global economy on the local are contributing to speed up urbanisation and, it goes without saying, its environmental drawbacks. While the concentration of activities provides a vital setting for the economy, the densification of land and transport use changes the urban microclimate, causing pollution and posing a burden on the urban environment and infrastructure. Consequently, large cities are turning into 'domes' of environmental challenges, concentrating vehicular exhausts, heat absorbing materials, reflective surfaces, and so on. In their turn, individual buildings are developing 'environment rejecting' construction approaches to avoid the external pollution, becoming thereby more and more dependant on automated, resource intensive systems of acclimatisation and lighting to operate, which imply not only higher running costs but also significant environmental loads. It follows that, irrespective of the location, globalisation is prompting a vicious circle of a worsening urban environment and a spiralling consumption of natural resources.

Yet, and contradicting the arguments above, globalisation may to some extent also contribute to homogenise worldwide a race to the top in urban environmental management standards. First, multinational construction products manufacturers as Siemens, American Standard, Lucent, are now globalising environmental technologies for (urban) buildings. And second, international developers, contractors, architects, engineers, as well as building occupants (e.g. 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 construction technologies and building management approaches.

This interplay between environmental disruption and reform is most intriguingly taking place in China, *specifically due to* its recent economic opening process. In this country, the rush for converting the key cities into international business capitals within a short period of time is prompting – it goes without saying –

environmental drawbacks, but also innovative experiments with international building professionals. These are introducing new technologies, managerial, as well as legislative approaches – the latter going as far as to include alterations in the Chinese building code, especially as for the case of large-scale office buildings that were until recently lagging behind in China. Although not particularly driven by it, these experiments are in turn also contributing to introduce environmental management solutions.

In the coming sections we shall explore the contradiction of urban environmental disruption and reform for the case of Beijing, developing our argument as follows. We first provide an overall description of the main characteristics of Beijing's office stock in view of China's recent economic reform and the main environmental drawbacks arising from it. Second we discuss the contradictions thereby taking place within Beijing's urban regulatory framework and the key environmental policies/directives being developed to deal with the growing challenges. We finally analyse the case of the China World Trade Center building, which illustrates how the dynamics of globalisation may also have a positive correlation with the local environment.

Beijing's office stock

In 1986, Deng Xiaoping instituted China's Land Administration Act commodifying – and internationalising – the right of land use in urban China. This reorganisation of the Chinese urban system has brought Beijing into a new phase of urbanisation, including alterations in the urban land use, finance, and investment structures, also operating more flexible policies of loaning, capital pooling, and the drawing of foreign investment among others into the urban property sector. In this context, profit-oriented property development companies have been created in Beijing with a mandate to develop commercial estates, soon growing to be the city's leading economic sector (Dianchun Jiang *et al*., 1998). And the result was an ever-accelerating proliferation of local urban developments, economic activities, in addition to realty investments into office buildings, introducing in the city a modernisation process unprecedented in history.

With regards to its office stock, the open-door policies and reform initiated since the late 1970s and early 1980s have attracted a growing number of international business enterprises to establish representative offices in Chinese cities. Beijing, enjoying its status as China's capital, became one of the key locations for the establishment of such offices. It started thereby to grow into a global city which, though many times in competition with Shanghai, could no longer be characterised only as China's political and cultural centre, carrying out the administrative work for nearly 1.2 billion people, as it became also the country's expanding international financial, educational, and services capital (Gu and Kesteloot, 2001; Hu Zhaoliang, 1991). Responding in turn to a sudden growth in the demand for office spaces, Beijing has been taken up by massive urban renewal and old inner city redevelopment projects, where investments into realty in the city averagely amount to about half of total investments made in the city nowadays. Statistics currently predict another expansion in the property market after the city received the International Olympic Committee vote in September 2001 to host the 2008 Olympic Games.

In this context, while historically Beijing lacked business districts, hundreds of large construction sites have been opened bringing the 3000 year-old city to a new

level of development, many times implying the demolition of traditional settlements and the relocation of their inhabitants. A large part of Beijing's office stock is thus rather newly constituted; an expansion that has been brought about through a series of municipal development plans, proposing the rehabilitation of the three pre-1949 main central business districts (Wangfujing, Qianmen, and Xidan) into new commercial centres, as well as instituting five primary and 30 secondary additional commercial and retail centres including office towers, hotels, and other commercial services, scattered regularly throughout the city. In addition, three interrelated development zones have been created in the city with distinct functions: the Haidian Special Zone (designated for research and development in high-technology fields), the Shangdi Information Industry Base (IT companies), and the Fengtai Industrial Park.

According to Jones Lang LaSalle (2002a), Beijing's office stock (grade A, i.e., top segment) is currently blooming in five main locations. These are the Beijing Central Business District (CBD), the most developed area of Beijing, the East Changan Area, situated in central, the Third Embassy Area, which is privileged by green areas, the Airport Area, traditionally benefiting from its proximity to the airport expressway, which is generally popular among European companies, and finally the Zhongguancun area, located in Beijing's north-western district, which has recently become the focus of local high-tech companies, incorporating the Zhongguancun Science and Software Parks and a potentially rich supply of labour from the many nearby universities and research institutes. In total, Beijing's grade A office space currently amounts to 3 million square metres, located predominantly in the eastern parts of the city (Ibid.).

In terms of market, since 2001 office property in Beijng has started to present an increase in vacancy levels with the completion of new supply, where the total grade A office stock is currently estimated to be vacant at 16.3 percent (2002 figures). Rentals, in this context, and subsequently new construction activities, have continuously been declining, particularly in the Third Embassy Area, attributable to emerging competitive rents on offer in newer buildings and the softening of some landlords previously attempting to maintain rental levels high (Ibid.). However, China's entry to the WTO has brought about an economic improvement for the sector since the beginning of 2002, as large financial and insurance corporations stepped up their search for quality office space in the city, prompting new constructions (CB Richard Ellis, 2002). Most of the office buildings are public-private ownerships (usually by investors in partnership with the Chinese government). Multinational corporations, i.e. the main occupiers of the space, are usually tenants of their offices.

Environmental challenges

While in the 1930s Beijing was often mentioned in Western literature as one of the world's most liveable cities, it has been currently ranked, together with Shanghai, among the top ten most polluted cities in the world by the United Nations (Chang, 1998; Ruano, 1999). This is of course partly resulting from the high concentration of heavy industries within municipal boundaries and rise in living standards (entailing the use of more natural resources, such as electricity and water), but also largely from the commodification of Beijing's property sector and the resulting environmental pressures, where five or six main environmental challenges now predominate.

First of all, Beijing has since the mid-1980s and particularly early 1990s turned into a large construction site, where green areas significantly fall short and

where the dust storm phenomenon is increasingly manifesting. Beijing's residents currently have only 2.3 square meters per capita of green area, a number far below the average figure laid out by the United Nations (60 square meters per capita), for which the galloping activities of the property sector have a key role to play (Jones Lang LaSalle, 2002b).

Secondly, the heat island effect following the high densification of land use is a notable climatic phenomenon in Beijing. With a total area of 16,800 square kilometres with mountains in the west and in the north, and a total population over 10 million people, the average air temperature in the inner city in summer months is about three to four degrees higher than that of the suburbs. Considering the city proper alone, which has an area of 1040 square kilometres, the temperature differential is about four to five degrees (Li Min, 1997). The heat island effect is further exacerbated by a third environmental problem, vehicular and industrial emissions, as anthropogenic heat released from combustion of fuels contributes to the formation of an 'urban heat dome'. The use of automobiles within the municipality, in this regard, has significantly risen during the past decade as the city grows, contributing to an increase in urban atmospheric pollution in the city. It was only in 1998 that the state prohibited leaded petrol and made purifiers mandatory (Rosario, 2001). According to the Beijing Municipal Environmental Protection Bureau, China's vehicle emissions limit is 2 to 3 times higher than that of developed countries; as a consequence, 74 percent of hydrocarbons and 63 percent of CO_2 in Beijing come from such sources. Besides industrial and vehicular emissions, air quality in Beijing is further worsened by residential coal burning and road dust, the latter coming from the 4000-5000 construction sites spread throughout the city and, in a minor scale, from the Gobi desert (Fu-chen Lo and Yu-qing Xing, 1999).

A fourth environmental challenge concerns energy use. Although considerable progress has been made in the supply of electricity, central heating, gas, coal, and so on, since the introduction of economic opening policies, the rapid urban development and enhancement of living standards have made problems of energy shortage increasingly obvious (Wu Xumin, 1993). Coal still remains the main source of fuel, representing 70 percent of all fuels used in the city, although the government is trying to substitute coal burning by gas. The constant increase in coal consumption, in this respect, has brought about continuous deterioration of the environmental quality, especially during the heating season, when the total suspended particles – e.g. sulphur dioxide, nitrogen oxide – in the air exceed the standards allowed by the state, severely worsening Beijing's air pollution problem. In terms of efficiency, buildings in Beijing, including grade A office buildings, are estimated to consume far more energy for heating as compared to buildings in similar climatic zones in Europe or the USA, and still to be less comfortable to be in. Designs, materials, and construction techniques are deemed to be in general highly inefficient, while energy efficiency standards are still lacking, lagging behind, or poorly enforced.

Finally, perhaps the most critical environmental problem in Beijing, which has also been aggravated by the city's growth and the rampant activities of the construction industry, regards the water shortage and the subsequent increase in soil erosion the city has been undergoing. Located near the northern tip of the North China Plain, in a region characterised by a semi-arid temperate monsoon climate, Beijing has only about 600 millimetres of annual precipitation. Owing to its topography and monsoon, the distribution of rainfall in Beijing is characterised as inconsistent. In a year of average rainfall, Beijing is endowed with water resources ranging from 4.2 to 4.5 billion cubic metres; in a dry year the amount can reduce to 3.3 billion cubic

metres (Chang, 1998). The rainfall period from June to September is about 85 percent of the yearly total and dry years are prone to occur frequently (Luo Tingdong, 1993). It is known that surface water can provide 1.74 billion cubic metres in a normal year, 1.32 billion cubic metres in a semi-dry year, and 1.03 billion cubic metres in a dry year. The average groundwater reserve of the city is of 2.45 billion cubic metres, increasing the amount of water that can be in total supplied to Beijing to 4.19 billion cubic metres, 3.77 billion cubic metres, and 3.48 billion cubic metres, respectively (Ibid.).

In the light of these limitations – and following the speeding pace of the economic reform and opening, as well as due to the rapid development of all undertakings in the city (including population growth and the improvement of living standards) – the demand for water in Beijing has increased tremendously in the past decades. According to 1993 figures balancing the supply and demand of water in the city, it was predicted that nowadays the shortage should be of about 200 million cubic metres annually – for a year with normal precipitations, and 1.17 billion cubic metres for a below normal year. Estimates also predict a shortage of 900 million cubic metres by 2010 – for a year with normal precipitations, and 1.98 billion cubic metres for a below normal year – alerting against the sharp contradiction between supply and demand (Ibid.).

Sewerage treatment is another problem in Beijing, also significantly worsening as the city further grows. By 1992, Beijing only had about 9 percent of the total volume of sewage processed (Wu Liangyong, 1992), counting with 2,880 kilometres of sewers (85 times greater than in 1949, though), 7 sewerage systems and 3 domestic sewage treatment plants, with a daily treatment capacity of 250,000 tons (World Bank, 1994). These figures have not improved since then due to the limited investments in the field, resulting, among others in the contamination of the soil and of underground water resources.

Contradictions of the regulatory framework…

As mentioned above, the overall legislation for the Chinese land and property market has been undergoing a transformation process since the economic reform of the late 1970s. Urban planning, likewise, also developed a new agenda after the economic reform. It had been first introduced in China in the 1950s, under the communist regime, following contents and models of the former Soviet Union, then laid fallow during the Cultural Revolution period. Since the 1980s, certain experiences from developed countries have been introduced, leading in 1989 to the approval of the Chinese Urban Planning Act, an internationally grounded urban planning system adapted for the Chinese context, consisting of 6 chapters and 46 articles (Zou Deci, 1995). The act was then complementary to the Land Administration Act and the (related) Environmental Protection Act, the latter being drafted at the national level in 1979 and put into practice in 1989. The Land Administration Act may be locally specified with correspondent regional regulations, e.g. the Beijing General Urban Planning Regulations, approved in 1992 (Jakubowski, 2000).

In describing the legislative framework of urban China, it is important to note that together with the internationalisation of urban land use, urban land prices have significantly risen. While this has resulted in the increase of land use efficiency by legal means, it has, conversely, also turned the urban regulatory framework in many cases into a contradiction in terms. Urban densification, particularly regarding the plot

ratio issue, previously blocked by centrally supplied guidelines regarding norms and standards, started to be legitimated, and so did a verticalisation process (Hamer, 1993). According to Gaubatz (1999), despite the fact that China's urban planners now make use of international practices (e.g. zoning regulations, height restrictions, and controlled development), numerous concessions to high-profile developments are commonly being permitted in view of conflicting regulatory frameworks and ill-defined enforcement procedures, leading to a disjunction between 'the planned and the built form of the city'. As a result, this has been prompting a kind of urban planning that seems to 'follow rather than lead patterns of development and investment' (Gaubatz, 1999).

Within this process, Beijing, as the country's capital and main historical city, has, at least on paper, strict height and density controls. The General Beijing's Master Plan of 1982 stipulates that the maximum height of the inner city is 9 metres in the centre and 18 metres in the periphery (Chang, 1998). Owing to this reason, investors are frequently unmotivated to invest in the old city and the construction of low- and mid-rise structures continue to predominate in Beijing. But economic pressures following the commodification of the property sector have increasingly complicated the implementation and enforcement of the city's urban planning laws, leading many times to infringements. As a consequence, the revision of the 1982 Master Plan of Beijing, conducted in 1993, had to reconsider significantly height restrictions so as to legitimise existing structures (Gaubatz, 1999).

In Beijing, urban planning issues (e.g. zoning regulation), buildings codes (e.g. concerning height and orientation of buildings), their enforcement, and the issuing of building permits are carried out by the Urban Planning Bureau of Beijing. In administrative terms, Beijing is considered to be an 'independent municipality' in China, being directly under jurisdiction of the central government (Chang, 1998). The People's Congress of Beijing and the Standing Committee of Beijing Municipal People's Congress are the governmental bodies constitutionally empowered to draft and issue municipal rules and regulations.

…And emerging environmental directives

In terms of environmental legislation, Beijing first opened its Environmental Protection Bureau in 1974, an entity originally subordinated to and directly supervised by the Urban Construction Committee. The Bureau (and subsequently the Beijing Environmental Protection Committee) was established to strengthen environmental leadership in the city. Its responsibilities include the drafting of environmental policies, rules, regulations, provisions, and standards for Beijing as well as their enforcement procedures, the collection of excess pollution discharge fees and penalties, and the revision and approval of environmental impact assessments and environmental protection facilities (World Bank, 1994, Beijing Municipal Environmental Protection Bureau, 2002).

Following the overall environmental management principles in China, environmental protection in Beijing pursues the San Tong Shi approach, an approach introduced by the National Environmental Protection Act, which refers to the implementation of environmental control measures simultaneously during the construction process – in other words: the implementation of clean technology. This approach has been strengthened by the Administrative Measures for Environmental Control for Construction Projects – drafted jointly by the State Council, the State

Planning Commission, and the State Economic Commission – detailing requirements for the design, construction, and operation stages of construction projects, and the related responsibilities of the local Environmental Protection Bureaus, construction departments, and construction units (World Bank, 1994). Based on these measures, at the local level, the Beijing Municipal Planning Commission, the Beijing Economic Commission and the Beijing Municipal Environmental Protection Bureau issued the Detailed Rules for Implementation in Beijing Municipality of the "Administrative Measures for the Environmental Protection of Construction Projects", thereby specifying requirements for construction projects in Beijing as well as related penalties (World Bank, 1994).

Parallel to such developments, the Chinese government has clearly recognized that a decline in the urban environment acts as a deterrent to further economic growth and that the property sector is 'positively correlated with environmental qualities' (Jones Lang LaSalle, 2002b). In this sense, the government is now committed to eliminate pollution to further attract foreign investments and boost the urban economy as much as possible. This has resulted for instance in the introduction of a marketing campaign for the Olympic Games of 2008, by which the municipality is claiming to convert the city into an ecological one, investing US$ 12 billion on projects to improve the urban environment. In addition, this has also resulted in attempts to upgrade the environment through programmes targeting nearly all industrial sectors, among which the property industry and the related practices involving the constitution of the urban office stock. The above-referred Administrative Measures for Environmental Protection, in this sense, were further promulgated by the State Council into a set of regulations (the Regulation of Environmental Protection of Construction Projects) in December 1998, requiring an environmental assessment report to be submitted for construction projects to government authorities in charge (Ibid). For small-scale projects, the Ministry of Construction has drafted a set of guidelines for the implementation of ecological features in the construction of buildings in general, although no specific environmental laws exist yet in this regard.

In this context, the Beijing Municipal Environmental Protection Bureau has been officially entitled to control (approve and enforce) the environmental impact assessments procedures in Beijing, as well as for determining their parameters. While priority is being given to water conservation issues, particularly in residential buildings and hotels, these parameters were further specified as follows: For property developments, including hotels, offices, and residential buildings with a construction area above 60,000 square metres or land area above 30,000 square metres, in all areas, an environmental impact assessment report should be carried out for the Bureau's approval. Should these developments be in sensitive areas, the requirement for an environmental impact assessment report would be for projects above 20,000 square metres and land areas of above 10,000 square metres. Regarding non-sensitive areas, projects above 5,000 square metres should fill out an environmental impact assessment registration form, describing the environmental impact extent on the surrounding environment. Finally, all renovation projects of old districts as well as the development of new districts, disregarding the total area, are required to submit an environmental impact assessment report for the Bureau's approval (Ibid.). Constructions will be stopped (and developers are to be fined up to US$ 12,500) should they (i) be initiated prior to the environmental impact assessment procedures; (ii) be modified in their 'scale, nature, location, or other important changes taking place' without re-submitting the related environmental impact assessment reports, forms, or registration forms; or if (iii) the construction is delayed by five years after

the approval of the environmental impact assessment reports, forms, or registration forms, and these are not re-submitted (Ibid.).

In addition to the efforts above, certain programmes are being initiated for energy and water efficiency in buildings. In terms of energy, the competent environmental policy authority is the Economy Commission of Beijing Municipality. Although the Commission does not have energy saving programmes directly related to existing office buildings, efforts are being made to render Beijing an energy-saving city, mostly owing to the fact that despite the significant improvements achieved since the economic opening in terms of energy management in the city – including better services – the rapid economic development and the enhancement of living conditions have progressively led to shortages in the supply of electricity, thermal energy, gas, and other energy sources as well as to severe deterioration of the air quality due to the extensive use of coal as main energy source (Wu Xumin, 1993). Along these lines, the Chinese government has recently started to support energy-saving demonstration projects, both for housing and office buildings (e.g. the sustainable housing base in Beijing Elk Garden in southern Beijing's Yizhuang Economic Development Zone and the ACCA21 – Administrative Centre for China's Agenda 21 – building, respectively).

In turn, in terms of water management, water conservation in Beijing has been receiving a growing attention after the economic opening, given that shortages in the city's water supply system consists of a recurrent problem. Programmes date back to at least 1981, when Beijing carried out a Water Saving Policy in an all-embracing way, achieving reductions in water consumption levels, e.g. about 40 percent in industrial consumption terms after 8 years of the programme's implementation (Luo Tingdong, 1993). Similarly, the increasing rate of daily domestic water consumption dropped in percentage from 7.8 during the period 1979-1981 to 1.8 during the period 1981-1987 (Ibid.). But despite the Water Saving Policy, however, daily water consumption has increased tremendously ever since. Each Beijing inhabitant nowadays consumes about 300 litres per day, several times more than as compared to the pre-1978 period. Water consumption levels in Beijing have also increased due to the construction of more power plants as well as due to the agricultural enhancement policy, whose guiding principle states that to 'serve the Capital, make the farmers prosperous, and construct the countryside with socialist modernisation', requiring investments in irrigation, although through water saving systems (Ibid.).

Nowadays, the Water Saving Office of Beijing's Water Management Bureau develops technical guidelines for the use of water facilities as well as consumption parameters – applicable to all types of buildings – implying a raise in water costs proportional to consumption levels (using a principle of 'use more pay more'). In this sense, while energy efficiency in office buildings is still not so much of a hot topic in Beijing, water efficiency is not only a growing political priority as well as a major public concern. Office buildings in Beijing, in this regard, with a total area above 50,000 square metres, are required to apply a water-recycling scheme. These technical guidelines are in fact expected to be adopted (with certain adaptations) all over China starting in 2003.

Although accentuated by it, this approach in Beijing's water management has largely benefited from the economic opening process. The coming section shall discuss this development in Beijing's environmental management, by describing the case of the China World Trade Center building.

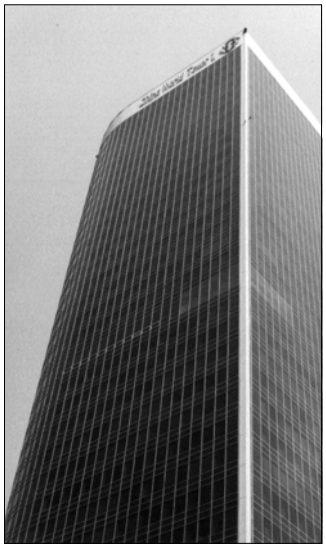

Figure 1
China World Trade Center, Beijing.

China World Trade Center building: a trigger of local environmental change

As its name indicates, the China World Trade Center building (figure 1) symbolises the opening up of China to international trade. The construction initiated in 1985 by a group of Chinese-Singaporean developers/investors, the Shangri-la Group, and completed in 1989. Profiting from a favourable location on the Jianguomenwai Avenue (Central Business District area), its architecture is much in line with global trends, incorporating fittings as the curtain wall, in a 39-storey tower. Current tenants include, among others, auditors, head offices of multilateral organisations as the IMF, banks, and airline companies.

Decisions regarding the construction of the China World Trade Center complex started in 1985, initiated by the Shangri-la Group. The American architectural firm Sobel/Roth won the bidding for the conceptual design of the building, while the Japanese engineering company Nikken Sekkei Ltd. was appointed for the building's technical structural, electric, and hydraulic specifications. In 1986 the French company SAE started foundation work. Nowadays, the Shangri-la Group owns the building in partnership with the Ministry of Economic Affairs (in a fifty-fifty contract, according to the Chinese urban land use law, cf. above). The complex totals 42,000 square metres, comprising two office buildings and two hotels, in addition to a subway station, meeting area, mall, and parking facilities.

At the time when the construction initiated, the Urban Planning Bureau of Beijing did not have any specific regulations for such scale of buildings, neither for the architecture nor for the engineering. For this reason, new standards had to be developed for the China World Trade Center, eventually paving the way for the introduction of environmental management approaches. In the first place, American building codes were referred to for the setting up of parameters for the architectural and structural design as well as for the main engineering features. Secondly, and while the Planning Bureau did not demand specific standards regarding the building's environmental performance, the Japanese engineering Nikken Sekkei firm suggested the introduction of a water recirculation scheme that would reutilise second quality water coming from taps for the flushing of toilets. This represented at the time a major step in environmental management in Beijing, given that such solution, that was blooming in Tokyo, was not yet present in urban China. The technology applied for the whole water equipment was in turn imported from the USA, Hong Kong, and Japan being the most advanced at the time, and the setting of parameters for water consumption was done following American ones. In contrast, however, nothing was done in terms of improving the energy performance of the building beyond conventional standards set at the time. The building, in this context, is hermetically 'sealed' from the outside, thus fully automated in terms of building services such as acclimatisation and lighting.

In this sense, the China World Trade Center building marks a turning point in Beijing's water management, which also demonstrates how the local environment may profit from an international perspective. As we described above, the water recirculation system would in the ensuing years become a rule to be applied to all

large-scale residential and office buildings as well as hotels. This rule was thus largely influenced by the innovations brought by foreign building professionals, which until recently had been banned from China.

Summary and conclusions

The aim of this paper was to explore the contradiction between environmental disruption and reform taking place in major cities in the era of globalisation. Major cities, while prospering by participating in the globalised world economy, are also seeing major transformations in the urban space. These transformations may be summarised as a three-fold process of verticalisation, expansion, and discontextualisation of urban buildings, which are trapping such cities into a kind of vicious circle of environmental disruption, and spiralling consumption of natural resources and environmental challenges. On the other side of the spectrum, however, while the influences of globalisation are sharpening local environmental problems, they are also contributing to introduce environmental management solutions.

The case of Beijing represents an intriguing illustration of this dynamics. Due to China's rather recent economic opening process, this city has embarked on a galloping modernisation process to meet the standards of a global city. As a result, numerous changes have been made in the urban land use and planning system, many times allowing the predominance of economic interests upon regulatory frameworks as its office, residential, and hotel stock grew. It goes without saying, numerous environmental challenges have accentuated ever since, including the decline in green areas, heat island effect, energy inefficiency, and water shortage.

However, thanks to the same process, certain environmental management solutions have also been introduced in the city's office stock. The case of China World Trade Center building illustrates how the water-recycling scheme, which is now a standard for large scale residential and office buildings as well as hotels, was originally introduced by a Japanese engineering firm. A question that is to be answered then is the following: If the same process that contributes to put pressure on Beijing's environment and infrastructure is also contributing to manage the use of resources, which of the two trends is prevailing: that of environmental disruption or that of environmental reform?

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