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Healing Landscapes

24 BIOPHILIA FOR
HEALTHY CITIES
– *Blue-green infrastruc-
ture as DNA for healthy
urban development*

60 MIAMI RISING
– *The city's conflict be-
tween its vulnerable cli-
mate and its excess capital*

82 LANDSCAPE AS
COMMON GROUND
– *Creating an holistic
approach to healing and
building in Syria*

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Biophilia

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Cities

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Pollution, climate change, depletion of resources and loss of biodiversity – it is high time to search for new role models for future urban spaces. Herbert Dreiseitl, landscape architect and urban designer, calls for Blue-Green Infrastructure (BGI) as an approach to design liveable cities. He argues that BGI could be the DNA for any healthy urban development, the ‘medicine’ to keep cities alive and vibrant.

HERBERT DREISEITL

Growing up in a small village where the crow of the cock woke me up in the morning, the smell of the dunghill was a daily unconscious experience, and green trees and flourishing fields were around everywhere, I do have good memories of my childhood. But I also remember the social challenges and conflicts our family experienced as immigrants in a small, value-driven community where social control was as pervasive as strong opinions and even prejudice. The situation changed when I moved to the nearby city. In this urban environment, I was able to talk about my inner experience and broach the questions that I had on my chest with many of my new friends; I learned about different lifestyles, felt culturally stimulated, and, in contrast to earlier years, felt encouraged to master the social and cultural challenges that I was confronted with. Among the outdoor sceneries that in my memory are vividly connected to these first years in the city, are the open spaces and the reassuring presence of the river with its green riparian corridors, where we had some of our first romantic trysts and flirts. It was these blue and green spaces that provided the city with its special character and identity; I cherished this not only because it had become my hometown, but also because this was an urban realm that bore out my ideas of liveability and personal well-being.

Later, I started to work with prisoners and drug addicts in therapeutic settings where these young fellow humans learned to give a new foundation to their lives and view their future with a sense of hope. Studying the conditions and contexts from which these people came from, it was evident to me that there had been very little love in their lives and they had grown up without feeling sufficiently cared for.

They did not feel welcome, neither in their social environment nor in the physical space they had known as a child and youth. The experience I gained from working in the therapy sector not only marked my path to art therapy, it also gave rise to my desire to contribute to making our cities healthier and thus ultimately to become a landscape architect.

Addictions count among the disorders that we associate very much with the modern world, especially the urbanized modern world of the wealthy industrialized countries as it emerged post World War II. Likewise, the endemic diseases of our time, such as allergies, diabetes, coronary heart disease, or excessive obesity, are linked to a materially more comfortable, but in many other ways demanding, urban lifestyle. More recently, the long-standing increase in psychological and mental illnesses, whether depression, burnout syndrome, or bipolar disorder, has also been attributed to the rise of stress levels characteristic of life in fast and highly technicized urban environments. “Cities make us sick” was for a long time a dictum that received little questioning. Conversely, the countryside was believed to offer much better conditions for a healthy life, particularly regarding air pollution or noise exposure. A number of studies have shown, however, that things are not as simple and that the binarism of city vs. countryside does not hold when it comes to healthy environments. To give an example, as the latest UN studies show, the average life expectancy in the metropolis and city-state Singapore is above 85 years, one of the highest life expectancies globally. The obvious question that is posed in the light of such evidence is: What makes certain cities such apparently healthy and highly liveable places?

Like so many other useful and therefore widely used concepts, health and liveability too are essentially contested concepts. Their meanings depend on people’s perceptions and expectations, and they vary significantly from culture to culture. Yet, there are basic elements to these concepts that are similar in all ethnic groups and cultural regions of the world. As a general idea, then, when referring to health and liveability, there are three dimensions to be distinguished:

- The physical dimension, which comprises facilities and infrastructures, medical treatment, and technical excellence;
- The social dimension, encompassing social knowledge, opportunities for interaction, e.g. through civic participation, and the quality of governance;
- The cultural and mental dimension, which comprises care for beauty, inspirational qualities, and contributions to cultural identity.

The biggest challenge to health and liveability is the pace with which today’s world is becoming urbanised. It is mind-boggling to realize that cities now host more than half of all mankind; and soon it will be two-thirds. Looking at the challenges of pollution, climate change, depletion of resources, loss of biodiversity, etc., the real battle on this planet is connected to human consumption and lifestyles. In this context, cities are increasingly important as drivers of change; in fact, decisions on how we will live and survive will mostly be taken in cities. Urbanisation has created enormous problems, but it might also be the key to solutions. In contrast to rural regions, which constitute above all the territories where the extraction of resources takes place, in cities we are forced to share spaces with multifunctional usage and learn to be efficient at all levels.

Worldwide, space in cities is scarce. Given growing populations and new demands for workspace, production, mobility and recreation, conflicts over who will allocate the shrinking resource of land to what purposes are likely to become more frequent and more intense. The losers will most likely be the soft and unspoken voices with smaller budgets: the protagonists of green spaces, of common land and, last but not least, the environment, particularly the inner urban landscape.

In contrast to natural living systems, the built urban, so-called gray structures seem to be highly inflexible; they lack contextual connectivity and cannot cope with the dynamic forces of change, the almost unpredictable rhythms of the environment and the socio-economic and political trends that affect societies. Probably the biggest challenge and dilemma in megacities today is their lack of resilience for adapting to changes of conditions at so many different levels, be they climate extremes, sea-level rise, lack of resources, or the socioeconomic and cultural changes in human nature that are affecting the demands on built forms. As the nature of change itself is changing, inflexible systems can hardly ever cope, as they are limited and certainly not healthy.

The complexities of the global environmental challenges are enormous and perhaps even intimidating to some. On the other hand, the human problem-solving capacity should also not be underestimated. The proposal here is to cast light on one possible route of improvement by asking whether landscape and water design, in particular what I call Blue-Green Infrastructure (BGI), might be rediscovered as a role model for future cities?

Nature, after all, may have some of the answers. By comparing structures in the natural environment with those of urban settings, a significant difference can be observed. Nature works on principles of flexibility and resilience, has a capacity for dynamic reaction and seeks to regain balance to any event – from a soft minor change to the unexpected disaster. Given the enormous impact of, say, a flood on erosion, hurricanes that destroy forests, avalanches or volcanoes that wash away mountains and hillsides, it is ever impressive and astounding to see how quickly ecosystems adapt to the new conditions. Indeed, over time one hardly recognises the impact of a disaster; only experts with their specialized knowledge of an area and its habitats can tell the difference. This ability of ecosystems for flexible and dynamic responses is not only unique, the truly crucial point is that several important lessons may be learnt from the flexibility and resilience of ecosystems for the design of urban settings. We are at a turning point of city development.

Blue-Green Infrastructure (BGI) is an approach to urban design that relies on natural elements (flora and water), which are deployed in strategic ways. However, BGI is not yet properly understood in its true function and value to a city and its inhabitants. Still, it is the backbone for liveability and urban health, a repository of resources that balances and stabilises life processes. And it is the basic element to enhance biophilia. We cannot easily measure, count and quantify the value of BGI to urban structures, not in the way we are able to do this for hard forms of engineered infrastructure. BGI can never be a prefabricated décor that is countable, statically determined

and never changing. Vegetation is in a permanent state of evolution, responding to daily rhythms, seasonal changes and the many stages of aging and renewal. All phases coexist in a living system. In a natural forest this process of renewal takes place all the time; life and death coexist. It is a healthy resilient living system.

Recently, the ancient Japanese tradition of “forest bathing” has gained attention also in Western cities. This Japanese practice is proven to lower the heart rate and blood pressure, reduce stress hormone production, boost the immune system, and improve overall feelings of well-being. City dwellers can benefit from the effects of trees with just a visit to the park. Brief exposure to greenery in urban environments can relieve stress levels, and experts have recommended “doses of nature” as part of the treatment of attention disorders in children.

Simply put, humans like nature and greenery and the more of it we experience, the happier and more productive we are. In fact, this tendency to respond positively to nature and natural settings is called the “biophilia hypothesis,” coined by Edward O. Wilson in his 1984 book, *Biophilia*. Kellert (2008) argues that many of our instinctive and intellectual abilities have developed over the 200,000-year-long evolutionary period through adaptation processes and responses to the natural environment, habitat of the human species. Thus, most of our emotional and intellectual competencies, such as problem-solving, critical thinking and constructive abilities, rely on the skills and aptitudes learnt in those remote days of close association with natural systems and processes that are underpinning human health, maturation and productivity to the present day. There are correlations and connections

The Kallang River Bishan-Ang Mo Kio Park project is intended as a vision for how to shape cities that address the dual needs of water supply and flood management while creating open spaces for people and nature in the city.

between place-based relationships and evolved human-nature relationships, as well as local natural and cultural identity. When this connection is absent, like in so many current examples of urban and suburban developments deprived of cultural and sensory richness, the opposite phenomenon occurs, placelessness, causing lack of empathy and, consequently, lack of stewardship (Beatley, 2004, in Zingoni de Baro, 2015). Beyond that, UN statistics show that over 60 per cent of the world's cities will face water shortage by 2025. Ironically many cities across the globe will also experience, in parallel, the devastation of floods. Flood and drought happen more frequently, adversely affecting food production, water security, energy, mobility and public health. There is a trend of “too much at one time, too little at other times”.

Exacerbating these issues, fast-growing urban sprawl continues to cover the surface of the planet with asphalt and concrete. Instead of slowing down rainwater runoff, holding it back and avoiding concentrations, this type of development results in large quantities of precipitation that need to be collected at the same time and same place. These are the preconditions for urban flooding. There are other consequences to this question of water conveyance: urban streams often lack water in dry periods. As a result, temperatures rise and oxygen is low. Natural habitats die; fish and plant life suffers. BGI can mitigate these conditions, creating natural corridors that are highways for biodiversity. BGI has a significant effect on microclimate. In the absence of blue and green, there is no filtration of air, no holding back of micro particles (wind-blown dispersal). As a result, there are higher dust

concentrations, which contribute to conditions that are unhealthy. Research, as done in the city of Hamburg, for instance, showed clearly that in city centres that have less green and water-bound surfaces, concentration of dust particles is significantly higher. Streets with trees have less dust than streets without trees and planted greens. According to WHO estimates, 7.1 million people died in 2012 as a direct result of air pollution. Today however, it is common that many cities lose almost all their ecological structures and green corridors including open waterways, productive landscapes and park networks.

For whatever scale and dimension of the development, BGI is an underlying fundament that connects people with their environment. Without water systems and green structures (and their proper management) there is no foundation for long-term sustainability and resilience. BGI is the DNA for any healthy urban development, the medicine to keep cities alive and vibrant.

The Case of Singapore

In my experience, Singapore is one of the most experimental and forward-thinking cities of today, combining the search for resiliency and biophilia as drivers for urban health with modern technologies for smart mobility, renewable energies, environmental-friendly industries and urban development.

A modern Asian city-state with high population densities, Singapore has developed with incredible speed. Situated near the Equator in a region where tropical thunderstorms are frequent, the problem of flooding due to intense rainfalls was initially solved

through conventional engineering, relying on mono-functional technical solutions of concrete channels to get the precipitation from monsoon rain showers out into the ocean as directly and quickly as possible. Numerous other aspects, such as the integration of the channels into the urban fabric and existing parks, the creation of areas where residents have access to the water bodies and can enjoy those natural environments, and the consideration and protection of local flora and fauna habitats, were either neglected or not considered at all.

A change of direction took place in 2006 when the Public Utilities Board and the National Water Agency of Singapore launched a programme called ABC (Active, Beautiful, and Clean) Waters that aims to realize the full potential of an integrated BGI approach. By treating rainwater as a prime resource to fill up reservoirs and water bodies, the ABC Waters programme is a strategic initiative that works with the entire urban catchment of the island. Instead of transporting water into the city from far away, the city serves as a collection and storage facility of surface water, therefore reducing water insecurity. The ABC Waters programme was implemented with the expectation that it would spawn numerous additional projects by private developers. Currently, about 150 projects are on the way; several are already under construction and most are projected to be realized within a 20-year period.

One of the pilot projects, by far the largest, is the transformation of 3.2 km of the Kallang River in combination with the restoration of 62 hectares of Bishan-Ang Mo Kio Park. This is a classic BGI project with a strong social



component as it is visited by over 3 million people per year. The design was carried out under my direction by Ramboll Studio Dreiseitl. Applying an interdisciplinary planning process including on-site test studies and hydraulic modeling with flow simulations, this BGI was designed to accommodate the dynamic process of a river system, which includes fluctuating water-levels and widths to make sure there are no unexpected problems. Special emphasis was placed on security by creating a special safety system that becomes active in case of a sudden water-level rise in the open river valley. Elements from the concrete canal that previously traversed the terrain, were recycled and reused as a substrate for the riverbed and a specially formed hill to create a platform for artwork.

Today Kallang River is a vibrant and naturalized urban river; it feels like a natural environment despite the fact that it is man-made. Improvements such as enlarged hydrological capacities, the upgrading of limnological parameters, efficient erosion control and others were possible through suitable bioengineering techniques and the reshaping of the river profile. Plants and bedding materials were used to stabilize the banks to withstand the erosive energy of high flows, while at the same time creating diverse stream habitats for native plants and animals. Not only is there a significant increase of biodiversity, the new infrastructure also evokes a completely new atmosphere that has attracted new and expanded social life. Assuming that socio-economic factors play into how such a large project evolves, we conducted a study together with the National University of Singapore on the effects of BGI on human well-being as well

as its impact on the real estate market, which is a sensitive factor. Besides the return of animals and plants that previously had been close to extinction to the heart of Singapore within the river and park corridor, we have seen a change in social behavior, such as greater interaction and trust between people. And it probably comes as no surprise that the apartments and condominiums surrounding the park are very popular and in high demand. Last but not least, the project has enormous value for the image and symbolic capital of Singapore. Images of Bishan-Ang Mo Kio Park can be found across the board, be it business and travel magazines, touristic brochures and advertisements, or official government publications. The Kallang River Bishan Park project is intended as a new vision for how to shape cities that address the dual needs of water supply and flood management while creating open spaces for people and nature in the city.

Sir Robert Watson, the Chair of the Inter-governmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), highlights the multifaceted nature of the BGI approach: “This new inclusive framework demonstrates that while nature provides a bounty of essential goods and services, such as food, flood protection and many more, it also has rich social, cultural, spiritual and religious significance – which needs to be valued in policymaking as well.”

There are many questions to be answered about the integration of BGI into cities. What functions and qualities must these spaces fulfil today, and in the future? How can we create living systems that save natural resources, filter, clean and regulate water supply, balance temperature, produce good air, and increase

natural habitats? What are the basic principles, processes and methods to integrate BGI in cities? These questions must extend to the search for strategic policymaking tools and good governance structures. Detailed knowledge about blue-green living systems, about materials and integrated technologies have to be developed and experts must be called in during the early stages of the project, and importantly, be taken seriously. Urban landscape architecture should have a higher priority in the developments of any scale and not be seen as a by-product.

To seek answers to those questions and find out why the implementation of BGI is neglected or lacking altogether in so many urban developments around the globe, we conducted research together with five universities on drivers of change, as well as constraining factors that stand in the way of the construction of blue-green cities (Dreiseitl, H., Wanschura, D., Wörlén, M.; 2016). The outcomes tell us that the main factors are not insufficient technology or technological competence, but rather the degree to which a “blue-green spirit” has been able to permeate the decision-making structures, horizontally and vertically, of governmental and other institutions; the issues are capacity building, skills and know-how, and finding the right window of opportunity.

On the scale of an individual building, Singapore’s Khoo Teck Puat Hospital (KTPH) with Yishun pond is a perfect example for combining a large institutional complex with a functional and productive landscape. The outcome is a healing landscape that produces biophilic effects. The KTPH complex is one of seven public hospitals in Singapore. Its aim is to widen the perspective on healthcare in Singapore by including healing spaces in which

the design of the physical environment actively contributes to the well-being of the patients. This approach was translated into the integration of biophilic elements. The KTPH design brief spoke explicitly of a patient-centric approach, predicated on access to daylight, ventilation, views, and the presence of gardens and nature. Patient and visitor areas are placed around a landscaped central garden. This garden opens up to the adjacent Yishun stormwater pond from which it taps vistas and breezes. The former grey pond now provides picturesque views to the hospital as its concrete edge was softened with planting and artificial floating wetlands were added to the pond. Visitors from nearby housing estates now use the hospital's public spaces – including the waterfront promenade – alongside patients and other official visitors. A study initiated by the *City Green Magazine Singapore*, claims that patients having a view of the natural scenery from their room are likely to be released earlier (on average after 7.96 days) than patients whose room lacks such a view (who take on average 8.71 days to be released).

In Singapore, a focus on water and green spaces is part of a long-standing narrative and strategy. The founder of modern Singapore, Lee Kuan Yew, already implemented programmes to plant thousands of trees, clean up the waterways, and promote technologies to collect, recycle and reuse water; his son, the present prime minister Lee Hsien Loong, launched the ABC Waters programme with its vision of Singapore as a city interwoven with water bodies and gardens.

Besides flood prevention and control, water security and other hydrological aspects, the ABC Waters programme aims at creating

spaces for recreation, physical exercise and various social activities. It is also geared towards supporting social interaction and integration as it increases the tendency to use open spaces for activities in groups and encourages residents to spend time with their families, neighbours, and communities. If the citizens of Singapore will indeed go outside, enjoy the parks, exercise and meet friends more often – activities known to promote good health – the new amenities that are currently being made available to them are likely to reduce individual and public health costs.

By improving the social and aesthetic attractiveness of the city's green spaces and the open spaces surrounding individual buildings and institutional complexes, the ABC Waters programme will also entail an increase of real estate values. Furthermore, the creation of Blue-Green Infrastructure augments a city's overall attractiveness and liveability and is likely to be viewed as an expression of good governance. Finally, BGI promotes biophilia – people's affinity with nature – as it reconnects people with natural forms, elements, and processes – factors that are key to life satisfaction and happiness as well as to developing courage for progressive change and for being optimistic about the future. Biophilia will also strengthen humans in their willingness to protect nature. More than ever we need cities today that put nature first as they design new buildings and open spaces, and engage in overall urban planning and management. The successful cities of the future will recognize the essential need for daily human contact with nature as well as the many environmental and economic values provided by nature and natural systems (Beatley, 2011).

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