Reconnecting with Nature: Designing Urban Spaces in Balance with Green Space

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Abstract

Climate change is occurring around us and impacting on our daily lives, meaning that we have to deal with our cities in a different way. There is increasing awareness of the need for daily contact with green spaces and the natural environment in order to live a happy, productive and meaningful life. This paper tells the narrative of how our urbanization models have been disconnecting humans from nature. Non-sustainable, non-resilient patterns of urbanization, along with the neglect of inner-city areas, have resulted in fragmentation and urban decline, led to a loss of biodiversity and caused the deterioration of ecosystems and their services. Urban regeneration projects allow us to 'repair' and restore some of this damage whilst enhancing urban resilience. Connecting existing ecosystems and re-establishing ecosystems both within cities and at the peri-urban fringe is vital for strengthening ecosystem resilience and building adaptive capacity for coping with the effects of climate change.

The paper addresses this timely question across research and practice, and explores how this can be achieved through the integration of nature-based solutions, the re-greening of neighbourhoods, and by attributing value to natural capital. Transforming existing cities and neighbourhoods in this way will enable ecosystems to contribute their services towards healthier and more liveable cities. From Descartes to Fairchild to Howard and McHarg, the author identifies the linkages that exist between a rich palette of seminal literature and different schools of thought about nature within the city.

1. Introduction: A Disregard for Nature

In the big picture of Earth's evolution, *Homo sapiens* has only been around for a very short time, and it is likely that the Earth will still be around for a long time even after we have destroyed ourselves as a species (the reason why Martin Seligman argues that we have been misnamed as *Homo sapiens*, since we are not a 'wise' species at all). Everything changed with scientific discovery, technology and the Industrial Revolution.

Over the last 300 years, we saw that humans could manipulate nature through the emergence of science. Humankind started to believe that it had dominion over the Earth; and that the Earth and nature have to serve us in our own evolution. Just think of the discoveries of philosophers and scientists like Copernicus, Galileo, Descartes and Newton. Their understanding was that nature was meaningless and purposeless, and its only function was to "serve humans in their evolution". Descartes for instance, in "Discourse on the method" (1637) believed that animals had no feelings. His belief was: *Man is at the top and Earth is here for us to use, to exploit.* (see: Figure 1) It took many years to correct our relationship with the Earth. The seminal book "The limits to growth" (Meadows *et al*., 1972) displayed the limits of finite resources and noted that the whole Industrial Revolution was about taking and extracting minerals and resources, and

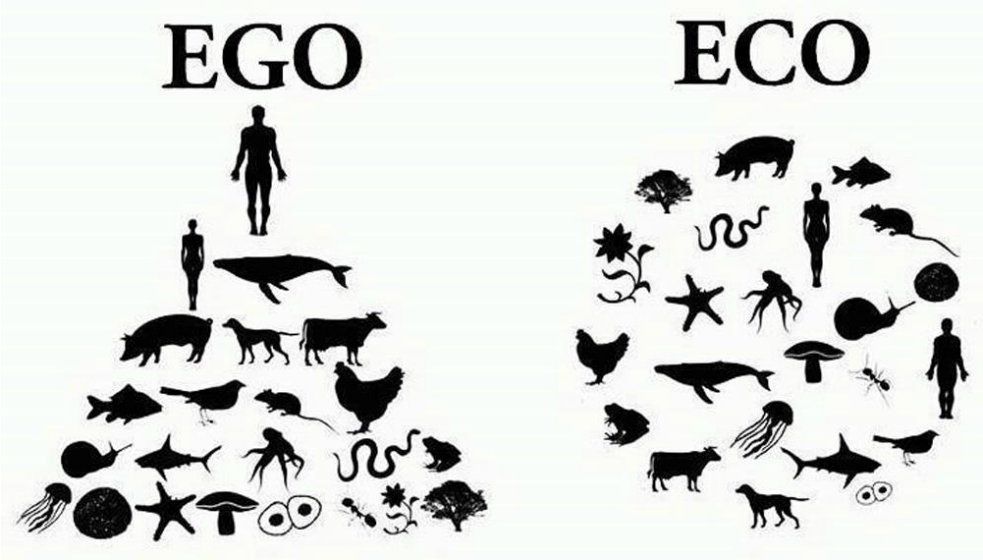

Figure 1. Diagram that shows that humankind is part of the ecosystem, not apart or above it (Source: the author)

disposing of waste, with a complete disregard for the environment and natural ecosystems.

2. Re-appreciation of Nature within Cities

Cronon (1995) asserts that urban inhabitants have created a wholly artificial view of what nature and wilderness are, based on ideas of open space and grandeur that rarely correspond to the lived reality of the people who inhabit rural spaces. The view of nature as a pristine and uninhabited space makes it difficult to see nature on a smaller, less imposing scale, and to appreciate for instance that a tree in an urban back garden can equate to a tree growing in a forest; that the two trees are identical despite the different setting. In our mind, the forest tree somehow has a greater perceived natural value, and nature is seen as being something that does not belong within the city (Cronon, 1995).

Rautio & colleagues (2017) argue that this does not have to be the case. In working with children in Finland they have found that urban inhabitants are not necessarily disconnected from nature; there is plenty of nature present in urban environments for them to explore. To imply that urban children are disconnected is to disregard the ways in which nature is present in and encroaches on their lives. Their focus is on how children's relationships with nature emerge and change based upon the setting, which they are in. The children's understanding of nature in the urban environment is an assemblage. The author argues that nature should not be viewed as something that exists beyond the city, but instead, "*environmental education research and practice could and should intensely focus on the everyday materialisations of complex historical, societal, political and cultural conditions that give rise to environmental phenomena, human attitudes and relations included*."

Connecting with nature makes people come alive and nourishes the senses. The author argues that today, we are at a turning point how we think about nature within cities. We understand that cities need to be built on regenerative principles, as we start to grasp how everything in life and the environment is connected (Girardet, 2008). We are revisiting the wisdom of nature to inform our organisational structures (e.g. local food production) and realize that nature has a profound positive influence on our health and well-being. We have arrived at a new understanding, that we are merely participants in the natural world. We rediscover indigenous traditions and the interdependence of all things in nature, things that coexist together. The inter-connectedness of systems - it means that we are not in a privileged position to exploit or destroy the ecosystem. In fact, the opposite is

true. We have a position of stewardship, where we must lead in a respectful and responsible relationship to the natural world. We are not 'above' nature.

A new deep understanding of nature has emerged that sees the commonality of all of life as part of the same ecosystem, and it influences our thinking of cities as living organisms (one of these approaches is urban metabolism). The concept that the Earth is a self-correcting organism, the so-called *Gaia hypothesis*, was developed by James E. Lovelock in 1975 and published in 1979 (Lovelock, 1979). It states that the Earth is a vulnerable system in balance, and that the temperature of the planet and its atmosphere are produced and maintained by the sum of living organisms. The Gaia hypothesis is based on the idea that all life on earth functions as a single system. This system both defines and maintains the conditions necessary for its survival. Lovelock argues that the earth's living matter – including the atmosphere, oceans and land areas – combine to create a complex system with the ability to keep our planet a place fit for life.

The Gaia hypothesis has fundamentally altered the way scientists view evolution and the environment, but not all agree. Contrary to the Gaia hypothesis, which suggests the Earth has a self-righting tendency, Johan Rockstroem, Director of the Stockholm Resilience Centre (2018) and numerous other leading scientists say that the feedbacks of global warming could push the planet to an extreme state. In the face of this scenario what we need are strategies to mitigate the effects of climate change. Greening up cities alone will not make a difference unless there is a sharp reduction in the use of fossil fuels (Steffen et al, 2018).

3. From Garden Cities to Biomimicry and Biophilia

The 19th century *Garden City* movement based on the ideas of Ebenezer Howard (expressed in the seminal book "Garden Cities of To-morrow" (1898) was the search for an escape from the polluted cramped conditions of the City of London at this time. Still today, this relatively simple theories of new circular cities in *Arcadia* have a significant impact on urban theories on urban systems and how to possibly develop new cities from scratch.
One important characteristic of complex urban systems is their resilience. Urban resilience of cities means the ability to maintain human and ecosystem functions simultaneously over the long-term (Alberti & Marzluff, 2004). Urban resilience, also called *adaptive capacity*, refers to a city's ability to cope with and recover quickly from hardship or crisis. A resilient city is typically one that is prepared and well equipped to contend with and mitigate the multiple effects of climate change, such as urban heat islands, heatwaves, urban flooding, energy blackouts, and other potential disasters. A resilient city has a robust infrastructural system and can even turn a crisis into a positive development (Meerow *et al.*, 2016; Mitchell & Harris, 2012).

In a similar way, the concept of *Biophilia* introduced by Edward O. Wilson (1984) suggests that humans possess an innate tendency to seek connections with nature and other forms of life (Kellert, 2011). As predicted by Rachel Carson in 'Silent Spring' in 1962, we are now in the process of redefining our relationship with nature, and how our lives and health depend upon it. This growing understanding is not about giving up technology, but rather developing the most advanced technologies to date, for instance through the biological revolution, digital engineering and nanotechnology. We have to use that rich and available knowledge to find innovative and better solutions, employing ideas of *Biomimicry* – innovation inspired by natural systems (Benyus, 2002; Neves & Francke, 2012).

4. Biodiversity Loss, Urban Heat Island Effect, and Ecosystem Degradation

It is widely accepted that our cities are facing a wide range of challenges, with unsustainable urbanization (built frequently at too low density) in turn being linked to human health problems, the degradation and loss of natural capital and its corresponding ecosystem services (clean air, soil and water), climate change and a worrying increase in the risk of natural disasters. Urban expansion is always leading to changes in land cover in the countryside, shifting green space to 'artificial surfaces'. An aerial survey of the UK in 2015, for instance, revealed that over 22,000 hectares of green space was converted to artificial built surfaces between 2006 and 2012. Over 7,000 hectares of this land were previously forest, and over 14,000 hectares were previously

agricultural areas and farmland. Over 1,000 hectares were changed from wetlands to artificial built surfaces in order to provide more suburban homes. Completion of urban construction sites comprised nearly 3,000 hectares and completed new industrial and commercial developments slightly over 1,000 hectares (University of Leicester, 2015).

More research is needed to clearly define the factors in our current urbanization models that hinder the reconnection with nature in the urban system. These factors are economic, social, technical and environmental. Governments are increasingly trying to quickly fix the issue of housing affordability by boosting supply and approving inacceptable low-density car-dependent housing developments on precious greenfield land. However, far too many homes are being planned and built on greenfield sites that were formerly protected green-belt land (Lehmann, 2019). At the same time, sufficient land for urban infill and regeneration is available. For instance, there are sufficient brownfield sites for an extra million homes in England alone, and there is no excuse for further encroaching into precious greenfield land that is necessary for recreation, biodiversity, forestry and food supply (CPRE, 2018). The government, developers and policy makers do still not prioritise the redevelopment of brownfield land and infill densification enough.

As far back as his 1722 book "The City Gardener", the English botanist Thomas Fairchild (1667–1729) noted that city residents feel more relaxed and healthy when they can enjoy gardens and greenery (Fairchild, 1722). He suggested improving air pollution and improving the urban microclimate in London by creating parks and gardens, and he also realized that numerous small gardens with trees and bushes are more effective rather than just a large park with a lawn. Almost three hundred years later, the research on the urban heat island (UHI) effect confirms Fairchild's observation (Bowler *et al*., 2010; Doick *et al*., 2014).

Obviously, trees and their canopies are a critical piece of the life support system on this planet and are vital for any future project. Urban forest projects, constructed wetlands, and the urban farming movement are all good ways to re-integrate nature into an urban setting (see: Figure 4). Natural elements such as street trees, gardens and planting have been a feature of cities for hundreds of years. The most effective urban green space is not a lawn, but a garden with tree coverage from different types of trees and bushes with large leafs.

The dangerous UHI effect leads to significantly warmer urban areas compared to surrounding rural areas, and this temperature difference is usually larger at night than during the day. The UHI effect occurs because the dense, dark surfaces (such as bitumen on roads or concrete on building roofs) absorb and store heat during the day and then release it at night. Urban greenery can help reduce this heat gain and the impact on human health (Lehmann, 2015; Sailor, 2014). The main cause of the UHI effect is from the modification of land surfaces and material, for instance concrete roofs that store and trap solar heat during the day. It can best be counteracted by green roofs (and facades) with planting and vegetation, white or light-coloured surfaces (using the *Albedo Effect* to reflect solar radiation) and the use of materials that absorb less heat (Note: from 2012 to 2014, the author was principal investigator of 'Urban Climate Research', the largest study of the UHI effect in Australian cities). It is only a question of time until green roofs will become mandatory for new buildings in the US and other countries.

The term *nature-based solutions* (NBS) refers to the use of nature for tackling environmental and societal challenges while increasing biodiversity. A definition offered by the European Union Commission, who has been funding critical research in NBS over the last ten years, states that these solutions "inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience (…) and bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions" (Rizvi, 2015; Shanahan, 2015; EU-Commission, 2015 and EU-Commission, 2017; Fields in Trust, 2018). These NBS provide practical, sustainable, cost-effective and adaptive alternatives for various urban planning objectives; by working with nature, rather than against it, it is possible to take further steps towards a more competitive, resource efficient

and greener economy (which is often termed 'green growth'). It can also help to enhance natural capital rather than depleting it. For instance, green roofs or walls can be used to reduce the impact of high temperatures, collect storm water, reduce pollution and fine dust, and act as carbon sinks, all whilst simultaneously enhancing biodiversity. Similarly, the collection and storage of rainwater in constructed wetlands, or the protection of mangrove forests along coastlines utilise a nature-based solution to achieve several objectives, including disaster risk reduction. Urban flood control is regulated in a natural way, with mangroves alleviating the impact of wind and waves on coastal settlements or cities whilst also capturing CO_2. Additionally, the mangrove forests can provide safe nurseries for marine life and help control coastal erosion resulting from a rise in sea-levels, mitigating potentially harmful effects on the environment and on human health and society (Kabisch *et al.*, 2016; Lennon & Scott, 2014; Maes & Jacobs, 2017; Rich, 2018; World Forum on Natural Capital, 2018).

5. Conclusion: Lessons Learnt

The urban neighbourhoods of the future will have to offer new forms of green space. These will serve a dual purpose, existing both as areas for recreation whilst acting at the same time to mitigate the warmer urban microclimate. Tomorrow's neighbourhoods will also need to generate at least 50% of their own power themselves (Lehmann, 2015). Integrated development, which concentrates on energy and water management, green infrastructure and the urban microclimate, will take a leading role in urban regeneration.

Every city is unique. Cities differ in the ways in which they are vulnerable to climate change. When it comes to strategies to increase resilience, what works in one city may not work in another. Urban regeneration projects allow 'repairing' and restoring some of the damage caused to ecosystems whilst enhancing urban resilience. What is needed now is to nudge that transformation in the direction of sustainable and resilient solutions, making the most of opportunities for re-greening, using resources efficiently and acknowledging the value of natural capital (Lehmann, 2017; Nature Editorial, 2018).

By beginning to place a value on natural capital, and assessing our vital systems as whole and not as separate parts, we can begin to make efficiency savings that previously would not have been apparent. In doing so, we not only benefit financially through saving valuable resources and mitigating against environmental risks resulting from climate change, but also contribute towards the repair and renewal of our ecosystem, conserving resources that are finite and helping to prevent further global temperature rise. Hence, a final question the paper might raise among its readers is: How can we all set the conditions for the change to happen and reasonably "quickly"? In other words, how can effective local to planetary stewardship strategies for urban ecosystems and the biosphere be "co-designed" within and across communities (of knowledge, practice, and citizenship)?

Endnotes

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