

Urbanization, wetlands and ecosystem services – a nexus we ignore at our peril

By Robert McInnes

The ecosystem approach, which recognizes that human society is an integral component of ecosystems, provides a conceptual construct that integrates the management of land, water and living resources whilst promoting conservation and sustainable use in an equitable way. Essential to the delivery of the ecosystem approach is the recognition that the conservation of ecosystem structure and functioning, in order to maintain ecosystem services (or the benefits humans obtain from ecosystems), should be a priority.

Well-managed cities can lead innovation, generate wealth, enhance quality of life and accommodate more people within a smaller footprint at a lower per capita resource use than any other settlement pattern. To achieve this cities often depend on wider ecosystems for the flow of energy, materials and water, and they also benefit from the ecosystem services generated both within and beyond municipal boundaries. Often urban habitats are novel or emerging and bear little resemblance to pristine natural habitats. Consequently traditional nature conservation approaches have failed to protect, and in many cases even recognise, the flow of benefits delivered by urban ecosystems and especially wetlands.

Biodiversity conservation has traditionally relied on a system of designated areas in order to protect threatened and endangered species. The primary geographical emphasis of this process has been outside of urban areas. Such a system is fundamental as a means to an end, where that end is the protection and maintenance of all forms of ever-decreasing wild biodiversity. Whilst the maintenance and appropriate management of rural protected areas is essential for stemming the global loss of biodiversity, biodiversity also exists outside of rural protected areas and inhabits city-regions.

Cities are not irrelevant to biodiversity conservation with a plethora of species living and commuting through urban areas and many protected areas lying within or contiguous to urban centres. However, many urban habitats fail to get recognised within the classical protected area model yet these areas can still support a diversity of species and, from a human well-being perspective, deliver numerous ecosystem services. The majority of urban biodiversity conservation strategies aim at preserving and reconnecting remnants of native habitats and restoring native species. Whilst such approaches are essential, the question arises as to whether traditional approaches need to be supplemented as they fail to embrace the full range of urban nature and the benefits provided.

Similarly, recognition of the importance of the common, local and non-iconic species, even including the bacteria, fungi and earthworms which drive many biogeochemical processes, can often remain subservient to charismatic and appealing species. This is in part an element of a wider perception issue where focus on flagship species can detract conservation attention away from the overall importance of non-charismatic biodiversity. This can have a particular resonance regarding the delivery of ecosystem services, such as increasing resilience to flooding, improving water quality, regulating climate and acting as sources for pollination, all of which are vital to supporting human well-being within urban landscapes.

Therefore the need to protect, restore and manage the biodiversity supported by urban green spaces, whilst still protecting vital resources, extends beyond the traditional bounds of nature conservation planning. Biodiversity and infrastructure must be seen as part of the same landscape. The potential benefits of habitat conservation and restoration have a greater chance of outweighing the perceived economic gains to be had from habitat conversion, especially

when multiple ecosystem services are bundled together in order to demonstrate the benefits delivered by a single ecosystem.

A review of 57 city-based case studies conducted on behalf of UN Habitat investigated pressures on, and responses by, cities and analysed the ecosystem services associated with the response options. The most prevalent direct pressures recorded were habitat loss, urban expansion, pollution and loss of biodiversity. The most frequent indirect pressures were the lack of sanitation and waste disposal, lack of green spaces, institutional failings, lack of a clear plan or vision and a lack of understanding. For all the pressures there was a weak correlation between the pressures and the level of economic development, with cities from poorer states experiencing a slightly higher range of pressures. The responses applied varied across global regions. Certain responses, such as the involvement of multiple stakeholders, were recorded at high frequencies from across all the regions, others, such as the use of subsidies or payments for ecosystem services, were only recorded in low number of case studies. A significant observation was that the monitoring of any response option, and therefore the ability to test its success or otherwise, was significantly less likely to occur in Africa than in other regions.

The review analysed the recognition of ecosystem services across a variety of response options implemented to address particular urban pressures on the environment. Each case study was investigated to identify both the planned ecosystem services, the ones which were specifically referenced or defined in the case study text, and the serendipitous or collateral ecosystem services which, despite not being identified as a specific outcome from the response option, could also be recognised as occurring through interpretation of the case study narrative. Analysis of the relationship between the occurrence of planned and serendipitous ecosystem services indicates that there is a strong correlation between the frequencies at which they have been recorded but with serendipitous ecosystem services occurring in greater frequencies than planned ones. There are, however, four ecosystem services which repeatedly are under-recognised, namely: the storage, recycling and processing of nutrients, the accumulation of organic matter and carbon storage (all supporting services) and acting as a source for pollination (a regulating service).

The three regulating services are all dependent on biogeochemical processes predominantly driven by microbial biodiversity whilst pollination is dependent on a wide variety of invertebrates. Therefore the ecosystem services which had the lowest level of recognition in the case studies are the very services which underpin the functioning of all urban ecosystems and provide the bedrock of biodiversity upon which society depends. The message conveyed by this analysis is that a more rigorous and systematic consideration of ecosystems is still required to ensure that the value of biodiversity is truly integrated into city-region planning. This is especially true for urban wetland ecosystems which deliver a disproportionate level of benefits when compared to terrestrial systems.

As the awareness of ecosystem services and how to recognise, demonstrate and capture their value grows, both in the peer-reviewed science and in the wider psyche of society, the benefits of conserving and restoring functioning ecosystems, and wetlands in particular, should act as powerful incentives for the protection of biodiversity and its integration into urban planning. The challenge is to mainstream the awareness of the role of biodiversity and ecosystem services in urban planning and management decision-making across all levels of civil society to national governments.

The integration of ecosystem services into spatial planning and urban management should not be considered as optional if a paradigm shift is to be achieved and future human well-being secured. Just as urban planners and managers now acknowledge that densification and agglomeration correlate positively with reduced resource use per capita, they now need to go beyond their traditional understanding of biodiversity to extend this positive correlation into

systemic solutions. It is vital that they understand, identify and assess the ecological processes that operate in the city-region so that it is feasible and practical to safeguard these processes, and consequently the ecosystem services that they provide, to secure these benefits for present and future urban residents.

At the detailed scientific and economic analysis end it is important to address the challenge that ecosystem services, and the biodiversity that supports them, presents to neoclassical market-based economics, through the use of significant non-market values and the difficulties with assigning unambiguous property rights. When considering the economic implications of ecosystem services it is important that attention to both supply and demand sides of the cost-benefit equation is duly made. Demand-side approaches include accounting methods that document and communicate how consumption choices impact the flow of ecosystem services. From the supply-side, studies are exploring ecosystem service replenishment rates, susceptibility to disturbance, replacement cost, and scenarios which track and value various combinations of ecosystem service flows over time.

In broader civil society the awareness levels of ecosystem services and the linkages between social and environmental systems are depauperate. Improving awareness of ecosystem services and the recognition of their value among all stakeholders allows for a more balanced consideration of environmental impacts and empowers people to make decisions based on a more intimate understanding of the trade-offs with environmental benefits. But in seeking to influence management decisions by raising awareness of ecosystem services, civil society needs to be addressed in the appropriate language to ensure that full recognition of the socio-economic costs and benefits are clear and made relevant.

In raising awareness, the connectivity among systems needs to be highlighted both within and beyond cities. Concepts such as landscape urbanism, city metabolism and the ecosystem approach are useful approaches to relay messages of joined up systems to the appropriate audiences. However, for many sectors such terms would be incomprehensible. Still, there is the need to understand the implications of cities on the wider environment and commit this understanding to action. Some authors have argued that to address the issues associated with urbanisation demands a new rural-urban compact built on developing markets for ecosystem services (often termed 'payments for ecosystem services'), helping the rural poor to become major suppliers of ecosystem services, developing business opportunities for rural communities, developing labour intensive conservation models, engaging with governments, development agencies and international negotiations and improving the science that underpins the rural-urban relationships. Thus how we improve this nexus needs to be considered within the city and also beyond the municipal boundaries.

Word count: 1606

Issues to consider:

1. Does current thinking on managing an ever-increasing urban population place too much emphasis on built infrastructure and neo-classical market-based economics at the expense of cost-effective, multifunctional ecosystem solutions?
2. If so, how can the multiple benefits provided by ecosystems, and wetlands in particular, be better integrated into urban planning and management to assist in improving human well-being?
 - a. How can professional biodiversity and urban managers better advocate this kind of integration?
 - b. How should civil society be engaged to assist with this process?

3. Are there exemplars from which we can learn where opportunities have not been missed and the beneficiaries of ecosystem services have been maximised?