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Let nature do her thing:

Reimagining ecosystem restoration in cities

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The UN Decade on Ecosystem Restoration aims towards “living in harmony with nature” by 2050. In an anthropocentric and increasingly urbanized world, the inverse may be true as well: Harmony with nature is a necessary precondition for effective ecosystem restoration. We consider how megadiverse settings in developing economies present unique challenges and opportunities for making peace with nature. We show how towns and cities can provide a space for fostering harmony with nature and accelerating learning for conservation. Finally, we discuss opportunities for a collective, inclusive agenda for biodiverse cities.

UNDP has a formidable track record of strengthening protected areas, protecting iconic and endangered species and supporting sustainable and inclusive livelihoods in mixed-use production landscapes and seascapes.² Biodiversity is both a nature-based solution³ and an indicator of environmental health. It provides local ecological services and connects us with nature. However, urbanization trends indicate that we are increasingly distanced from natural biodiverse spaces. By 2050, about 68 percent of the world’s population will live in urban areas⁴ and an estimated US\$90 trillion will be spent on infrastructure, concentrated in urban settings.⁵

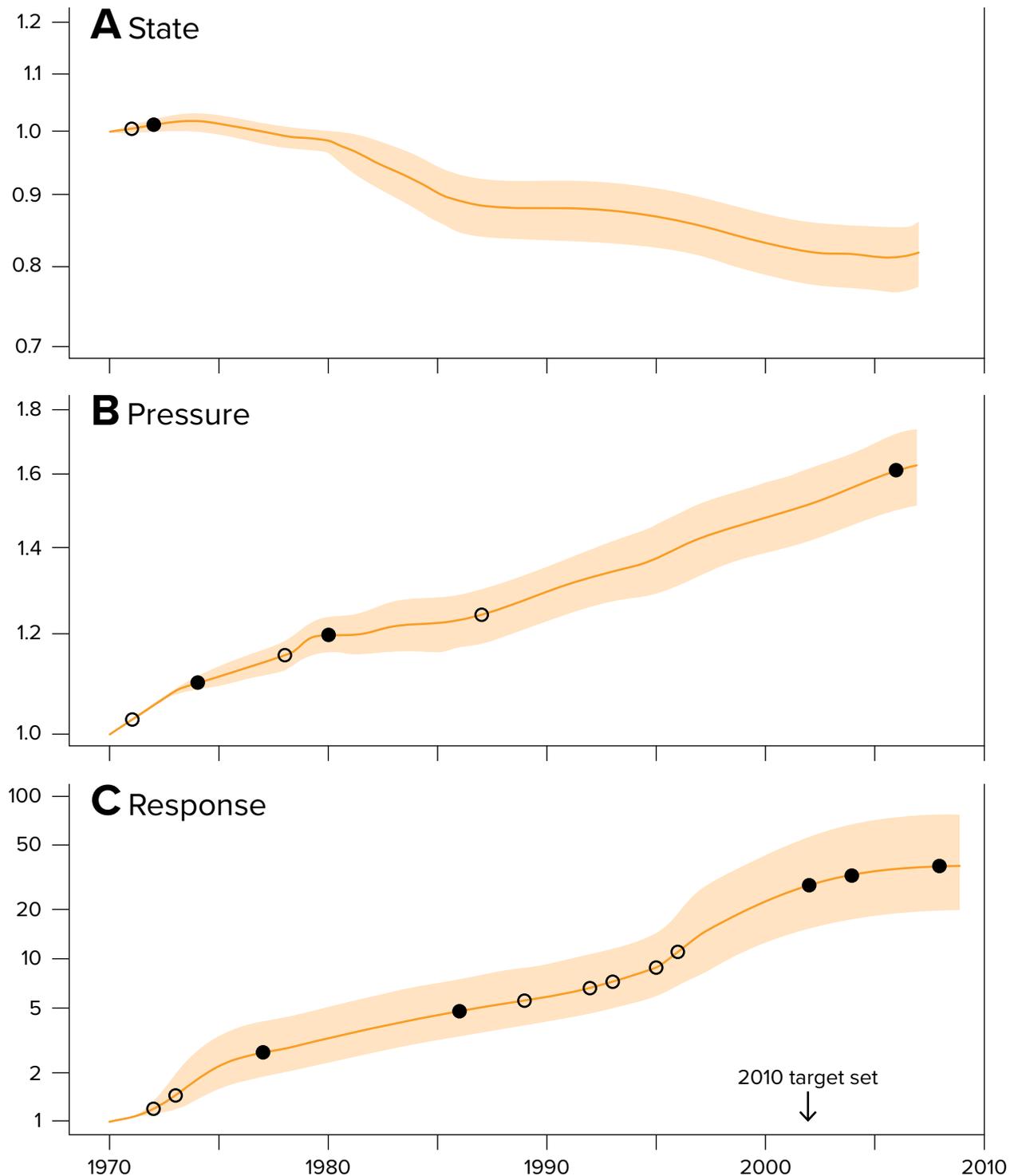
UNDP’s 2020 Human Development Report (HDR) highlights our increasingly disconnected relationship with nature.⁶ Meanwhile, the Post-2020 Biodiversity Framework states, “Governments and societies need to determine priorities and allocate financial and other resources, internalize the value of nature and recognize the cost of inaction.”⁷ Contextualizing the UN’s 2050 aspiration of “harmony with nature” within biodiverse cities, we assert that such a future is essentially rooted in nature-society relationships. It is important to get human-nature interaction and green spaces in urban spaces right, given its impact on the broader environment, economy, health and well-being of city residents.

1. Megadiversity and its discontents

Among the 17 mega-diverse countries, 15 are classified as developing nations. In these areas, conservation efforts tend to concentrate in forests and/or marine ecosystems where biodiversity is abundant. Nonetheless, the international community has not fully met any of the Aichi

Biodiversity Targets set in 2002.⁸ Indeed, between the years 1970 and 2010, biodiversity indicators declined while pressures on biodiversity increased (Figure 1), and the rate of global biodiversity loss is not slowing down.⁹

Figure 1: Aggregated indices of state of biodiversity, pressures on biodiversity, and responses of biodiversity



Source: Butchart, S. H., Walpole, M., Collen, B., Van Strien, A., Scharlemann, J. P., Almond, R. E., ... & Watson, R. (2010). Global biodiversity: indicators of recent declines. *Science*, 328(5982), 1164-1168.

Biodiversity in cities is typically overlooked, even though it offers many benefits, such as mitigating environmental disasters, filtering and cleaning water, reducing the urban island heat effect and improving human health through increased longevity and cognitive function.^{10,11,12} Failure to incorporate biodiversity into city planning increases systemic risks including ecological and geophysical complications, and rising inequities affecting social cohesion. Urban migration reduces individual interactions with classic biodiversity at the outskirts and rural areas along with diminishing understanding of wildlife, thus undermining general conservation efforts.^{13,14}

There are unique challenges to implementing nature-based solutions in developing countries. Rapid urbanization and population growth mean that nature-based solutions and designated green spaces often conflict with arguments to “better use” these lands for purposes that have a more direct developmental impact, such as housing or commercial uses.¹⁵ Nature-based solutions often

take a longer time to implement compared to anthropogenic solutions, e.g. it is quicker to build a concrete retention wall than to restore riparian buffers for urban rivers.

Furthermore, there is a greater likelihood of nature-society conflict, as wildlife such as monkeys, rats and mosquitoes share living spaces with people and potentially carry diseases. Natural spaces in the developing world also tend to be associated with a lack of progress and are perceived as poor or crime-prone areas.^{16,17} As developmental decisions attempt to address multi-dimensional issues, green spaces seem less pertinent than poverty alleviation, access to education, and food security, when in fact, nature-based solutions can play a key role in addressing these interconnected issues. For example, urban community gardening in Mexico City has helped alleviate economic pressures for food security, while also mitigating the urban heat-island effect. A law passed in 2017 specifies the rights for citizens’ access towards urban gardens.¹⁸

2. A collective, inclusive agenda for biodiverse cities

The development of biodiverse cities requires an inclusive system to leverage and incentivize multiple actors towards the co-creation of sustainable and regenerative habitats—living spaces for people and non-human nature alike. Urban biodiversity contributes to a wider ecosystem; thus, policies and biodiversity indicators need to reflect this. Living labs can be used to test and scale up innovative nature-based solutions in urban spaces that meet community needs and integrate a multitude of actors. These actors include policymakers, academia, civil society (especially local community, women, and children—not only formally organized groups, but also informal collectives) as well as indigenous groups, even those that live and/or operate outside of cities, to ensure access and inclusivity in building forward better.

a. Expanding our biodiversity indicators—putting the “system” into ecosystem

The interconnected effects of urban spaces must be reflected in the valuation of nature’s contributions. The newly developed Urban Nature Index (UNI) by the International Union for Conservation of Nature (IUCN) acknowledges the complexities and interdependencies of urban biodiversity including consumption drivers, human pressures, habitat status, species status, nature’s contributions to

people and governance indicators. The UNI incorporates important biodiversity indicators that have not been previously considered, such as access to nature for vulnerable urban communities, livelihoods stemming from conservation and sustainable management, diet sustainability and others.¹⁹

These considerations complement the well-recognized City Biodiversity Index (CBI)²⁰ endorsed by the Convention on Biological Diversity in 2009. This index comprises 23 indicators that measure components of: i) native biodiversity, ii) ecosystem services provided by native biodiversity and iii) governance and management of native biodiversity. This tool has been tested in over 50 cities in more than 12 countries. Some practical application challenges have been identified, such as the lack of data, unclear scale and boundaries, difficulties in capturing heterogeneous bio-geographical characteristics and limitation in number and scope of ecosystem services,²¹ reflecting the complexity of biodiversity. However, the CBI also enables navigation of this complexity, and has been found to promote intersectional dialogue across various departments in cities using it.²²

b. Reimagining cities as living labs for biodiversity and ecosystems

The emerging concept of “urban living labs” refers to an open innovation ecosystem integrating multiple stakeholders to generate and implement on-the-ground solutions.²³ Living labs offer a platform to learn and experiment by integrating pioneering processes within communities for sustainable design and the development of cities. This encourages the creation of conservation-related data to inform decision-making, while also serving as a vehicle to train and inspire citizen scientists.

However, challenges arise if the different roles and expertise of stakeholders in the process of innovation are not well acknowledged.²⁴ Involving communities on the ground allows for different cultural and local needs to be met. In Indonesia, the living lab approach has been recommended to promote the participatory development of smart cities such as Depok, Semarang, Bekasi and South Tangerang.²⁵ If successful, a “city-governed” urban living lab model can be scaled into wider applications for sustainable value to society.²⁶ For example, the concept of “sponge infrastructure” in Shenzhen, China has the potential to expand to address the challenge of inconsistent water supply, ranging from uncontrollable floods to droughts.²⁷

c. New forms of rights—organic growth and regeneration, and equitable access to green spaces

When defining “living harmony with nature,” it is vital to acknowledge that nature has a right to share our habitat in the city. Strategies such as rewilding include leaving allotted spaces uncultivated and self-regulated, thereby ascribing agency to nature. Rewilding has been successfully implemented in several cities including Barcelona, Dublin, Hanover, Harbin, Melbourne, New York, Nottingham and Singapore.^{28,29,30} However, cities in megadiverse developing countries may hesitate towards rewilding due to the notion that greenness invites unwanted “pests” into living spaces.³¹ Contrary to public perception and fear, organic growth provides balanced habitats for plants and animals, and averts unwanted intrusions into human spaces. This is also why lived experience and stories matter: Successful policy implementation must begin by empathizing with people’s hopes, fears and prejudices, building forward in a way that is compassionate to both humans and wildlife. Tapping into local lived experience and narratives from citizens can

also address deficiencies in city-level data and elucidate contextual challenges in implementing nature-based solutions.³²

For urban planning, we can learn from indigenous people and their traditional ecological knowledge (TEK) or local ecological knowledge (LEK), which integrates ecology and culture throughout intergenerational interactions with nature.³³ This adaptive approach remains relevant for current urban policy design and climate change adaptation, given the complex non-linear dynamics of social-ecological systems.³⁴ In fact, the evidence of indigenous communities incorporating non-native or alien species in their food, medicine and culture further calls into question widely accepted labels in conservation, such as “native”, “alien” and “invasive”, arguing that such distinctions share a root with human xenophobia.³⁵

Governments have attempted to address environmental impacts through linear land restoration frameworks and lessons from Western science, but policies that do not include the narratives from TEK and LEK are missing a key element.³⁶ Importantly, studies show that worldview and belief systems have a strong bearing on developing resilient social-ecological systems.³⁷ An example of applying LEK in urban environments is in The Nature of Cities Festival, where biophilic artwork enabled an immersive experience for participants to build emotional resonance around human-nature interdependencies.³⁸

Access to green space is an increasingly important element in environmental justice, and evolutions in planning are needed to better design green cities. A study using big data showed that wealthier communities benefit more from green space accessibility than lower income communities in Shanghai,³⁹ and this disparity in access, quality, and quantity of green space was consistent in Global South cities.⁴⁰ Stark contrasts are also evident in Los Angeles with poorer neighbourhoods being, on average, 7.6 degrees warmer than wealthier ones.⁴¹ This deprivation of access to nature (and its benefits) among lower socio-economic groups may reinforce negative health effects and exacerbate inequalities with direct impacts on educational performance and productivity.⁴² In the UK, women with less exposure to green space were found to be more susceptible to stress and major depressive disorders.⁴³

3. Encouraging innovative solutions from urban civil society, private enterprise, and nature herself

A study of urban green space performance in 14 countries showed that multi-actor models incorporating interdisciplinary knowledge can not only help to overcome blind spots but also facilitate innovation towards SDG achievements⁴⁴ and improve urban green space performance.⁴⁵ However, ambitions to create green cities, especially in the Global South have met sluggish progress. Urban biodiversity conservation is often hindered by lack of political will, budget limitations, human resource constraints and the technical and practical issues of reconciling multi-stakeholder visions for community spaces.^{46,47}

While biodiversity policy goals may be set at the national level, the onus of creating and maintaining local landscapes is often within the purview of local authorities and their landscape units. Forward-thinking authorities could attempt to implement nature-friendly landscapes that potentially attract wildlife habitation, but this may conflict with residents and local communities' desires. Local councils are obligated to respond to community requests, such as to clear trees that may harbour bees (although bees can serve as pollinators and should not attack humans if left undisturbed). This strong bearing of residents' level of acceptance towards urban biodiversity further reinforces that harmony with nature is a *precondition* for successful ecosystem restoration.

Local communities—the ultimate beneficiaries—ought to have a say in the destinies of their neighbourhood green spaces. Bottom-up urban greening activities can include women, youth and other communities that tend to be excluded in decision-making. In some cases, women's roles within society lead them to develop unique biodiversity-related knowledge, positioning them to bring valuable insights and solutions to biodiversity concerns.⁴⁸ Community involvement also contributes to a sense of membership and ownership, which is important in co-creating and

maintaining these urban green spaces.⁴⁹ However, while support from urban civil society is needed for successful urban ecosystem restoration, issues of ownership and agency must be addressed: To what extent is local community empowered—or even permitted—to influence the design of local and neighbourhood landscapes? In Indonesia, it is uncommon to discuss environmental issues publicly, because they usually disrupt corporate interests.⁵⁰ Meanwhile, an observation in March 2021 found that a city council in Malaysia banned residents from growing fruit trees and vegetables outside their homes, yet four days later reported having planted more than 150,000 new trees in 2020 “as part of commitment to sustainability”.^{51,52}

However, the tension between profit-oriented development vs. not-for-profit green spaces need not be a binary option. The LINC KL mall located in Kuala Lumpur's Golden Triangle in Malaysia found a way to incorporate the natural landscape during construction. Contrary to mainstream construction practice in Malaysia, which often levels sites to build from scratch, this mall preserved several large fig (*Ficus* sp.) trees by integrating them into the interior design and architectural experience. The fig or banyan is a hardy, native keystone species that requires minimal maintenance, and its fruits are an additional source of food for birds. Examples like this can be unpacked further to understand the reasons for such decisions, and the costs, constraints and benefits of pursuing unconventional building strategies. Construction projects can integrate green infrastructure, including green parks or roofs capable of absorbing water, mitigating heat, and filtering pollution. Planting greens aids carbon sequestration, but planting must be done in a resource- and energy-efficient way to confer net benefits for climate (i.e. require minimal watering and chemical input). Nature-based models that can help conserve resources include selecting local species for landscaping, using mulch as natural fertilizer, and mimicking tropical forest structures.⁵³

Figure 2: Large fig trees preserved and incorporated into the design of LINC KL mall



Source: Google Maps and Google Street View (image credit: KP Lai).

Finally, perhaps one of the most disruptive “nature-based solutions” is simply to see the urban landscape through the eyes of nature: that is, with no clear boundaries between “designated” green/non-green space, or public/private space. This can point us to new opportunities to transition vacant or abandoned land for habitat creation and conservation.^{54,55} For example, urban residential spaces, while typically privately owned and

therefore not a “public good”, are a key component in strengthening the ecosystem services of towns and cities.⁵⁶ Local authorities can also be supportive by encouraging the creation of biodiversity-friendly landscapes in communities and homes. In fact, governments in Bolivia, Ecuador, India, New Zealand and Panama have enacted legal “rights of nature”, providing nature with the same legal status as humans.⁵⁷

Discussion

In this paper we have shown how urban biodiversity and ecosystems are essential components of sustainable cities. Paying attention to how green spaces and healthy ecosystems are distributed across cities (such as by applying variations of IUCN’s 3-30-300 guideline⁵⁸) can

1. Partnerships and investments in collecting and analysing data that can help us model and predict the costs of neglecting urban biodiversity and ecosystems while identifying benefits that we are likely to miss. We note that conservation resources in developing megadiverse countries

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