



Renaturing cities: from utopias to contested realities and futures

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ABSTRACT

Renaturing urban environments is a transformative pathway for urban sustainability that can be leveraged for collaborative research and planning to reverse long trends of ecosystem degradation. People-nature connections need to be reinforced to enable the successful uptake and upscale of urban renaturing practices. Improving people's understanding, perception, and emotions towards nature is therefore key. In this paper, we discuss how human knowledge and values of nature can be enabled through urban renaturing. Besides, we discuss the required transitions in urban planning processes to support urban renaturing practices.

1. Introduction

Rapid urbanization and human interventions in the biosphere have endangered human and nature's well-being. Restoring and promoting the people-nature connections and managing ecological changes to support biodiversity and associated ecological functions is increasingly recognized as an effective solution to enhance species' resilience and promote climate change mitigation and adaptation (Egerer et al., 2021). Two (seemingly) interrelated concepts entered the science and policy narratives in search of a paradigm shift for people-nature connections: rewilding and renaturing of cities. The term 'rewilding' started to be used by conservation scientists and policymakers to describe an approach including ecological restoration practices, species

reintroduction, and passive management (Jepson, 2016). Monbiot (2014) refers to rewilding as unleashing rather than controlling natural processes according to human objectives (Hettinger, 2021). Rewilding is often portrayed and perceived as threatening to urban citizens (Vasile, 2018), with Tanasescu (2017, p. 104) discussing how docile "wild" animals can become problematic among locals when rewilding takes place in a way that the animals still feel dependent or affectionate towards humans. "Urban rewilding" strategies mainly focus on reducing the impact of humans on urban ecosystems by reducing human interventions (Kowarik, 2018).

The concept of rewilding, however, is progressing the debate and understanding of people-nature relations; it is contested since it does not resolve the ever-lasting debate on how nature is framed and conceived

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about people (Newson, 2022). For some indigenous and aboriginal communities, rewilding is an unfitting term, given that 'wild' or wilding is foreign to humans (Helm, 2020). Steele (2021, p. 82) also notes that many initiatives in Melbourne, Australia, to reconnect people with nature – even though including the term 'wild' – seem paradoxical albeit necessary: "life in cities is increasingly removed from nature." A preferred term to rethink and open the debate about the conceptualization and the relation to planning cities with and for nature is thus one of renaturing. Urban areas are complex socio-ecological systems, meaning harmony between humans and nature should be generated for a sustainable urban life (Hwang, 2020). Renaturing recognizes the entanglement of humans and the natural environment. Casagrande and Vasquez defined renaturing as "an intentional and reflective attempt to restore human relationships with natural processes of ecosystems in addition to the more common focus on restoring the biophysical health of ecosystems" (Casagrande and Vasquez, 2010, p.195). Renaturing is an acknowledged pathway for transition to nature-positive cities where nature is integrated into the built environment (Frantzeskaki et al., 2022) also pointing to the role of Nature-Based Solutions (NBS) as a holistic approach to enable urban renaturing (Sarabi et al., 2019).

Despite the growing recognition of the importance of the people-nature connection, the anthropocentric view has continued to dominate the discourse surrounding urban renaturing (Pineda-Pinto et al., 2022). Urban renaturing strategies, including NBS, have been predominantly evaluated based on their potential to provide ecosystem services that benefit humans. In recent years, an increasing number of scholars have called for a more holistic and less human-centered approach to urban nature (Arcari et al., 2020; Randrup et al., 2020). However, the question of how to cultivate a more empathetic people-nature relationship in urban environments remains unanswered. In this paper, we present and elaborate on a series of guiding questions that can inform pathways to renaturing cities in a way that balances and harmonizes the needs of humans and nature.

2. Guiding questions to inform pathways to renaturing cities

To advance a renaturing agenda, we propose three aspects to be further investigated to guide pathways for planning and implementation of renaturing practices. Our conceptual underpinning is based on the idea that urban renaturing, as an urban imaginary (Gabriel, 2014; Gandy, 2006), requires and will alter people's ecological literacy (Kabisch et al., 2022). In addition, renaturing urban environments results in and emanates modified people-nature connections and can broaden or shift people's values of nature over time (Buijs et al., 2018). Accordingly, renaturing cities requires a planning approach that enables ecological literacy and nurtures people-nature relations. In the following sections, we unpack each aspect by drawing on findings from the scoping literature review and emerging scholarship of urban ecology and NBS research.

2.1. Renaturing needs to enrich and be enriched by people's knowledge of nature in cities

How can people's understanding of and knowledge about nature in cities enrich and be enriched through renaturing urban environments? Considering this as one of the guiding questions for designing and planning urban renaturing, we first need to recognize what underpins the knowledge paradigm that shapes our relationship with nature. Current literature suggests that nature is portrayed as the ultimate antithesis of cities: unordered, sterile, dangerous, and uncontrollable (Straka et al., 2022). People's understanding of nature in cities (as a knowledge paradigm) is entrenched in the dominant (anthropocentric) modernist paradigm, which assumes that nature is a profitable resource that can be exploited and tamed by humans without facing significant consequences (Davoudi, 2014).

Critical scholars argue that this modernist paradigm of people-nature

relationships is characterized by a racialized, androcentric, and class-based hierarchy of knowing and being, which marginalizes non-western cultures and histories (Broitman et al., 2018; Clancy, 2019; Davoudi, 2014; Straka et al., 2022). This paradigm dictates what a modern city is supposed to look like; a city where nature is regulated and controlled for the benefit of humans. This way of thinking has profound implications on how humans treat and value the environment and what type of nature can coexist with humans in cities (Franklin, 2017; Vincent, 2017).

It is argued in the literature that because of this, humans are increasingly becoming detached from nature, a process that has been influenced by industrialization and rapid urbanization (Basak et al., 2022; Franklin, 2017). In response to this disconnect and broken knowledge link regarding nature, emerging scholarship from nature-based solutions research indicates the need to understand better how renaturing interventions in urban environments influence people's knowledge about ecological processes and enrich peoples' ecological literacy. Thus, to rebuild the relationship between people and nature, creating spaces for people-nature connections to emerge (Wellmann et al., 2023) and, in this way, facilitate knowledge and awareness building about nature are seen as interlinked processes/approaches. Renaturing the urban environment can therefore improve citizens' knowledge regarding the people-nature interrelations and nature dynamics (Mabon et al., 2023). Increasing the encounter of people with nature is an effective approach to improve nature experience, gaining knowledge about nature as well as awareness regarding the values of nature (Kuo et al., 2019). By creating spaces where nature and people can coexist and thrive, we can cultivate a new understanding of people-nature relationships that emphasizes collaboration, interdependence, and mutual benefit. However, to achieve this, we need to recognize the diversity of knowledge systems that exist in our communities and actively work to include and integrate them into urban renaturing efforts.

An example to illustrate the altered understanding of nature from people comes from Bangalore, India (building from the work of Murphy et al. (2019)). The case of revitalizing man-made lakes in Bangalore, India, is an example of how renaturing urban lakes together with and by the activities of local communities resulted in a coupled process of increased knowledge on the ecological functions of the lakes together with an evolving sense of place attachment. During the colonization by the British, the centuries-old practice of harvesting rainwater through man-made lakes or 'keres', which was done by local villages, was handed off to be managed and owned by state bodies (Murphy et al., 2019). As a result, the local knowledge and practice of maintaining the keres was lost. Following a culmination of building over the keres or using them for sewage purposes, and subsequently, the realization of the government in 1985 to restore the keres through a technical approach combined with mismanagement, the residents, in frustration, took on stewardship roles over the lakes. The Bangalore Water Supply and Sewage Board (BSWSSB) took on the opportunity to use the resident's stewardship. In 2010, a selection of the lakes was co-managed with resident groups. In restoring the lakes, the residents engaged in a learning process of the history of the lakes, how they were maintained and managed, their connection to the wider water system, and the eventual decline of the lakes. Through learning about the ecological and functional properties of the lakes, the place attachment of the community groups shifted from initially being concerned solely with 'renaturing' to broadening it to include 'protecting' and 'enhancing' the lakes. Some community members got involved with the revitalization efforts for a single purpose due to their enjoyment of nature or wanting to look at the birds. Still, gradually, as the participants kept getting more involved in the revitalization of the lake and maintenance activities, their ecological knowledge of the functionalities and cultural meanings of the lake kept growing. Place attachment to the lake evolved to include ecological preservation, responsibility, cultural connectivity, community, and a sense of purpose (Murphy et al., 2019). This example shows

how renaturing fosters a strong socio-ecological understanding which can feed into a strong sense of stewardship.

2.2. Renaturing needs to account for and enrich associated nature values

How people-nature relations and associated values can enable and be enabled through renaturing cities? The importance of bringing back nature to cities has been extensively acknowledged and researched; it is argued to be multifunctional in terms of sustainability, delivering social, economic, and ecological benefits (Kabisch et al., 2016; Lehmann, 2021; Pereira & Baró, 2022). At the same time, renaturing efforts contrast with the dominant paradigm of keeping nature out of cities and controlling what is left of it. This reminds us of the Woody Allen quote: “I love nature, I just don’t want to get any of it on me.” Given the detached nature of people-nature relationships, shifting this paradigm requires an improvement of citizens’ ecological literacy and an approach that considers people’s cultural understanding of nature.

The literature suggests that people’s perceptions and values of nature in cities are not static; rather, they can be positively influenced by increasing encounters with nature (Straka et al., 2022). As for wild animals, Basak et al. (2022) found that the perception of threats decreases significantly the more humans are exposed to them. The willingness to cohabitate with nature is not determined by socioeconomic background; rather, childhood experiences play a more significant role (Hosaka et al., 2017; Mohamad Muslim et al., 2018). It was also found that respondents who exhibit pro-environmental behavior in other areas (e.g., recycling) are more willing to cohabitate with wildlife in cities (Straka et al., 2022). The extent and type of nature people accept and are willing to cohabitate with are also strongly influenced by culture, as several studies across cities show (Mohamad Muslim et al., 2018; Straka et al., 2022). This shows that attitudes towards nature in cities can be influenced and shaped by reinforcing positive associations.

Related to values and associations with nature, a lens of biocultural diversity is proposed to have a more holistic and integrative view of the drivers that influence people’s understanding, appreciation, and association with nature (A. E. Buijs et al., 2016). It is important to recognize that nature can have different meanings for many cultural groups (Plumwood, 2006). IUCN finds recognizing different world views and cultural differences essential for the governance and management of natural areas and provides six principles for recognizing the cultural significance of nature, which are: respect diversity, build diverse networks, ensure safety and inclusivity, account for change, recognize rights and responsibilities and recognize nature-culture linkage (Verschuuren et al., 2021). Institutions play a significant role in defining which values are legitimized and which ones are excluded from the decision-making process. Therefore, sustainable urban renaturing requires institutions that enable the recognition and integration of diverse values of nature and nature’s contribution to people (IPBES, 2022).

As an example, Vasile (2016) suggests that, despite certain human-wildlife dichotomies being present in the Southern Carpathians, Romania, communities involved in rewilding projects, such as the reintroduction of the European Bison, strongly believed that wild animals have a soul, just like humans, and therefore also an inherent moral right to exist and be wild – the wilderness is also perceived with wonder and respect by locals. This perception played an important role in the acceptance and recognition of the importance of rewilding in restoring the health of the surrounding environment.

While nature in cities is acknowledged to entail certain sustainability benefits, it can also be a nuisance or a disservice. Von Döhren and Haase (2015) conducted a comprehensive literature review on the topic of nature as a disservice and identified several situations where more nature in cities could lead to negative outcomes. For example, plants can deteriorate infrastructure when they grow out of control or are poorly maintained, and maintaining nature in cities generates financial costs. Moreover, Hosaka et al. (2017) found that many wild animals are considered a nuisance in cities, feared for damaging property and

transmitting diseases, leading to reluctance to coexist with them. Acknowledging these fears is key when planning to renature cities and can enable learning how to deal with nature as a disservice.

Despite such fears being present also in the above-mentioned rewilding project in the Carpathians, Vasile and Opincaru (2021) found that the level of support shown to such conservation or renaturing projects was significantly correlated to the level of exposure and participation during each step of the implementation process (p. 47). In pro-active communities where involvement and participation were actively empowered through learning about rewilding, locals reported higher satisfaction from the project and a more accepting view towards experiencing damages, as well as experiencing socio-economic benefits from eco-tourism growth. This comes hand in hand with Vasile’s previous finding that the level of education and type of occupation of the population highly impacts the perceived effectiveness of species reintroduction (Vasile, 2016, p.19). Communication, education, and encouraging collective action are thus key tools for ensuring the success of renaturing initiatives, in line with Ostrom’s beliefs of what can improve resilience in social-ecological systems (Ostrom, 2009).

An illustrative example of connecting renaturation initiatives to local cultural heritage and values is the restoration of the Xochimilco area in Mexico City, the only remnant of the pre-Hispanic form of land cultivation within a wetland ecosystem, referred to as ‘chinampas’. The deterioration of this World Heritage site triggered grassroots initiatives in which local traditional producers collaborated with academics for ecosystem restoration. Cultural traditions are at the heart of the ecosystem protection approach, aimed at putting back in place traditional land management practices and at protecting threatened endemic species (the axolotl). Through this, healthy, sustainable food and water systems are safeguarded. The history of the lake on which the pre-Columbian city was built appeals to people’s cultural identities, with endemic species playing a significant role in indigenous cultures. Also, Mexican food culture is a source of pride for local citizens. The renaturation approach of Xochimilco builds on this heritage by taking a grassroots, traditional approach to renaturing the area and selling produce from the traditional Chinampa cultivation in local farmer markets, also to fund restoration efforts. Furthermore, chinampa cultivation initiatives promote volunteering and new producers to join. Local families who have been there for generations support this renaturation effort because they want to revive the chinampas, and produce is increasingly sold in markets and restaurants throughout Mexico City.⁷

2.3. Renaturing needs to be a collaborative planning intervention with and for people-nature connections in cities

How can we plan cities with and for nature appreciating people’s multiple values, and knowledge systems, and (new) people-nature relations? Urban planning has been traditionally defined as the practice of shaping cities and arranging activities in urban spaces to achieve future goals (Wheeler, 2013). However, the traditional top-down, monofunctional, and ‘engineering’ approach by which urban planning defines problems and looks for solutions is not well suited to address the complexities of people-nature relationships (Dorst et al., 2022). Planning for urban renaturing can set the stage to improve people’s ecological literacy and their various values towards nature to enrich renaturing programs. Openness and inclusive planning approaches to different epistemologies and knowledge systems are important for understanding how renaturing cities as urban programs can elicit and enhance ecological literacy across different knowledge systems (Pauleit et al., 2021). Including the local and indigenous populations’ knowledge rather than solely relying on scientific or expert knowledge can lead to solutions more aligned with both society’s and nature’s needs and conditions (Brondizio & Tourneau, 2016; Folke et al., 2016). In

⁷ (Astbury, J. (2018) NATURVATION Case Study Working Paper Mexico City)

geographies where indigenous communities are included, their knowledge systems and cosmologies emanate from a more integrative conceptualization of people-nature relations, and ecological literacy is intrinsically experiential and historical (Mistry & Berardi, 2016).

The inclusion of various knowledge systems requires a flexible and adaptive urban planning approach. Adaptive planning recognizes socio-ecological systems as complex adaptive systems and combines different knowledge systems and learning environments to enhance the capacity to deal with uncertainties (Folke et al., 2005). Adaptive planning enhances ecological literacy and the value of nature by providing a setting for self-organizing, experimenting, encountering nature, and “learning-by-doing” (Kato & Ahern, 2008). Adaptive planning feeds ecological knowledge into ecosystem management practices through continuous testing, monitoring, and reevaluation and integrates knowledge generation with the planning process (Ahern et al., 2014). Adaptive planning encourages and enables ecosystem stewardship across scales (Folke et al., 2005), an essential factor for the uptake and upscale of urban renaturing efforts (A. Buijs et al., 2018).

Planning for urban renaturing has to provide a setting that allows for the coexistence of different values towards nature. Therefore, a mosaic approach to urban governance is needed, which emphasizes a context-sensitive adaptive approach to planning that recognizes the differences between geographically distinct urban landscapes and community identities (A. E. Buijs et al., 2016). The mosaic approach can enable the active engagement of citizens in renaturing programs and the generation and transfer of knowledge across scales and geographical boundaries (A. Buijs et al., 2019).

However, striking a balance between local autonomy and integrity/connectivity at larger scales remains a challenge (A. E. Buijs et al., 2016). One potential solution to this challenge is adopting a performance-based approach to planning. Adaptive and mosaic planning and governance approaches are not well-suited for the mainstream conformative mode of planning, which only allows for projects which conform to a specific plan (Janin Rivolin, 2008). The performance-based planning provides the flexibility needed for adaptive and mosaic approaches while ensuring the achievement of collective goals (Cortinovis & Geneletti, 2020).

Utrecht Science Park (USP) (<https://www.utrechtsciencepark.nl>) is a successful example of planning for urban renaturing. As a peninsula of the city of Utrecht, the USP has a crucial role as a connecting element between the surrounding nature areas. However, nature has become fragmented in the USP, and biodiversity has declined. To address this challenge, a vision was co-created, envisioning the landscape for 2035, with 20 icon species and 6 corresponding habitats. This long-term vision provides room for experimentation and biodiversity restoration. Through intensive regional cooperation with all parties involved, from terrain managers to local authorities, an ‘Implementation and maintenance plan recovering biodiversity USP’ with an interactive map was delivered. A multi-disciplinary biodiversity council was assigned to advise operations. The council has been actively involved and consulted in area development processes, from a preliminary study for wind turbines to policies for green roofs or tree management. USP was turned into a testing ground for working towards solutions and increasing scientific and societal impact for biodiversity recovery. Taking a performance-based adaptive planning approach allowed using the area to experiment and develop knowledge of biodiversity restoration.

3. Conclusion

In this paper, we discussed how improving people-nature relationships can enable and be enabled through urban renaturing. People-nature relationships involve complexities and uncertainties that necessitate the recognition and integration of different knowledge systems and values towards nature in renaturing practices to enable their uptake and upscale in urban environments. On the other hand, urban renaturing practices can enhance ecological literacy and improve the values

towards nature. Future research and planning practice for renaturing cities needs to also take a more than human perspective to examine the impact of people-nature interactions on wildlife (Kreling, 2023). As thus, cities need to adopt their planning and governance systems encouraging humans’ encounter with nature, and multi-species sustainability (Rupprecht et al., 2020) for experimenting for urban renaturing.

CRedit authorship contribution statement

Shahryar Sarabi: Conceptualization, Writing – original draft preparation. **Niki Frantzeskaki:** Conceptualization, Writing – original draft preparation. **Johanna Waldenberger:** Conceptualization, Writing – original draft preparation. **Oscar Alvarado:** Writing – review & editing. **Dorine Raaimakers:** Writing – review & editing. **Hens Runhaar:** Writing – review & editing. **Charlotte Stijnen:** Writing – review & editing. **Helen Toxopeus:** Writing – review & editing. **Ema Vrinceanu:** Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.ufug.2023.127999](https://doi.org/10.1016/j.ufug.2023.127999).

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