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From instrumentalization to commoning: A critical review of participation in urban nature-based solutions

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Nature-based solutions (NBS) are becoming a widely recognized approach to urban sustainability. Most of the literature and policy handbooks on the topic emphasize the importance of participation in some form but interpretations and levels of commitment vary. While the mainstream discourse often presents NBS as a set of win-win solutions for urban sustainability, there is a tendency to romanticize both nature and participatory planning processes in the institutional language and practices of NBS. In this paper, we review critical perspectives on the mainstream NBS discourse. Then we bring scholarship concerning the relationship between cities, nature and social change into conversation with scholarship on commoning, to outline an approach for rethinking the democratic and transformative potential of NBS. In this approach, we argue for moving beyond the instrumentalization of nature inherent to mainstream NBS, and locate, within diverse strands of theory, perspectives that contribute to a vision of commoning as a frame for ecological spaces in cities. We contrast the tendency for instrumentalization and enclosure of NBS and urban space to the opportunities opened by the commoning approach, particularly in terms of equality of access, public and shared resources, and distribution of benefits.

KEYWORDS

cities, transformation, socio-ecology, participation, instrumentalization, commoning

Introduction

"Nature-based solutions" (NBS) have been proposed to enhance urban sustainability, in ways that reposition ecological processes in cities instead of relying on classical engineering solutions (World Bank, 2008). The NBS approach has been adopted by several large, multilateral institutions such as the European Union (EU), the International Union for the Conservation of Nature (IUCN), the World Bank and the United Nations (UN) (IUCN, 2008; Mackinnon et al., 2008; World Bank, 2008). Sowińska-Swierkosz and García (2022) define NBS as actions that are inspired and powered by nature, address (societal) challenges or resolve problems, provide multiple services/benefits, including biodiversity gain, and are of high effectiveness and economic efficiency. In cities, this can for example refer to the use of green space and open water streams as part of climate adaptation strategies.

In our critical reading of this approach, which we refer to as the "mainstream" literature on NBS, we argue that it values nature for its usefulness for particular urban growth and development agendas—in other words, instrumentalizing nature. There has been a surge of research and policy initiatives on ecosystem services in Europe, heavily supported by the European Commission through the "EU Biodiversity Strategy to 2020" (Maes and Jacobs, 2015). Ecosystem services shares affinities to market-based environmental governance, or what Braun (2015) describes as the commodification, marketization and financialization of nature.

This "instrumentalization" of nature has raised concerns that NBS may lose its potential to contribute to deeper forms of societal transformation, and has sparked a more critical approach to "nature," "solutions" and public participation (Ahern et al., 2014; Scott et al., 2016; Kaika, 2017; O'Sullivan et al., 2020; Randrup et al., 2020; Kotsila et al., 2021; Sekulova et al., 2021). Hence there is also emerging literature that takes a more critical perspective, developing analyses of the instrumental views of nature, and recognizing that NBS has a role to play in societal change (Anguelovski et al., 2018, 2022; Frantzeskaki, 2019; Toxopeus et al., 2020; Tozer et al., 2020; Woroniecki et al., 2020). Many scholars have argued that NBS requires rethinking the relationship between nature, people and the city (Scott et al., 2016; Randrup et al., 2020; Woroniecki et al., 2020; Welden et al., 2021). Public engagement is not only considered necessary for societal change, there is also growing recognition that forms of participation may provide the creativity and long-term investment that is required for deep transformations.

In this critical review article, we seek to provide direction for thinking about NBS away from technocratic policy agendas and ecological modernization, and toward more open processes that may mobilize a transformative sustainability agenda. Rather than presenting a systematic and comprehensive review, the article follows threads in the literature to highlight insights that emerge in the tension between the mainstream view and literatures that seek to critique it. This way we illustrate some of the key lines of conflict in research and policy perspectives on NBS and public participation. We recognize that there are relevant literatures on urban green spaces and participation that fall out of the scope of our discussion, but the literature review focuses on the NBS framing to maintain coherence.

To propose a way forward for transformative NBS, we draw inspiration from some scholars and community groups that have turned their attention toward counterhegemonic strategies of commoning (Linebaugh, 2008; Gibson-Graham et al., 2016) as a different pathway for NBS (Wamsler and Raggers, 2018; Frantzeskaki, 2019). Here relations of property, power and ecology are re-organized toward provision of common goods. While public participation in NBS is generally considered necessary and inherently positive, we argue that the role of public engagement in NBS has transformative potential beyond what that established perspectives recognize.

The remainder of this paper is structured as follows. In Section NBS in mainstream and critical literature, we review the literature on NBS, focusing on associated notions of nature and the role of participation. In Section Beyond the instrumental—toward NBS for the commons?, we situate NBS within a larger ontological debate about the human-nature dichotomy and reflect on the political potential of overcoming this divide. Then we introduce the concept of commoning and discuss the strengths and limitations of the concept in relation to urban NBS. In the conclusion in Section Conclusion we summarize and consider the wider implications of moving beyond the instrumental approach.

NBS in mainstream and critical literature

The framing of NBS in mainstream and critical literature

First we will discuss NBS as an emerging field of knowledge and policy development, focusing on the emergence of what we term the "mainstream" perspective (represented by key policy institutions), and subsequently reactions through what we term the "critical perspective" (represented by social science scholarship in particular).

Although NBS as an idea has antecedents in debates on urban greening, climate change adaptation and ecological restoration, an early milestone for the concept itself was its inclusion in a 2008 World Bank report on biodiversity and climate change (World Bank, 2008). Shortly thereafter the IUCN began using the term to raise the profile of biodiversity conservation and ecosystem services within climate mitigation and adaptation strategies (IUCN, 2008; Mackinnon et al., 2008). Since then, the concept has been increasingly referred to in EU legislation, recently in the Communication on the Green Deal for Europe (European Commission, 2019) and the EU Biodiversity Strategy 2030 (European Commission, 2020).

There is broad agreement that the NBS approach is intended to address major societal challenges such as food security, climate change adaptation, water security, human health and disaster risk. According to the Cohen-Shacham et al. (2016), the overarching goal of NBS is to support the achievement of development goals and human wellbeing in ways that reflect cultural and societal values and enhance the resilience of ecosystems. More recently, the IUCN's NBS Global Standard framed NBS as a tool to "harness the services of ecosystems" and "deploy nature in helping resolve major societal challenges" (IUCN, 2020). The European Commission (2021: 1) has defined NBS as solutions that are inspired by nature, which are cost-effective and provide environmental,

social and economic benefits. The EU has subsequently modeled itself as an international frontrunner in NBS development and implementation (O'Sullivan et al., 2020).

NBS is often held in comparison to "engineered" or "gray" infrastructure, in other words, the traditional modern ways of designing urban infrastructures [although scholars such as Seddon et al. (2021) propose finding synergies between them rather than viewing them as mutually exclusive]. The traditional approach in engineering designs has focused on using hard, resistant elements and responding to increased risk with increased size, for example increasing the diameter of sewage pipes for stormwater management or building more and larger tanks to store sewage (McPhearson et al., 2016). In contrast, a typical NBS solution to risk of flooding from increased precipitation and stormwater may include creating forests (Kelly et al., 2016), restoring wetlands (Peh et al., 2014), or establishing green roofs and walls on existing urban infrastructure (Enzi et al., 2017). Daylighting is another approach to water management within the tool kit of blue green infrastructure. It refers to opening waterways that were once buried in culverts or pipes in order to deliberately expose their flow (Pinkham, 2000). These approaches should only be considered NBS when they are part of coordinated efforts at the city scale and take care to select plant species that coordinate with biodiversity goals (Eggermont et al., 2015; Cohen-Shacham et al., 2019).

NBS may include interventions at a range of scales, from the design of regional and city-wide ecological networks to multifunctional urban parks providing recreation, and micro-scale design including streets designed to retain water and the integration of living systems with built systems such as green walls and green roofs to reduce heat island effects (Scott et al., 2016). In what we have termed the "mainstream" perspective on NBS, the wider goals seem to involve cities that are resilient, adaptable to climate change risks, and that protect the integrity and longevity of the natural processes underpinning society (Wilkinson, 2012).

The critical perspective does not necessarily contradict these goals. Rather, it reframes NBS in terms of its potential to transform social structures (Frantzeskaki and Kabisch, 2016; Haase, 2017; Randrup et al., 2020; Woroniecki et al., 2020; Welden et al., 2021). To Dorst et al. (2019: 4), NBS "aim broadly at societal change." Others also link NBS to social goals such as sustainable development and socio-ecological transition (Maes and Jacobs, 2015; Liquete et al., 2016). The proposition that addressing societal challenges is synonymous with societal change does not seem to be shared entirely by the funding institutions nor the mainstream NBS literature. While Criterion 8 of the 2020 IUCN standard indicates that implementing NBS could "trigger transformative change," it also insists that NBS is derived from "goods and services" (IUCN, 2020)—remaining firmly within the view of nature as a *service provider* for society and the economy. Welden et al. (2021: 968) assert that this is an attempt to mold NBS around the "instrumental values and technocratic perspectives" that dominate decision-making in mainstream institutions (see also Bieling et al., 2020). To them, the primary goal of the mainstream perspective seems to be interventions that fit within the frame of "green growth" rather than transforming society or the social practices, economic strategies and ontological relations to nature that define it.

Other critics argue that the mainstream view fails to challenge "business as usual" in urban planning (Pauleit et al., 2017) and instead situates solutions to societal problems within the model of green or "sustainable" economic growth (Faivre et al., 2017). The institutions providing frameworks for NBS tie it closely to economic growth and financial innovations (Ahern et al., 2014; Kotsila et al., 2021). It is argued that the mainstream NBS perspective, by giving equal weight to social, economic and environmental objectives, does not sufficiently prioritize the need for socio-ecological transformation (Nesshöver et al., 2017; Dorst et al., 2019; Frantzeskaki, 2019; Sekulova et al., 2021).

As an example of this, the European Commission states that NBS "embodies new ways to approach socio ecological adaptation and resilience, with equal reliance upon social, environmental and economic domains" (Dumitru and Wendling, 2021: 17). The inclusion of economic growth goals on equal footing with environmental and social goals together with the promise of co-benefits has led to concerns that NBS is too easily co-opted by neoliberal agendas through becoming "discursive tools for shaping and disciplining social activities that are not market oriented" (Kotsila et al., 2021: 268). To Scott et al. (2016: 268), interventions can appear as benign technical or ecological fixes to urban sustainability problems, but at the same time, they hold, "nature-based solutions and enhanced nature within cities can quickly become appropriated as part of a neoliberal planning discourse."

The critical perspective has also sought to reveal problematic aspects of specific NBS projects. Several studies have held that new or restored NBS projects such as parks, greenways and gardens have contributed to increased real estate prices and in turn gentrification (Tozer et al., 2020: 2). On this basis, there is a growing concern that NBS is being incorporated into private development schemes leading to the appropriation or enclosure of commons for so-called green ends to generate surplus value (Gould and Lewis, 2016; Scott et al., 2016; Gerber and Gerber, 2017; Kotsila et al., 2021). This can, according to the literature, in turn lead to new processes of gentrification and spatial exclusion (Anguelovski et al., 2022).

Furthermore, critical accounts have shed light on the funding underpinning NBS projects. In many instances, framing a project in terms of NBS becomes a way to access funding stream in the EU (Bauduceau et al., 2015). A burgeoning range of industries has emerged to design and monitor sustainability indicators, innovating "fixes" for unsustainable infrastructures and practices, and marketing sustainable products or sustainability brands (Astleithner et al.,

2004). These "fixes" are, according to Kaika (2017: 91), underpinned by a notion of nature "as if it were something that could be injected into cities in the form of parks or green roofs" by urban policy makers and planners in an attempt to "immunize" city dwellers against the threats of climate change, whilst stimulating economic growth. In this sense it fits well within the critique against "neoliberalization of nature" (Heynen and Robbins, 2005; McCarthy, 2005; Braun, 2015), or the privatization, commodification and financialization of nature, the (de)regulations that have enabled these processes, and the production of language that makes "common sense" of them in terms of "ecosystem services" and "natural capital" (Potschin et al., 2015).

Several articles have argued that further reflection about the ontological framing of "nature" is sorely needed to advance the concept of NBS (Nesshöver et al., 2017; O'Sullivan et al., 2020; Randrup et al., 2020). As the literature reveals, when NBS becomes an artifact of governance it becomes furnished with key performance indicators, best practices and institutional vested interests. These indicators can become ends in themselves, overshadowing the more substantive social and ecological challenges the concept was originally designed to resolve. For critical NBS scholars, the human-nature dichotomy is a barrier to transformative change (Hanson et al., 2020; Woroniecki et al., 2020; Welden et al., 2021). Within this literature, there is also optimism that NBS may, if properly reframed, be an avenue for reconnecting people with nature both materially and semiotically, and that this will have wide-ranging positive sustainability effects on cities and urban populations (Ibid.). Pineda-Pinto et al. (2022) identify an anthropocentric bias endemic in participatory NBS literature and practice, leading them to propose that the equitable distribution of environmental goods and bads must recognize nature's agency and capabilities.

It is evident from this reading of the literature that the NBS concept is situated in different framings at the same time—ranging from ecological modernization to more radical ideas of socio-ecological transformation. Given the wide range of possible meanings that can be attributed to NBS, we may call it a "boundary concept" meaning "a loose concept with strong cohesive power" (Allen, 2009: 355). A positive aspect of this can be that it provides actors from multiple disciplines and sectors with a flexible, common language to work together toward goals without fully understanding all the different perspectives and interpretations (Dorst et al., 2019: 5). The downside of the ambiguity is that the expectation for NBS to be a panacea of win-win solutions with co-benefits does not necessarily provide a framework for evaluating trade-offs between social, environmental, and economic goals, nor does it address relations of power (Anguelovski et al., 2016). As we discuss more in detail in the following section, implementing NBS opens challenging processes of deciding between competing priorities and managing diversity.

The problem of participation within mainstream NBS

In both mainstream and critical perspectives on NBS, participatory planning and governance are advocated to enhance social, political, and financial support of NBS (European Commission, 2016; Frantzeskaki and Kabisch, 2016; Pauleit et al., 2017). The European Commission's Handbook for NBS practitioners contains a long list of indicators for participatory governance (European Commission, 2021). Here the Commission emphasizes experimental approaches for innovation and continuous learning, institutional spaces for cross-sectoral dialogue, collaboration and public participation. As interventions are moved out of the domain of technical expertise to become issues of governance (Kvamsås, 2021; Kvamsås et al., 2021), it appears that some decision-makers are opening up different types of participation processes to attempt to improve transparency and legitimacy, gather information, stimulate creativity around the design of solutions, and foster social inclusivity (Puskás et al., 2021).

However, shallow versions of consultation and partnerships are still dominant, and deeper participation is limited by institutional structures that predefine the way an intervention frames nature (Kiss et al., 2022) and by the way cultures of participation vary across cities (Nunes et al., 2021). It is widely agreed in the critical literature on urban planning and participation that public participation can be challenging. The experience of urban planning research and practice, both of which went through a "participation turn" or a "communicative turn" in the 1980s and 1990s (Tewdwr-Jones and Allmendinger, 2002), has arguably been that the focus on participation tends to downplay power relations (Fainstein, 2000, 2014). The Habermasian ideal of inter-subjective communicative rationality was meant to outline the parameters for reaching consensus. However, as Fainstein (2000: 455) argued, the proponents of the communicative ideal "seem to forget the economic and social forces that produce endemic social conflict and domination by the powerful." In other words, participatory processes in urban planning must take as point of departure that power relations between participants are skewed, and avoid jumping too quickly to assumptions about consensus (Fainstein, 2014; Certomà et al., 2015). Cousins (2021) review of participatory NBS research found that justice concerns remain peripheral.

Certainly, much of the thinking and practice around NBS in both mainstream and critical perspectives are quite advanced in terms of public participation. By this, we mean that it often builds on long running local experience and research on participation. Public involvement is widely claimed to increase relevance, fairness, acceptance and ultimately sustainability although the empirical foundation for these claims is not always straight-forward (Wamsler et al., 2019; Toxopeus et al., 2020,

Kiss et al., 2021). Such participation takes different forms, ranging from top-down approaches to bottom-up governance involving self-organized city dwellers (Dorst et al., 2019).

Contributions from across the literature concur that in NBS projects, co-production and co-design are potentially powerful approaches to include members of the public on more equal footing with professional actors (planners, politicians, experts, institutional and private sector stakeholders) (Buijs et al., 2016; Basnou et al., 2020). The goal of co-design and co-production is to include the lived experiences, views and skills of many different actors to jointly define challenges and establish long term strategies to address specific problems (Szebeko and Tan, 2010). Researchers have argued that inclusive processes should then be reflexively sensitive to cultural specifics (Haase, 2017; Albert et al., 2021; Nunes et al., 2021; Seddon et al., 2021; van der Jagt et al., 2022) as well as to intersectional challenges related to socio-environmental justice, biocultural diversity, race and gender (Kaeser and Willcox, 2018; O'Brien, 2018; Basnou et al., 2020; Cousins, 2021; Sekulova et al., 2021). Toxopeus et al. (2020) investigated the justice implications of hybrid governance models for delivering urban NBS, in which not only members of the public but also private sector interests are included in governance, and found that they lead both to deterioration and improvement of justice outcomes. Deterioration of justice outcomes can be related to the prioritization of projects that serve high income groups, or displacement of vulnerable segments of the population when urban greening increases housing rents in the area (Toxopeus et al., 2020).

Certainly, public involvement may draw NBS solutions in different directions and not always the direction idealized in some of the literature (Puskás et al., 2021; Kiss et al., 2022). Wamsler et al. (2019) observed that the most vocal participants in their case studies were there to oppose the NBS proposals and instead demand increased car access and parking spots. The assignment of roles within NBS projects is highlighted as an area requiring further development (Arlati et al., 2021; Malekpour et al., 2021). Cárdenas et al. (2021) found that programmes for involving people in learning about and monitoring NBS need not be restricted to spatial proximity to projects, opening opportunities to expand inclusiveness. Common success factors across contexts include polycentrism (Zingraff-Hamed et al., 2021) and platforms to negotiate questions of valuation in more holistic terms (Cousins, 2021; Kiss et al., 2021; Mok et al., 2021).

Critical perspectives, although broadly supportive of the idea of participation, have examined potential downsides or weaknesses in participatory approaches. As several have shown, there is potential for participation to deteriorate trust if the participants do not feel their contributions or opinions made any impact (Collins and Ison, 2009; Cook et al., 2013; McEwan, 2019; McEwen et al., 2020). A related challenge with participation is that institutions, from municipal governments all the way up to the European Commission, require that problems and solutions are already well-defined in order to receive funding (O'Sullivan et al., 2020; Sareen et al., 2021). In this way the space for substantive participation has been limited from the start, and the result may be that participation serves to weaken the legitimacy of NBS governance. While there is a large body of planning literature advocating for more participatory processes, there is a perception amongst many planners and policy makers that deeper participatory processes might hinder rather than improve the development of projects (Raymond et al., 2017). Furthermore, a selection bias toward successful examples of participatory NBS has been identified in the literature leading to a lack of knowledge about the downsides and failures of participation processes in NBS (Wamsler et al., 2019; Enqvist et al., 2020).

Some scholarship in the critical perspective has investigated the potentials and limitations of co-production in the form of stewardship, as a particular form of socio-nature relation in which civic groups manage ecosystems in cooperation with public institutions and disseminate knowledge about the links between social and ecological systems and wellbeing to wider publics (Connolly et al., 2013; Enqvist et al., 2019; Tozer et al., 2020). A core idea behind this, according to Tozer et al. (2020), is that stewardship creates a different mode of relating to nature, and fosters ownership. Nature-driven stewardship initiatives have shown some promise for introducing new participants to urban nature governance and thereby diversifying the range of views on what nature is and how we may value, protect and instrumentalize it toward adaptation needs and intergenerational equity goals (Enqvist et al., 2019; Tozer et al., 2020; Cárdenas et al., 2021). At the same time, stewardship can also be subsumed under neoliberal ideologies involving notions of the good citizen and state roll-back (Tozer et al., 2020).

In other words, there are ideas and proposals for participation within NBS whereby participation goes way beyond the invited spaces of limited types of public participation. Studies of actual practice, however, seems to suggest that that participation is not without its trade-offs, especially for many of the "vulnerable" or "marginalized" groups that equitably minded participatory processes have been directed to engage with (Kabisch et al., 2016; Seddon et al., 2021). Participation in formal planning processes requires surplus resources in the form of time, energy and care—externalities which are gendered and often in short supply among the most vulnerable people (Cohen-Shacham et al., 2016; Kaeser and Willcox, 2018). There is also scope for more financial and other types of support from government agencies for privately initiated or self-organized community participation in creating and maintaining NBS outside of formal processes (Wamsler and Raggers, 2018; McEwen et al., 2020). Overall, we find that it is unclear whether the use of advanced participation techniques, such as coproduction and codesign, has been able to overcome the tendency for the ideals of NBS to be subsumed under the more instrumental goals of the governance system of which these solutions are part. When subsumed under

instrumentalizing NBS discourse, participation risks treating symptoms (need for input from the public) while leaving underlying causes (skewed power relations) unaddressed.

In what follows, we will extend this critical reading of the mainstream NBS discourse and bring it into conversation with scholarship concerning the relationship between cities, nature and societal change. More specifically, we will situate this literature in an argument for commoning as an approach for rethinking the democratic and transformative potential of NBS. Arguably, this approach has the potential to move us beyond the instrumentalization of nature inherent to mainstream NBS, and locate, within diverse strands of theory, a conceptual trajectory that might mobilize NBS in the composition of different socio-ecological worlds.

Beyond the instrumental—toward NBS for the commons?

Building on the insights from the critical perspective on NBS, we will now propose a pathway for reclaiming NBS as a potentially radical idea for societal change toward urban sustainability. This means moving beyond the instrumental way in which nature is conceived as "solutions," and to instead considering how core ideas of NBS can play a role in generating new social configurations comprised of humans (Frantzeskaki, 2019; O'Sullivan et al., 2020) and more-than-humans (Tsing, 2015; Welden et al., 2021). Our starting point is the premise that nature is neither passive nor external to human society. The promises of NBS rest on making space for, and inviting collaboration with, nature in the city. As an illustration, we might think of flipping the narrative of integrating nature into cities, and rather integrate cites into nature—what Kos (2008) terms the shift from "nature in cities" to "cities in nature." In our perspective, such a framing has the practical benefit of rendering visible the multiple ways urban metabolisms outsource their ecological costs and carbon emissions.

It is helpful to overcome the clear demarcations between on the one hand, more-than-human nature and its uncontrollable wildness, and on the other, the city and the idea of ultimate human control of its surroundings. We are increasingly trained to the idea that the ideal urban space is a censored, "smart" and disciplined environment (Townsend, 2013). While most cities are not (yet) very "smart," the urban infrastructures in most modern cities manifest a strong cultural separation of nature and city. It is this conceptual separation that supports the assumption of nature as an externality to the modern environment, and of nature as best managed and hidden. Modern urban infrastructures serve to hide the relationship between nature and the city, rendering invisible the way nature fundamentally shapes conditions for society. Arguably, herein lie the ontological assumptions of the Anthropocene, as nature controlled by human agency and planning. To the contrary, the city is always a process of transformed nature, a metabolic transformation of nature through human labor, where the city turns into a "hybrid" of the natural and the cultural, the environmental and the social (Swyngedouw, 1996; Kaika and Swyngedouw, 2011).

Overcoming the sharp city-nature dichotomy can help us make the potential of NBS visible. Many scholars have understood transformative climate adaptation as "a cultural shift from seeing adaptation as managing the environment "out there" to learning how to reorganize social and socio-ecological relationships, procedures and underlying values "in here" (Pelling, 2011: 88). Thought in this way, NBS can create a certain type of disturbance of our human-controlled urban environment—a good kind of disturbance that may open up for renewal of the system and emergence of new trajectories (Folke, 2006: 259). Acknowledging this fact, Haraway and Tsing (2019: 14) urge us to, start thinking about our situation in a way that includes plants, animals, and microbes.

Building on these perspectives, NBS can potentially mobilize a wider cultural shift by better integrating urban lives with natural processes. While this may seem overly optimistic, there is broad agreement among scholars of the Science and Technology Studies tradition, for example, that infrastructures shape our social and cultural practices and in turn our way of seeing the world (Winner, 1980). Jensen and Morita (2017) propose infrastructures as ontological experiments with the potential to engender new forms of sociality, transform landscapes, shape politics and shake up the relationship between subject and object. These reconfigurations occur because infrastructures organize material flows and mediate social practices in space and time.

Therefore, arguably it is not too far-fetched to think of "city in nature" (Kos, 2008) as an infrastructural shift that potentially mobilizes social and cultural practices conducive to more sustainable forms of living and even socio-ecological transformation. Obviously, it not something that will occur by itself if we just put more nature into our cities—that is too simplistic. Rather, integrating nature into the city must form part of a wider political project that also overcomes problems of instrumentalization, solutionism, and limited public participation that we discussed in the previous section. Here we argue that *commoning* is one political project that has such a potential.

Commoning as a transformative trajectory for NBS

The notion of commoning has emerged in the literature over the past decade to describe processes of social organizing around the common use of resources, public goods and sustainability (Linebaugh, 2008; Helfrich and Bollier, 2015). Commoning involves processes that work against enclosure, privatization, and regimes of scarcity to affirm abundance through collective

ownership and use of resources. Commoning recognizes that the translation of nature into commodity creates new avenues for capital valuation and accumulation (Gomez-Baggethun and Ruiz-Perez, 2011; Kull et al., 2015) that are ultimately incapable of equitably satisfying social and ecological needs. It is about finding other methods of valuing and exchanging resources in ways that are vital to the pursuit of equitable and sustainable futures.

As such, the concept and practice of commoning can be understood in contrast to the instrumentalization and commodification of nature we identified as a challenge in the mainstream discourse in the previous section. Instead of conceiving of nature as "solutions" or resources fulfilling particular needs and priced through their market exchange values, nature may be valued for its contribution to public goods and ecological sustainability. As Gibson-Graham et al. (2016) point out, we should avoid seeing commoning as simply the opposite of capitalist privatization, or to limit commoning to a particular set of governance norms. Rather, it should be seen as a relational process of "negotiating access, use, benefit, care, and responsibility" (Gibson-Graham et al., 2016: 195). Currently, understandings of commoning go beyond Ostrom's (1990) focus on common pool resources governed by "members," to include more fluid forms of participation suited to the urban commons (McCarthy, 2005; Gidwani and Baviskar, 2011; Huron, 2015). Berlant (2016) describes the "commons" as a collective imaginary underlying much contemporary political theory and action, such as the global Occupy movement and the antiausterity movements in Europe, Latin America and South Asia—all questioning society's current organization and distribution of wealth.

This conceptual linkage between urban commons and NBS has already been made by several scholars (Wamsler and Raggers, 2018; Frantzeskaki, 2019), and several commoning scholars have reported case studies on projects that fall under the umbrella of NBS (community gardens, eco-rings, food sharing, urban parks). Notably, Frantzeskaki (2019: 102) argued that NBS "create novel ecosystems that require multi-actor collaborations for their design and sustainability. As such, nature-based solutions create new green urban commons."

In our conceptualization of commoning, it not only points to new ties among disparately located and unequally precarious lives but also marks the need for a collective struggle to determine the terms of social and ecological transformation; posing the question: *what is to be sustained and for whom*? Commoning may offer solutions for minimizing the negative economic impacts from climate change in equitable and inclusive ways although this is not necessarily the case (Nightingale et al., 2019). Commoning is often used to describe actions outside of states and markets or mobilized as part of a utopian ideology to resist the state and capital (Helfrich and Bollier, 2015). While others may hold that the state is integral to commoning because the state provides the governing context within which commoning projects occur and has the power to undermine or undo commoning projects (Bollier, 2016). Furthermore, state actors can facilitate commoning through administrative and financial support (Van der Jagt et al., 2017; Wamsler and Raggers, 2018) as well as delegating space (Gilmore, 2017).

While the project of commoning has the potential to reinvigorate utopian imaginaries and practices of provisioning and distributing resources as well as forming social networks for adapting together, we are alert to the many potential pitfalls and weaknesses of the concept as well—particularly as it is coupled with NBS. We do not assume that commoning resolves all power imbalances at play in social-ecological configurations. Processes of scaling up (Bouzarovski and Haarstad, 2019) or "mainstreaming" (Wamsler and Raggers, 2018) local initiatives are complex and fraught with dangers of co-optation and dilution (but see Buijs et al., 2019). The literature on commoning mostly focuses on the Global North, while a broader geographical focus might reveal a diversity of projects across the world.

Another potential pitfall of commoning approach is responsibilization, shifting responsibility to members of the public in ways that align with austerity politics and state retreat (Perkins, 2009). Urban sustainability transition literature has raised concerns about the redistribution of responsibilities for environmental planning and implementation from state-driven agendas to corporations, non-profits and public groups (McClintock, 2014; Nightingale et al., 2019). As many scholars have argued, municipalities, nation states and international governance bodies have an important role to play in coordinating, integrating and connecting public-led initiatives to ensure they work together toward NBS goals and climate change adaptation. Leaving these institutional tasks to conscientious individuals and community groups may create fragmentation and social differentiation (Buijs et al., 2016).

Finally, we may add the complex role of expert knowledge in NBS, and the importance of ecological expertise in sustaining NBS in urban spaces. This adds a tension in NBS and the commons, between expert knowledge on the one hand, and public participation and democratic decision-making on the other. Urban infrastructures can be intensely complicated, not only materially but also in terms of their regulation, planning, administration, funding, safety and maintenance. This means that expertise and bureaucratic procedures are necessary, which needs to be weighed against democratic concerns in participatory processes.

What does commoning mean in the context of NBS?

As other authors have pointed out, public participation in NBS is an opportunity to recreate public goods and democratic use of resources in cities. It is not the task of this paper to

sketch concrete interventions *per se*, but we would like to propose some avenues for thinking about how using NBS in a commons perspective has practical implications. Arguably, the seeds of such transformation already exist in practice. There are multiple cases of how strong synergies and co-benefits between public engagement and NBS has created inspiring solutions for common benefit, documented by projects such as *NATURVATION* (Hörschelmann et al., 2019) and *Sharing Cities: Activating the Urban Commons* (Shareable, 2018). As these cases illustrate, when cities work nature into their environments, they may at the same time create spaces for shared social practices, engagement of the public and improve access to resources. Public parks, community gardens, green spaces between buildings, access to urban rivers, canals and beaches, and urban forests are instances where NBS opens for greater degree of common access, benefit and multi-actor decision-making.

What scholarly analysis can contribute, we would hold, is a framing for conceptualizing and thinking across these interventions. By putting forward the commoning approach we intend to shed light particularly on NBS framings that counteract privatization and instrumentalization of nature. Here we will briefly point to three benefits of the commoning approach that can help avoid problems of NBS that we identified in the previous section. These benefits are equality of access, public or shared resources, and distributed benefits.

Firstly, commoning NBS opens for considering the importance of *equality of access*. Commoning NBS can help urban governance counteract the tendency for privatization and enclosure of urban space by designing solutions that help return urban space to all city dwellers. Public parks are perhaps the ultimate example of these contrasting terms of access over urban spaces—while residential areas surrounding parks are often highly priced due to the attractive locations and proximities to green spaces, the public parks themselves may provide access to recreation and nature experiences for the wider population (of course mediated by distances people have to travel to get there, and the structural inequalities involved in that, as well as the various ways public and state ownership of public parks are managed). In turn, NBS designed in a commons-perspective can return places and areas of cities to the public. In a more abstract sense commoning NBS opens for a greater equality of access to the metabolic flows of nature. Rather than closing natural processes of, either from the city itself or from public access, commoning NBS may involve a wider set of the population in the flows of water, energy, nutrients, matter, people, wealth, and waste that partially constitute a city.

Second, commoning NBS advances solutions based on *publicly owned or shared resources*, and correspondingly open processes of decision-making. As examples of community gardens illustrate, NBS can create significant co-benefits with public and shared ownership and inclusive decision-making (Shareable, 2018). Giving people a stake in resource management and an opportunity to take part in decision-making can enhance a sense of stewardship (Tozer et al., 2020) and citizenship (McEwen et al., 2020). The Sharing Cities project, in its collection of 137 case studies, shows that sharing projects can catalyze broader engagement and "civic imagination"—visions of what "ordinary people can do" when personal interests and the common good are aligned (Shareable, 2018, p. 27). This is, in turn, closely related to processes of decision-making. To Tzoulas et al. (2021), the need to integrate both cooperative and competing interests in the implementation of NBS necessitates the creation of diverse decision-making arenas. Kvamsås (2021) argues that implementing NBS in ways that takes advance of the opportunity for co-benefits require cross-sectoral and inclusive decision-making that go beyond the technical solutions themselves. In other words, while managing NBS can be complex, this complexity in governance can also have positive co-benefits when city dwellers experience ownership and stewardship of the resources, and when open decision-making processes enable public engagement in this stewardship (McEwen et al., 2020; Tozer et al., 2020; Kvamsås, 2021; Tzoulas et al., 2021).

Third, commoning can arguably improve the *distribution of benefits* from NBS. As we recounted in Section NBS in mainstream and critical literature, the benefits from NBS are typically discussed in a positive sense, without sufficient attention to the maldistribution of these benefits or how NBS may have adverse affects. NBS may increase housing prices, stimulate gentrification or push out other services that people rely on (Anguelovski et al., 2022). Commoning may not necessarily guarantee against these negative effects. But through its broad-based ownership and decision-making ideals, commoning is arguably conducive to a broader distribution of benefits from NBS. This follows from our point about equal access and shared ownership, but we want to point out that distribution of benefits can also accrue to others than those who directly take part in sharing or decision-making. Projects highlighted by the NATURVATION project illustrate this—for example an organic community garden in Utrecht, the Netherlands, provided social care to vulnerable people with support needs (Hörschelmann et al., 2019). Similarly, community garden initiatives we have looked into in have provided social care and educational opportunities for school children and kindergartens (see Wågsæther and Haarstad, 2021).

We do not mean to suggest that commoning is a panacea for sustainability, as it may not be sufficient to counteract green gentrification, for example (Anguelovski et al., 2022). However, we have aimed to show that commoning NBS can arguably facilitate a spreading of benefits from natural amenities, while open decision-making processes can help mediate the adverse distributional effects.

Conclusion

In this critical review of the literature on public participation in NBS, we took a point of departure in what we termed the mainstream perspective on NBS. The NBS approach has been established as an umbrella concept covering various strategies for urban sustainability. The importance of public participation is typically emphasized by most approaches to NBS, but participation can mean different things. Our review drew together perspectives from a number of scholars who pointed to problems of participation and the dangers of instrumentalization of nature inherent to the mainstream approach. We discussed this in relation to theoretical contributions critiquing how nature has been enrolled into the economic domain—or *instrumentalized*. In particular, if public participation becomes part of this enrolment, then democratic and justice potential of participation may be significantly circumscribed. Our aim has not been to condemn instrumentalization itself, since using nature for co-benefits in cities necessarily instrumentalizes nature to some extent. Rather, the critique we discussed has primarily been aimed at the enrolment of NBS into the paradigm of economic growth, privatization and enclosure of urban space. Against this backdrop, we reviewed experiences with public participation in NBS from a wide range of studies and found that there is a proliferation of advanced public participation and engagement techniques in operation. It remains unclear, however, whether these advanced participation techniques are able to counter the instrumentalizing tendencies of the mainstream NBS discourse.

Nevertheless, we maintained that integration of nature in cities is potentially a radical idea that may play an important role in societal change toward urban sustainability. Drawing on ideas from the socio-ecological transformation literature, we brought in perspectives on how nature in urban environments can create positive forms of disturbance that may advance renewal of urban systems and stimulate the emergence of new trajectories. Participation in NBS contributes to transformative change when it moves beyond legitimation and consensus exercises and toward redistributing power and responsibility. Additionally, we argue that transformative NBS involves learning the value and co-benefits of ecosystems beyond a transactional ideology that recognizes only nature which is exchanged through markets as productive. We argue, with inspiration from critical literatures on NBS, that commoning is one approach that can help realize this. The concept stands in contrast to instrumentalization, and instead values nature for the regenerative relationships we may form through multi-species collaborations. These relationships are seen as contributing to public goods and ecological sustainability.

Reflecting on the potential of commoning as an approach for realizing NBS in cities, we emphasize equality of access, public or shared resources and distributed benefits. We recognize the danger that commoning may be another way to create a romanticized version of NBS. That is not our intention. It is key to recognize that there will always be trade-offs, conflicts and competing agendas behind NBS—even in interventions organized as commons. It is critical to hold open the question of how humans might organize themselves to share resources and how relations with more-than-human nature in cities might generate adaptive capacity in the context of rapid climate change.

Author contributions

DR conducted the majority of the literature review and wrote the first draft. HH initiated the article, wrote the complete draft, and finalized the article. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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