



Operationalizing the Nature Futures Framework to Catalyze the Development of Nature-Future Scenarios

# Identifying nature-positive futures in new cities: an application of the Urban Nature Futures Framework

Shaikh Fairul Edros Ahmad Shaikh<sup>1</sup>  · Perrine Hamel<sup>1</sup>

Received: 2 November 2022 / Accepted: 28 August 2023  
© The Author(s) 2023

## Abstract

With the increasing loss of biodiversity due to urbanization, it is essential to examine and re-imagine the place of nature in cities. The opportunity to redesign positive relationships between cities and nature is particularly apparent in the development of new cities—rapidly developing areas observed in many Asian and African countries. As these new cities are built on a perceived tabula rasa, there is a potential to design positive nature futures. This study, therefore, aims to understand how nature is incorporated into existing plans for new cities and identify pro-nature perspectives envisioned within these plans. We use the Urban Nature Futures Framework (UNFF) to conduct a content analysis on the masterplans of new city and town developments within the Jakarta Metropolitan Area (JMA). The UNFF promotes the creation of multiple positive visions of nature in cities by considering three broad nature perspectives: Nature for Nature, Nature for Society, and Nature as Culture, as well as emphasizing equity in these visions. Our findings show that the Nature for Society perspective tends to dominate the design of new cities in the JMA, closely followed by the Nature for Nature perspective embodied by pollution control measures. New cities also emphasise the Nature as Culture perspective through nature stewardship programmes. Based on these results, we exemplify how the UNFF can be used to further integrate nature elements in new cities' masterplans. We conclude with a discussion of the strengths and limitations of the framework at each stage of the new city development process.

**Keywords** Nature futures framework · New towns · Private cities · Masterplans · Indonesia · Jakarta

## Introduction

Urbanisation drives biodiversity loss both directly and indirectly. Direct drivers occur largely through habitat loss due to land use change and habitat fragmentation through infrastructural developments such as roads (IPBES 2018). Indirectly, urbanization increases the density of people whose consumption patterns may lead to more resource use and extraction (Satterthwaite et al. 2010). Given the decline

of biodiversity due to unsustainable urbanisation, there is a need to envision positive nature futures for urban areas (Mansur et al. 2022). Creating desirable, nature-positive futures requires thinking of scenarios and actions that improve biodiversity and nature's contributions to people while considering the multiple values that are related to nature (IPBES 2022).

To address the need for more nature-positive futures in urban areas, the Urban Nature Futures Framework (UNFF) was developed to account for the diverse values of nature in urban areas (Mansur et al. 2022). The UNFF builds on the Nature Futures Framework (NFF) which identifies three broad nature perspectives: (i) Nature for Nature (NN), (ii) Nature for Society (NS), and (iii) Nature as Culture (NC) (Pereira et al. 2020). NN focuses on the intrinsic value of nature—i.e. nature is valuable in itself, independent of people. This perspective focuses on enhancing and protecting ecological systems through conservation irrespective

---

Handled by Shizuka Hashimoto, The University of Tokyo, Tokyo Daigaku, Japan.

---

✉ Shaikh Fairul Edros Ahmad Shaikh  
shaikhfa001@e.ntu.edu.sg

<sup>1</sup> Asian School of the Environment and Earth Observatory of Singapore, Nanyang Technological University, Singapore, Singapore

of human benefit. NS, on the other hand, emphasises the instrumental benefits that nature provides to people, such as ecosystem services. Finally, NC highlights the relational value between people and nature (Chan et al. 2018). Within the NC perspective, people live in harmony with nature and practise care for the environment. In many cases, environmental decisions and policies contain a combination of these three perspectives.

The NFF can either be used as a scenario development tool to identify pathways to more nature-positive futures (the “state space”) or as a heuristic tool to assess how policies and initiatives contribute to different nature perspectives (the “policy space”) (Kim et al. 2021). The NFF has recently also been applied in different contexts such as assessing biodiversity management for climate adaptation in Africa and South America (Palacios-Abrantes et al. 2022), creating scenarios for forests in light of urban growth in Brazil (Lembi et al. 2020) and water management modelling (Kramer et al. 2023). The NFF has also been creatively used to explore future scenarios in fictional works related to African futures (Lavery et al. 2022) as well as to develop future narratives for the High Seas through storytelling (Pereira et al. 2022).

While scholars highlight the potential of the NFF in the planning process, to better understand and communicate socio-ecological systems’ dynamics, they also highlight an important limitation of the framework: applying the NFF operationally to inform decisions beyond a visioning exercise (Mansur et al. 2022; Palacios-Abrantes et al. 2022). In the urban context, Mansur et al. (2022) recognise the onerous step of finding adequate indicators for each of the nature perspectives. For the NC perspective, in particular, “cities themselves [would] need to develop a set of indicators to monitor progress across different neighbourhoods and communities within the city”. While this process would enable inclusivity and participation, it also implies a long and uncertain journey towards incorporating the UNFF in decision-making. Which decisions the UNFF could inform is also left open, calling for further work to investigate how, in practice, the framework could inform urban planning.

To explore the practical uses of the framework to inform urban planning, we apply the UNFF to investigate nature perspectives promoted by masterplans of new cities, using the case study of the Jakarta Metropolitan Area (JMA), Indonesia. We use ‘new cities’ as a collective term to refer to various masterplanned developments such as new towns, satellite cities, private cities, etc. (Moser and Côté-Roy 2021). Many new cities are developed on greenfield sites in rural or peri-urban areas, or acquired land from existing settlements (Zoomers et al. 2017), which allows these cities to be developed from a ‘blank slate’ and is seen as an opportunity to incorporate environmentally friendly infrastructure and modern best practices in urban planning (Watson 2014). Furthermore, many of these new cities are

often led and managed by private sector actors (Firman and Fahmi 2017). For example, in 2020, the Indonesian government announced plans to develop a new city in Maja, Banten province, with the aim of slowing down urban sprawl as well as promoting economic development (BAPPENAS 2020). A large portion of the new city of Maja is being developed and managed by Ciputra Group, focusing on compact and transit-oriented development (TOD), and has won an award for the implementation of efficient green buildings in its residential clusters (Citra Maja Raya 2020; Iswara 2019). As future models of urban development, it is important to examine new cities’ varied nature perspectives and the type of infrastructure or initiatives that private developers promote as part of their environmental commitments.

Using the UNFF, we examine the masterplans of new cities in the JMA using content analysis and aim to address the following research questions:

- What are the predominant nature perspectives in these new cities?
- What are the themes (initiatives, motivations) within each nature perspective?

In addition to these research questions, we highlight how the outcomes of our analysis can potentially be used to redesign masterplans of new cities and discuss some uses of the UNFF at different stages of urban planning and development.

## Methods

### Sampling new cities and content scope

Since the late 1980s, new cities have been developed in the Jakarta Metropolitan Area (JMA) by large private property developers in Indonesia (Herlambang et al. 2019). As these new cities are built on large areas of land acquired by these developers (usually more than 1000 hectares), these cities differ from traditional urban areas in Indonesia as they tend to be highly masterplanned and are solely managed by subsidiaries of these property developers—with little intervention from the government (Dieleman 2011; Herlambang et al. 2019). Up until 2016, 27 new cities have been documented in the JMA (Herlambang et al. 2019). From the list of documented cities, we identified the types of documents available for our analyses. Detailed masterplans and technical documents are rarely publicly available for these new cities. Despite the data limitation, we identified five publicly available data sources on new cities: (1) new cities’ websites, (2) sustainability reports, (3) corporate annual reports, (4) maps and development layouts, and (5) corporate promotional videos. Comparing these different sources, we found

that, minimally, each new city development will have a website describing the development project. However, websites were found to have varying levels of detail when providing information on new city plans and initiatives. In contrast, sustainability reports provided the most detail on the initiatives and future directions of each city but were limited as we only found six developments that had sustainability reports. All the sustainability reports were recent for either the year 2021 or 2020. As such, our analyses focused on the websites and latest sustainability reports of those six new cities (Table 1): Bumi Serpong Damai (BSD), Delta Mas (DM), Jababeka (JBK), Lippo Cikarang (LC), Sentul City (SC), and Summarecon Serpong (SS).

## Content analyses

### Data preparation—unitization of text

The first step in content analysis is to determine the unit of analysis. In textual content analyses, units will determine how the text will be broken down into parts and analysed (Krippendorff 2019). Units of analysis for our study are sentences in websites or sustainability reports that relate to the environment. We define “environmentally related” as planned or existing actions or initiatives that directly or indirectly affect the quality and quantity of the environment within the new city development. These would also include social and technological aspects such as community programmes, institutional arrangements, infrastructure, and urban designs. Each unit would convey a single initiative or idea. We also excluded text that did not pertain to the city and its surrounding areas or if the scope of the initiatives only focused on internal activities (i.e., only their corporate offices or involving only their employees).

We prepared the data by extracting all the text from each website and compiling it into a single document. We left the text in the original language (i.e. either English or Bahasa Indonesia) prior to coding. All text in the sustainability reports had text in Bahasa Indonesia with a corresponding English translation; we used the English translation when coding the sustainability reports. Using our definition of environmentally related units, the text was first extracted independently by the first author and another coder with

expertise in urban planning in Indonesia. Each extracted unit was then compared by the coders to ensure agreement in identification and prevent sentences from being left out. Unlike some content analyses that calculate unitizing reliability i.e., the level of agreement between coders for determining units (Neuendorf 2017), we did not calculate this statistic as the total number of units ( $n = 330$ ) was manageable for us to go through the entire sample and correct any disagreements between coders. After the units for analysis were finalised, we translated the units that were in Bahasa Indonesia into English.

### Coding of units—category creation and assigning nature perspectives

Due to the lack of indicators in the UNFF, it was challenging to code the units consistently and directly into the three nature perspectives. To simplify the coding process, we first assigned each unit a category based on the main topic of its content. Categories here refer to the specific initiatives, actions, and objects mentioned in the text. We identified these categories by grouping units with similar topic. The categories were developed using a grounded theory approach where categories are produced inductively and emerge from the prevailing data (Barona 2023). Examples of these categories are waste management, energy efficiency, habitat restoration, etc. (Supplementary Info, Table S1). At the end of the coding process, we identified a total of 17 categories.

From our list of categories, we then coded them into one or more of the NFF perspectives: NN, NS, and NC. We operationalised these nature perspectives in the content analyses using the guiding descriptors in Table 2. These descriptors were developed based on the UNFF definitions and urban-related themes from NFF workshops (Mansur et al. 2022; Pereira et al. 2020). For each category, we determined what nature perspective would be assigned based on our guiding descriptors by considering the downstream impact of various initiatives and their contribution to each nature perspective. This approach aligns with the suggestion by Mansur et al. (2022) to consider the socio-ecological feedback of initiatives. We provide the rationale for the allocation of NFF perspectives to each category in the Supplementary Information (Table S1). Some units may contain multiple categories

**Table 1** The developer, size, and location of the new cities analysed in this study

Project	Developer	Area (ha)	Location (regency/city)
Bumi Serpong Damai (BSD)	Sinar Mas Land	6000	South Tangerang
Jababeka (JBK)	Jababeka Group	5600	Bekasi
Lippo Cikarang (LC)	Lippo Group	3250	Bekasi
Deltamas (DM)	Sinar Mas Land	3200	Bekasi
Sentul City (SC)	Sentul City Tbk	3100	Bogor
Summarecon Serpong (SS)	Summarecon Agung	750	Tangerang

**Table 2** Guiding descriptors for each nature perspective

Nature perspective	Guiding descriptors
Nature for Nature	Nature is intrinsically valued through the conservation, protection, and restoration of blue-green nature spaces and biodiversity to allow natural and ecological processes to occur with little to no human intervention within the city. Blue-green infrastructure within the city is also designed to enable ecological connectivity and improve habitat quality for biodiversity. Furthermore, any anthropogenic impact on nature is minimised or mitigated
Nature for Society	Nature has instrumental value to people through resource provision, improvement of health and well-being, environmental regulation, and risk reduction. Nature-based solutions can be implemented to address various issues faced by the city and aid with the transition toward a circular economy
Nature as Culture	Nature as culture emphasises the reciprocal and harmonious relationship between people and nature. People are seen as part of nature and nature as key in people's identity and culture. The role of nature in people's culture can be symbolic, through activities and practices, and/or physical spaces that promote social cohesion and a sense of place. New norms and mindsets which emphasise stewardship, care, and connection with nature is promoted

and will be assigned nature perspectives according to their categories. Assigning nature perspectives to each category requires us to understand the intent of environmental narratives found in the websites and sustainability reports. Having a clear statement of purpose or intent provides context for the underlying value system of an initiative or decision. For example, a unit that mentions initiatives to promote care for the environment clearly highlights a NC perspective. However, as these documents were not written with the NFF in mind, it is often challenging to tease out the precise nature perspective of each code due to the lack of the statement of intention or rationale. For example, we commonly encounter the mention of green space development—but without any context or a clear purpose for its development (see Supplementary Info—Table S2).

Therefore, in addition to the topical categories, we also grouped the units into (1) explicit, (2) potential, and (3) irrelevant. Explicit units refer to units with a clear statement of purpose or intent related to one or more nature perspectives (Supplementary Info—Table S1). Explicit units also included units that have a logical outcome for nature and/or people. Efforts to minimise pollution and waste, for instance, would lead to better environmental quality which benefits both nature and people. For such initiatives, we assign NN and NS perspectives. In contrast, potential units refer to units that do not clearly highlight a particular nature perspective (Supplementary Information—Table S2). In the example of green space development without any context or intention, it is possible to potentially assign all three types of nature perspectives. Green spaces, depending on their design, can be made to enhance biodiversity, provide recreational opportunities as well as promote a more harmonious relationship with nature (e.g. through cultural practices). Therefore, for these units, we identified them as “potential” and did not assign any nature perspective; they are dependent on the specifics of the initiatives and to assign any nature perspective would be highly speculative. Irrelevant units refer to units that are environmentally related but have no clear nature link. For example, we considered the distribution of water

supply to people in the new city as irrelevant as it focused on grey infrastructure without having a positive impact on nature or the environment. Both potential and irrelevant units were not included in the final analysis.

Given the above considerations, the coding process was initially conducted independently by the two authors. We selected a subset of the data containing all the units and used this dataset to first individually determine the categories that the units belonged to and the corresponding nature perspective(s) of those categories. We then proceeded to validate the first-round of coding by comparing the agreement between coders i.e., intercoder reliability (Neuendorf 2017). From this validation process, we developed specific coding rules that highlight how different categories are assigned to specific combinations of nature perspectives. We also document our rationale for the creation of these coding rules based on our discussions during the validation process. We then continued coding based on the coding rules for the rest of the dataset. We provide examples of how this was conducted in Table 3. The final coding rules and their justification can be found in Supplementary Information—Table S1. All units, their assigned category codes, and nature perspectives are provided in Supplementary Information—S3.

## Analyses

### Quantifying counts of nature perspectives and relative proportions by city

We then proceeded to tabulate the nature perspectives for each new city and compared their relative proportions (nature perspectives divided by total perspective for each city) to show the role of each nature perspective in shaping the new city masterplans and environmental narratives. The data analyses and visualisation were conducted using the R programming. Specifically, the counts for each nature perspective and their combinations were represented using an area-proportional Venn diagram using the `eulerr` package (Larsson 2022), while the relative proportions of nature

**Table 3** Examples of units identified, categories that were coded and the nature perspectives assigned to units and categories

Unit	Category	Nature perspective	Rationale
ID 172: The Company is committed to maintaining and conserving biodiversity in the operation area and its surroundings. The Company also ensures that it does not have a negative impact on biodiversity	E11: Nature conservation; enhancing and reducing impact on biodiversity; species protection	Nature for Nature	Initiatives in this category aim to protect nature and enhance biodiversity. These efforts primarily benefit nature (NN)
ID 1: Maximizing land area to develop a multifunctional space and facilitate residents and visitors with a greener and healthier living environment, for example RTH (green space), ...	E12: Green and blue infrastructure with specific cultural benefits to people: (i) focus on views (e.g. beautiful and natural views) and aesthetics, (ii) recreation, (iii) tourism, (iv) health and well-being	Nature for Society	Initiatives in this category provide cultural benefits that are primarily providing benefits to people (NS)
ID 229: Lippo Cikarang continues to emphasize the importance of awareness of environmentally friendly behavior, including wise and efficient use of electricity and oil fuel	E5: Nature education, community engagement, raising awareness, creating a green culture, corporate stewardship	Nature as culture	Such initiatives aim to raise environmental awareness of environmental impacts and promote stewardship and care for the environment (NC)
ID 242: Wastewater Treatment Plan (WWTP) responsible to manage waste across industrial areas to prevent polluting the surrounding environment	E1: Waste management, including wastewater treatment, composting, recycling, upcycling	Nature for Nature; Nature for Society	Proper waste management generally results in less waste released into the environment. This could lead to better environmental quality, benefiting both people (NS) and nature (NN)
ID 56: We have carried out several initiatives to reduce plastic waste internally and in collaboration with the community and the Tzu Chi Indonesia Foundation through outreach and training programs	E1 and E5	Nature for Nature; Nature for Society; Nature as Culture	Community-based programmes that have outreach programmes (NC) as well as are involved in reducing waste which aid in improving environmental quality (NS and NN)

perspectives within each new town were visualised using the package ggplot2 (Wickham 2011).

### Identifying key categories within nature perspectives

Using the categories that were identified for the units, we then determined the type of initiative with the highest frequency for each nature perspective and their combinations. We visually present the findings using the NFF triangle to organise the different initiatives within the framework.

### Methodological limitations

While our study attempts to provide a methodology for extracting NFF perspectives from masterplans using content analyses, it may not accurately reflect the nature perspectives held by actual stakeholders in the new cities. Beyond the coding by researchers, the content analysis codes could have been verified and calibrated through interviews or workshops with stakeholders such as the developers of new cities, communities within and surrounding these cities, and local governments working with the private developers. However, given the scope of this research, we were unable to conduct more in-depth assessments of their nature perspective and future research should consider calibrating the content analysis codes based on the relevant stakeholders' perceptions for a more robust assessment.

## Results

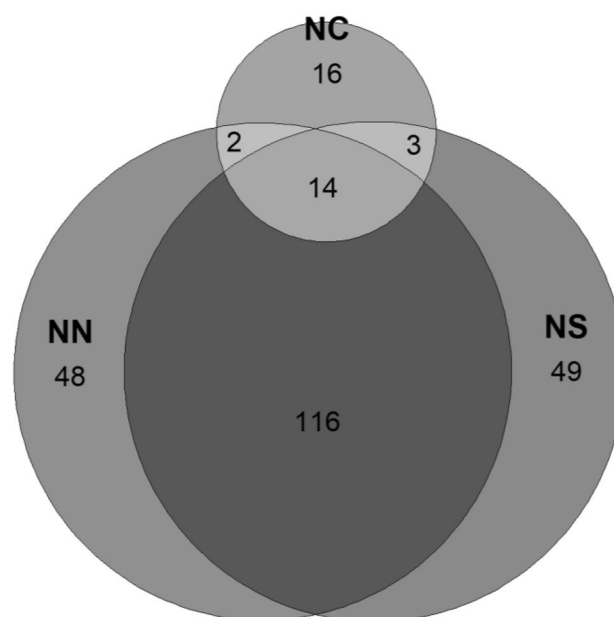
### Dominant nature perspective in new cities within JMA

The coding of environmental themes from the websites and sustainability reports of the six new cities produced a total number of 298 relevant codes. Within these relevant codes, 83.2% were explicit codes ( $n=248$ ) while the rest were potential codes ( $n=50$ ). We report the subsequent findings using only the explicit codes. The cities we analysed had varying counts of explicit codes with BSD having the highest ( $n=65$ ) and SS having the lowest with 22 codes (Table 4). The total and respective counts of each nature perspective can be seen from Table 4. The total count of nature perspectives differs from the count of explicit codes due to the presence of codes which contain multiple nature perspectives.

We observe that there are high and similar counts for total counts for NN and NS (Fig. 1). This is contrasted by the much lower total counts for NC-related codes ( $n=35$ ). Figure 1 highlights that the high counts in NN and NS are largely attributed to codes containing a combination of NN and NS. Codes that were categorised as both NN and NS

**Table 4** Counts for explicit codes of Nature for Nature (NN), Nature for Society (NS), Nature as Culture (NC) perspectives, and total nature perspectives

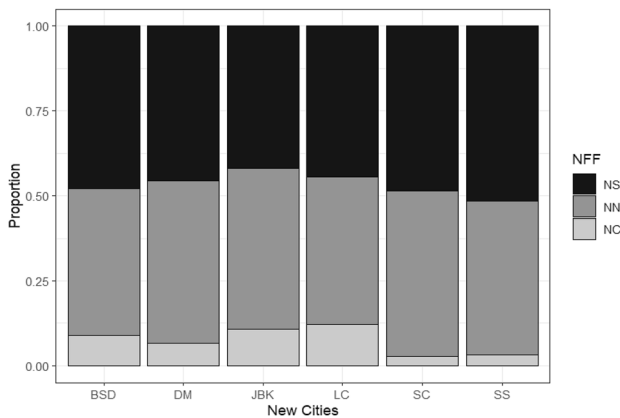
City	Codes	NN	NS	NC	Total perspectives
BSD	65	43	48	9	100
DM	30	22	21	3	46
JBK	56	44	39	10	93
LC	52	39	40	11	90
SC	23	18	18	1	37
SS	22	14	16	1	31
Total	248	180	182	35	397



**Fig. 1** Proportional area Venn diagram showing the total number of counts for each nature perspective: Nature for Nature (NN), Nature for Society (NS) and Nature as Culture (NC) as well as the counts of units with combined nature perspectives

make up more than 60% of the sum of codes for NN and NS (Fig. 1).

Across all new cities, we observe that on average NS is the dominant nature perspective which makes up about 46.7% ( $SD=0.03$ ) of total nature perspectives (Fig. 2). NN closely follows NS with an average proportion of 45.8% ( $SD=0.02$ ). In contrast, NC perspectives only have a relatively small proportion of total perspectives with a mean value of 7% (Fig. 2). When studying individual cities, however, we find that NS may not always be the perspective with the highest proportion. For example, cities JBK and DM have higher proportions of NN (47.8% and 47.3%, respectively) compared to their NS proportions (45.7% and 41.9%,



**Fig. 2** Relative proportions of each nature perspective [Nature for Nature (NN), Nature for Society (NS) and Nature as Culture (NC)] across the new cities analysed in this study: Bumi Serpong Damai (BSD), Deltamas (DM), Jababeka (JBK), Lippo Cikarang (LC), Sentul City (SC), Summarecon Serpong (SS). Relative proportion refers to the counts of each nature perspective divided by the total count of nature perspectives for each new city (see Table 3)

respectively). We also found that NC had the most variation across cities ( $SD = 0.04$ ) with LC having the highest proportion of NC perspective of 12.2% while SC had the lowest with 2.7% (Fig. 2).

### Themes within each nature perspective

Within the NN perspective, we found that habitat rehabilitation and nature conservation were common initiatives led by new city developers (Fig. 3). For these initiatives, they would ensure that their developments do not encroach into protected areas as well as conducting ecosystem rehabilitation programmes, often by revegetation and increasing plant species diversity. An example is Kota Deltamas (DM) which

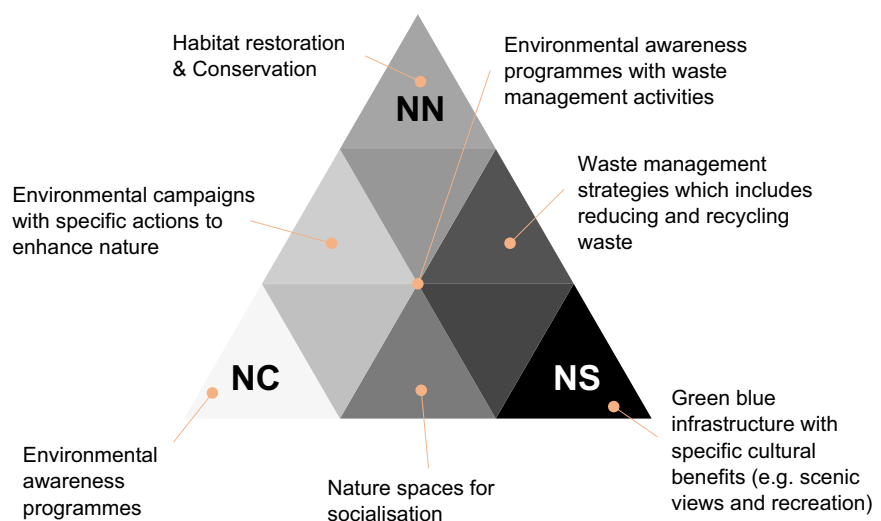
stated that the city has its own nursery which is used to cultivate seedlings for reforestation projects for areas within the city as well as in surrounding communities.

For NS, many cities highlighted the cultural benefits of nature such as its recreational and tourism opportunities, aesthetic value, and health benefits to people (Fig. 3). Sentul City (SC), for example, recognises correlation between health (both physical and mental) and park use. Therefore, the city emphasises the access to green spaces and claims that open green spaces make up 40–60% of their build area. In contrast, we find that regulating ecosystem services were sparingly mentioned. The few regulating ecosystem services mentioned focused on air quality such as greenspaces being the “lungs” of the city and carbon sequestration services that trees provide to help reduce carbon emissions.

When combining NN and NS, we found that the most common sub-theme was waste management strategies ( $n = 55$ ). Waste management strategies here include solid waste and wastewater treatment and management, recycling, upcycling, and composting. One of the seemingly more comprehensive waste management strategies was mentioned by SC which has its own Sentul City Recycling Centre which sorts out waste from residential areas and recycles both inorganic and organic wastes. The inorganic wastes could be used for craft materials for home industries while organic wastes were recycled into compost or liquid fertiliser. It is also worth noting that energy efficiency strategies were also commonly mentioned for NN and NS combinations ( $n = 22$ ) where technological solutions such as the use of LED lights in SS were mentioned as ways to reduce energy consumption.

Unlike NN and NS, NC categories had limited diversity in their approaches. Most NC activities tend to focus on environmental education initiatives to raise awareness and inculcate stewardship for the environment. For example,

**Fig. 3** Various initiatives that are associated with different nature perspectives and their combinations



LC conducts Lippo Cikarang Teaches—a programme which educates participants on plastic usage and its adverse impacts on the environment. Codes that contain both NC and NN were initiatives to have a community engagement element together with habitat rehabilitation strategies (Fig. 3). An example of this was the river rejuvenation strategy by JBK which involved communities and government agencies participating in the planting of vetiver seedlings during its Jababeka Ecoweek. However, we found very few codes that had the NC and NN combination ( $n=2$ ). The NS and NC combination was also limited ( $n=2$ ) often focusing on the communal role of green space for socialisation (Fig. 3). Codes that were categorised with all three nature perspectives commonly involved environmental campaigns which included educational sessions as well as waste management and energy-saving activities. BSD for example, under its Green Habit campaign has carried out plastic waste reduction efforts and outreach in collaboration with a community partner Tzu Chi Indonesia Foundation. These campaigns might not only help reduce waste going into nature (NS and NC perspective) but also may encourage participants to care more for the environment.

Activities and actions that were coded as having all nature perspectives ( $n=16$ ) tended to be environmental campaigns that were not only purely educational and raising awareness, but also included actual waste removal activities. Based on our coding rules, these activities would then be a combination of themes of environmental education (NC) as well as some form of waste management strategy (NN & NS).

## Discussion

### Prominence of nature for society perspective in new cities

Our study is the first, to our knowledge, to capture nature perspectives as conceptualised in the NFF in city masterplans. It reflects nature intentions stated by the developers rather than lived experience, and our results should be interpreted as such. Remarkably, we observed that the proportion of each nature perspective seemed consistent across the six new cities in JMA (Fig. 2). As expected, the majority of environmental information conveyed instrumental values, under NS. The predominance of instrumental values has been observed by other scholars in the nature-based solutions discourse (Bekessy et al. 2018; Randrup et al. 2020). It could explain why planners and architects—influenced by an international discourse promoting nature-based solutions in urban planning—emphasised these values.

Another reason for the predominance of NS values could be a communication bias towards values and elements that are more important for customers and clients. Emphasizing

the direct benefits of nature to local residents, from a NS perspective, appears to be a logical marketing strategy as having nature in these new cities has been documented as a desirable attribute for some new city residents in the JMA (Leisch 2002). Furthermore, hedonic pricing assessments in different cities have shown that the presence of and proximity to urban green spaces can have positive effects on property prices (Belcher and Chisholm 2018; Wu et al. 2015). This potential communication bias underlines a key limitation of our analysis—our results only highlight information from websites that could be biased in the messaging they would want to portray. Websites could reflect messaging for a more general audience—potential customers, city visitors, or tourists. More specific information on environmental plans such as climate mitigation could be found in technical documents such as sustainability reports which might cater to a different set of audiences such as investors and non-governmental organisations who might be interested in the risks and environmental performance of these cities. Indeed, the sustainability reports we analysed were readily translated into English, confirming the international audience they aim to reach.

Within the NS perspective, while cultural services were prominent, there were few mentions of regulating services such as carbon sequestration, or urban heat mitigation. This supports the claim that ecosystem services are still poorly integrated in the practice of urban planning and design globally (Frantzeskaki et al. 2019; IPCC 2019; Tardieu et al. 2021), and in Southeast Asia (Lourdes et al. 2021).

### Other nature perspectives

Intrinsic values were also quite prominent in the masterplans, demonstrating an awareness of the impacts of new cities' construction on biodiversity. However, we found that NN elements mainly comprised a reduction of environmental impact, with the dominant theme in NN elements being waste and pollution control (Fig. 3). However, urban masterplans could be more ambitious and transformative by promoting ecological restoration. For example, in Singapore, the parks authority (NParks) provides ecological information used in the city masterplans to promote development that enhances biodiversity (Chan 2019). Given that some of the cities in our analyses—and many others around the world—are built on agricultural landscapes (Firman 2000), there may be opportunities to restore biodiversity that has been lost to agriculture.

Although relational values were less prominent than the two others, they were still present in all new cities (Fig. 2). This suggests that the idea of “living with nature” (without referring to the explicit benefits from nature) is valuable and marketable. Connection with nature has shown to be associated with better psychological well-being for some



living in the JMA (Adiwena and Djuwita 2019). Furthermore, the prevalence of environmental stewardship initiatives could reflect the broader ethic of care for nature in Indonesia. Traditionally, indigenous cultures in Indonesia have emphasized the integral relationship between people and nature—therefore, the need to protect and care for nature (Maarif 2021; Pesurnay 2018). There have also been efforts to inculcate environmental stewardship through religious education highlighting the cultural importance of caring for the environment (Fua et al. 2018; Mangunjaya and McKay 2012). Through their various environmental stewardship programmes, these new cities complement their existing cultural attitudes towards nature. On the other hand, we acknowledge that the lower counts for NC units may reflect the intangible nature of this perspective. As noted in Table S1 and S2 in Supplementary Information, we acknowledge that some of the categories could have been coded as NC, but such coding was deemed too speculative to be incorporated in our “explicit” values.

### UNFF as a tool for enhancing nature-positive perspectives in masterplans

An important finding of our analysis was that different cities highlighted different themes within each perspective. The variety of themes highlights the diverse potential pathways for moving towards nature-positive futures from each of the three perspectives. By identifying common themes within each nature perspective, our study assembled a repository of initiatives that have been and will be carried out by new city developers (Supplementary Information—Table S1). This repository can be used to help us understand the nature-positive possibilities across various new city developments and can potentially act as seed ideas for other new city developments. In the context of masterplanning, planners could add elements from various themes, focusing particularly on

nature perspectives that are less represented, in particular from the NC perspective. This repository approach advances the potential of the UNFF, as proposed in its development stage (Mansur et al. 2022; PBL 2019), to inspire nature-positive futures through shared knowledge and practices.

While there are trade-offs implied by the elements pictured in Fig. 3 (e.g., the reforestation programme may reduce the availability of land for the development of recreational activities), the examples suggest that such enhancements to the masterplans can be resource-efficient, and aim for “win–win” alternatives where diverse values are emphasized. In other words, developers can select combinations of infrastructure and activities that, together, propose a vision that promotes diverse types of values.

We demonstrate how other types of nature perspectives can be included in masterplans by applying the findings to re-imagine alternative nature-positive visions for these new cities. Our findings suggest that a typical vision for new cities in JMA is one dominated by NS values: It entails blue-green infrastructure providing cultural services (e.g., recreational opportunities in parks, aesthetic value from green facades), and a suite of pollution control measures such as cleaner energy and waste management strategies (Fig. 4). Using it as a starting point, we exemplify how this “masterplan” can be re-imagined by adding elements from the two other perspectives. Elements in this vision would include the categories that were identified in the content analyses. With a focus on NN values, the masterplan would add elements of nature conservation and restoration, for example, reforestation of agricultural areas and creating habitats for native flora and fauna. The NN-focused masterplan would also emphasise a distinct separation between nature areas and urban developments to allow for nature to be left alone with little to no-interference from human activities. With a focus on NC values, such a masterplan would combine such activities with environmental awareness campaigns, for

**Fig. 4** Illustrative masterplan focusing on NS perspectives (top) and highlighting alternative designs based on NN and NC as key perspectives (bottom)



example engaging the community to plant trees and having more engagement in nature. These designs can be used as starting points for further consultative and participatory processes in the urban planning process.

### UNFF limitations

While our study demonstrates the usefulness of the UNFF in the context of masterplan analysis, it also highlights three main limitations. First, the framework says little about how ambitious a masterplan is with regards to nature integration. While JMA new cities appear to promote NS values, and while there are a total of 330 perspectives for all 6 cities, we do not know whether the vision they promote is, indeed, “nature positive”. Quantitative assessments of the benefits of urban nature are notably difficult. Recent attempts promoted by the Convention on Biological Diversity (Chan et al. 2021) or IUCN (IUCN 2022) highlight the challenges of using universal indicators to assess urban nature. While the UNFF was not developed for such quantitative assessment, its practical application in the context of masterplan analyses may be limited by the relative nature of the assessment. Only the relative proportion of NS, NN, and NC can be interpreted, as opposed to the actual ambition of integrating nature into masterplans.

A second limitation relates to the subjectivity of capturing nature values from published information, be it websites or sustainability reports. In the UNFF roadmap, Mansur et al. (2022) recommend that indicators for each nature perspective are selected collaboratively, with local governments and stakeholders involved in a visioning process. In using the UNFF as an analytical tool like in our study, we developed our own set of indicators (Supplementary Information—Table S1) to make the analysis robust and replicable. Yet our decisions remain somewhat subjective, relying on the authors’ interpretation of specific elements in the masterplans. The process was also time-consuming and may need to be expanded with the analyses of new masterplans. Our recommendation to strengthen this process would be to vet the matching of codes to themes, and themes to nature

perspectives (Supplementary Information—Table S1) with the authors of such masterplans. This could be done through explicit checks or interviews to infer the type of values motivating the design of the masterplans.

Importantly, our current analysis ignores two elements of the UNFF proposed by Mansur et al. (2022): social inequities and indirect impacts of cities, or telecoupling. Social inequities such as income disparity or racial segregation need to be regarded in environmental policies. For example, urban greening projects that ignore social equity issues may result in unequal distribution of environmental benefits such as green gentrification (Anguelovski et al. 2018). In addition, the inclusion of telecoupling in the UNFF accounts for the impact of an urban area on distant locations (Cui et al. 2020). Adding social equity and telecoupling to the three nature perspectives strengthens the UNFF as a heuristic tool to assess developmental trajectories and identify pathways to more positive nature futures. Yet, in the context of our analyses, identifying social inequities proved either irrelevant or challenging. On one hand, reflecting on procedural and recognitional equity, we posit that the masterplan visions we studied are not equitable, with no suggestion of a participatory and inclusive approach in the design process. Our content analysis, therefore, did not focus on this aspect. On the other hand, proxies we considered for distributional equity (e.g., accessibility of parks in masterplans, inclusivity of environmental programmes) felt inadequate, being more difficult to infer from masterplans than nature perspectives.

The limitations of our analysis, which focused on the planning stage, led us to consider the pros and cons of the UNFF at prior and future stages of project development. Table 5 below identifies which of the limitations are relevant to these stages. It appears that the UNFF is, by design, most appropriate for the first stage of visioning, with its potential to create nature-positive futures and identify trade-offs (Lembi et al. 2020; Palacios-Abrantes et al. 2022). It has important limitations for other stages, including the planning stage which we examined in this study, in that it fails to assess the overall performance, or ambition, of a

**Table 5** Strengths and limitations of the UNFF as a heuristic tool at different stages of the new city development

	Visioning	Planning	Implementation	Maintenance
UNFF potential	++	+–	–	+–
Strengths	Heuristic tool for creating inclusive, nature-positive scenarios	Potential heuristic tool to enhance “nature-positive” city design		Potential heuristic tool to enhance “nature-positive” cities, with incremental change
Limitations	Challenge to assess overall ambition	Challenge to assess overall ambition Challenge to find good indicators for each perspective	Challenge to alter development trajectory during the implementation process	Pathway dependencies or infrastructural lock-ins might limit potential for change highlighted by UNFF

city, and does not offer indicators. We note that other frameworks such as the recently developed IUCN's Urban Nature Index (IUCN 2022) are more appropriate compared to the UNFF to provide a more quantitative assessment of a city's performance. Our work, on the other hand, helps address the current lack of indicators for each nature perspective by providing a list of practical indicators one can use to operationalize the UNFF in the context of masterplan analyses.

## Conclusion

Our study shows how the UNFF can be used to identify the extent of different nature perspectives in new cities' masterplans in Indonesia. We showed that instrumental values (NS perspective), closely followed by intrinsic values (NN perspective) were predominant in the manifestations of natural elements embedded in the masterplans. In doing so, we demonstrated the practical use of the UNFF for such masterplan analyses. Using the framework, designers of future masterplanned cities can envision new development trajectories that incorporate diverse nature values for more positive nature futures. To help the UNFF gain wider applicability as a heuristic tool in urban planning, future research could focus on determining a set of indicators that hold in other geographies. We believe that our current list of UNFF categories can be a starting point to help develop these indicators. In addition, research on coupling the UNFF with more quantitative approaches to assess the actual performance of various nature-related initiatives can help to further improve the framework's practicality for designing and implementing nature-positive cities.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s11625-023-01411-3>.

**Acknowledgements** We would like to thank Sharifa Aulia Rosyida Irawan for her help with the coding of environmentally related text from the websites and sustainability reports. Special thanks to Nguyen Thi Nam Phuong for assisting us with the design of the master plans in Figure 4.

**Funding** This research is funded by the National Research Foundation, Prime Minister's Office, Singapore (award NRF-NRFF12-2020-0009).

**Data availability** All data generated and analysed during this study are included as supplementary information files.

## Declarations

**Conflict of interest** The authors also have no conflicts of interest to declare that are relevant to the content of this article.

**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are

included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

## References

- Adiwena BY, Djuwita R (2019) Nature relatedness as a predictor of psychological well-being: a study of Indonesian Urban Society. *ANIMA Indones Psychol J* 34(4 SE-Articles):175–187. <https://doi.org/10.24123/aipj.v34i4.2578>
- Anguelovski I, Connolly JJT, Garcia-Lamarca M, Cole H, Pearsall H (2018) New scholarly pathways on green gentrification: what does the urban 'green turn' mean and where is it going? *Prog Hum Geogr* 43(6):1064–1086. <https://doi.org/10.1177/0309132518803799>
- BAPPENAS (2020) Rencana Pembangunan Jangka Menengah Nasional 2020–2024
- Barona CO (2023) Eight recommendations to improve the reporting of qualitative social research in urban nature studies. *Urban for Urban Green* 84:127921. <https://doi.org/10.1016/j.ufug.2023.127921>
- Bekessy SA, Runge MC, Kusmanoff AM, Keith DA, Wintle BA (2018) Ask not what nature can do for you: a critique of ecosystem services as a communication strategy. *Biol Conserv* 224:71–74. <https://doi.org/10.1016/j.biocon.2018.05.017>
- Belcher RN, Chisholm RA (2018) Tropical vegetation and residential property value: a hedonic pricing analysis in Singapore. *Ecol Econ* 149:149–159. <https://doi.org/10.1016/j.ecolecon.2018.03.012>
- Chan L (2019) Nature in the city. In: Hamnett S, Yuen B (eds) *Planning Singapore: the experimental city*, 1st edn. Routledge, pp 109–129. <https://doi.org/10.4324/9781351058230>
- Chan KMA, Gould RK, Pascual U (2018) Editorial overview: relational values: what are they, and what's the fuss about? *Curr Opin Environ Sustain* 35:A1–A7. <https://doi.org/10.1016/j.cosust.2018.11.003>
- Chan L, Hillel O, Werner P, Holman N, Coetzee I, Galt R, Elmquist T (2021) *Handbook on the Singapore Index on Cities' Biodiversity* (also known as the City Biodiversity Index). Montreal: Secretariat of the Convention on Biological Diversity and Singapore: National Parks Board, Singapore. <https://www.cbd.int/doc/publications/cbd-ts-98-en.pdf>
- Citra Maja Raya (2020) Citra Maja Raya: Kelebihan Perumahan Dengan Konsep TOD. <https://www.citra-maja-raya.id/blog/citra-maja-raya-kelebihan-perumahan-dengan-konsep-tod>
- Cui X, Fang C, Liu H, Liu X, Li Y (2020) Dynamic simulation of urbanization and eco-environment coupling: current knowledge and future prospects. *J Geogr Sci* 30(2):333–352. <https://doi.org/10.1007/s11442-020-1731-x>
- Dieleman M (2011) New town development in Indonesia: Renegotiating, shaping and replacing institutions. *Bijdragen Tot De Taal-, Land- En Volkenkunde/j Hum Soc Sci Southeast Asia* 167(1):60–85. <https://doi.org/10.1163/22134379-90003602>
- Firman T (2000) Rural to urban land conversion in Indonesia during boom and bust periods. *Land Use Policy* 17(1):13–20. [https://doi.org/10.1016/S0264-8377\(99\)00037-X](https://doi.org/10.1016/S0264-8377(99)00037-X)
- Firman T, Fahmi FZ (2017) The privatization of metropolitan Jakarta's (Jabodetabek) urban fringes: the early stages of "post-suburbanization" in Indonesia. *J Am Plann Assoc* 83(1):68–79. <https://doi.org/10.1080/01944363.2016.1249010>
- Frantzeskaki N, McPhearson T, Collier MJ, Kendal D, Bulkeley H, Dumitru A, Walsh C, Noble K, van Wyk E, Ordóñez C, Oke C, Pintér L (2019) Nature-based solutions for urban climate change

- adaptation: linking science, policy, and practice communities for evidence-based decision-making. *Bioscience* 69(6):455–466. <https://doi.org/10.1093/biosci/biz042>
- Fua JL, Wekke IS, Sabara Z, Nurlila RU (2018) Development of environmental care attitude of students through religion education approach in Indonesia. *IOP Conf Ser: Earth Environ Sci* 175:12229. <https://doi.org/10.1088/1755-1315/175/1/012229>
- Herlambang S, Leitner H, Tjung LJ, Sheppard E, Angelov D (2019) Jakarta's great land transformation: hybrid neoliberalisation and informality. *Urban Stud* 56(4):627–648. <https://doi.org/10.1177/0042098018756556>
- IPBES (2018) The IPBES regional assessment report on biodiversity and ecosystem services for Asia and the Pacific. In: Karki M, Senaratna Sellamuttu S, Okayasu S, Suzuki W (eds) Secretariat of the intergovernmental science-policy platform on biodiversity and ecosystem services. <https://ipbes.net/assessment-reports/asia-pacific>
- IPBES (2022) Foundations of the nature futures framework. Annex VI to decision IPBES-9/1. <https://www.ipbes.net/document-library-catalogue/foundations-nature-futures-framework>
- IPCC (2019) Summary for policymakers. In Shukla PR, Skea J, Calvo Buendia E, Masson-Delmotte V, Pörtner H-O, Roberts DC, Zhai P, Slade R, Connors S, van Diemen R, Ferrat M, Haughey E, Luz S, Neogi S, Pathak M, Petzold J, Portugal Pereira J, Vyas P, Huntley E, Malley J (eds) Climate change and land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. <https://www.ipcc.ch/srccl/chapter/summary-for-policymakers/>
- Iswara MA (2019) Indonesia makes good progress in green building. *The Jakarta Post*. <https://ifc-org.medium.com/indonesia-makes-good-progress-in-green-building-9a3165842cc1>
- IUCN (2022) The IUCN urban nature indices: a methodological framework. [https://iucnurbanalliance.org/content/uploads/2022/06/IUCN-Urban-Nature-Indices\\_26Jun2022.pdf](https://iucnurbanalliance.org/content/uploads/2022/06/IUCN-Urban-Nature-Indices_26Jun2022.pdf)
- Kim H, Peterson G, Cheung W, Ferrier S, Alkemade R, Arneith A, Pereira H (2021) Towards a better future for biodiversity and people: modeling nature futures. <https://doi.org/10.31235/osf.io/93sqp>
- Kramer L, Teurlinx S, Rashleigh B et al. (2023) New paths for modeling freshwater nature futures. *Sustain Sci*. <https://doi.org/10.1007/s11625-023-01341-0>
- Krippendorff K (2019) Content analysis: an introduction to its methodology, 4th edn. SAGE Publications Inc. <https://doi.org/10.4135/9781071878781>
- Larson J (2022) Eulerr: area-proportional Euler and Venn diagrams with ellipses. R package version 7.0.0. <https://CRAN.R-project.org/package=eulerr>
- Lavery C, Pereira L, Chibwe B, Moonsamy N, Onwaulu C, Terry N (2022) Mosquitoes, mushrooms, magic: African futurist sci-fi for nature's futures. *Vector*. <https://vector-bsfa.com/2022/09/27/mosquitoes-mushrooms-magic-africanfuturist-sf-for-natures-futures/>
- Leisch H (2002) Gated communities in Indonesia. *Cities* 19(5):341–350. [https://doi.org/10.1016/S0264-2751\(02\)00042-2](https://doi.org/10.1016/S0264-2751(02)00042-2)
- Lembi RC, Cronemberger C, Picharillo C, Koffler S, Sena PH, Felappi JF, Mansur AV (2020) Urban expansion in the Atlantic forest: applying the nature futures framework to develop a conceptual model and future scenarios. *Biota Neotrop*. <https://doi.org/10.1590/1676-0611-BN-2019-0904>
- Lourdes KT, Gibbins CN, Hamel P, Sanusi R, Azhar B, Lechner AM (2021) A review of urban ecosystem services research in Southeast Asia. *Land*. <https://doi.org/10.3390/land10010040>
- Maarif S (2021) Re-establishing human-nature relations: responses of indigenous people of Indonesia to COVID-19. *Interdiscip J Relig Transform Contemp Soc* 7(2):447–472. <https://doi.org/10.30965/23642807-bja10023>
- Mangunjaya FM, McKay JE (2012) Reviving an Islamic approach for environmental conservation in Indonesia. *Worldviews Glob Relig Cult Ecol* 16(3):286–305. <https://doi.org/10.1163/15685357-01603006>
- Mansur AV, McDonald RI, Güneralp B, Kim H, de Oliveira JAP, Callaghan CT, Hamel P, Kuiper JJ, Wolff M, Liebelt V, Martins IS, Elmquist T, Pereira HM (2022) Nature futures for the urban century: integrating multiple values into urban management. *Environ Sci Policy* 131:46–56. <https://doi.org/10.1016/j.envsci.2022.01.013>
- Moser S, Côté-Roy L (2021) New cities: {Power}, profit, and prestige. *Geogr Compass*. <https://doi.org/10.1111/gec3.12549>
- Neuendorf KA (2017) The content analysis guidebook (Second). SAGE Publications Inc. <https://doi.org/10.4135/9781071802878>
- Palacios-Abrantes J, Badhe R, Bamford A, Cheung WWL, Foden W, Frazão Santos C, Grey K-A, Kühn N, Maciejewski K, McGhie H, Midgley GF, Smit IPJ, Pereira LM (2022) Managing biodiversity in the Anthropocene: discussing the nature futures framework as a tool for adaptive decision-making for nature under climate change. *Sustain Sci*. <https://doi.org/10.1007/s11625-022-01200-4>
- PBL (2019) Report on the workshop 'Global Modelling of Biodiversity and Ecosystem Services'. PBL Netherlands Environmental Assessment Agency, The Hague. [https://www.pbl.nl/sites/default/files/downloads/workshop\\_report\\_global\\_modelling\\_of\\_bes.pdf](https://www.pbl.nl/sites/default/files/downloads/workshop_report_global_modelling_of_bes.pdf)
- Pereira LM, Davies KK, den Belder E, Ferrier S, Karlsson-Vinkhuyzen S, Kim H, Kuiper JJ, Okayasu S, Palomo MG, Pereira HM, Peterson G, Sathyapalan J, Schoolenberg M, Alkemade R, Carvalho Ribeiro S, Greenaway A, Hauck J, King N, Lazarova T, Lundquist CJ (2020) Developing multiscale and integrative nature–people scenarios using the nature futures framework. *People Nat* 2(4):1172–1195. <https://doi.org/10.1002/pan3.10146>
- Pereira L, Ortuño Crespo G, Juri S, Keys P, Lübker H, Merrie A, Fulton B (2022) The living infinite. *Vector*. <https://vector-bsfa.com/2022/09/30/the-living-infinite/>
- Pesurnay AJ (2018) Local wisdom in a new paradigm: applying system theory to the study of local culture in Indonesia. *IOP Conf Ser: Earth Environ Sci* 175:12037. <https://doi.org/10.1088/1755-1315/175/1/012037>
- Randrup TB, Buijs A, Konijnendijk CC, Wild T (2020) Moving beyond the nature-based solutions discourse: introducing nature-based thinking. *Urban Ecosyst* 23(4):919–926. <https://doi.org/10.1007/s11252-020-00964-w>
- Satterthwaite D, McGranahan G, Tacoli C (2010) Urbanization and its implications for food and farming. *Philos Trans R Soc b: Biol Sci* 365(1554):2809–2820. <https://doi.org/10.1098/rstb.2010.0136>
- Tardieu L, Hamel P, Viguié V, Coste L, Levrel H (2021) Are soil sealing indicators sufficient to guide urban planning? Insights from an ecosystem services assessment in the Paris metropolitan area. *Environ Res Lett* 16(10):104019. <https://doi.org/10.1088/1748-9326/ac24d0>
- Watson V (2014) African urban fantasies: dreams or nightmares? *Environ Urban* 26(1):215–231. <https://doi.org/10.1177/0956247813513705>
- Wickham H (2011) ggplot2. *Wires Comput Stat* 3(2):180–185. <https://doi.org/10.1002/wics.147>
- Wu J, Wang M, Li W, Peng J, Huang L (2015) Impact of urban green space on residential housing prices: case study in Shenzhen. *J Urban Plan Dev* 141(4):5014023. [https://doi.org/10.1061/\(ASCE\)UP.1943-5444.0000241](https://doi.org/10.1061/(ASCE)UP.1943-5444.0000241)
- Zoomers A, van Noorloos F, Otsuki K, Steel G, van Westen G (2017) The rush for land in an urbanizing world: from land grabbing toward developing safe, resilient, and sustainable cities and landscapes. *World Dev* 92:242–252. <https://doi.org/10.1016/j.worlddev.2016.11.016>

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.