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Planning for Just Cities with Nature-Based Solutions: Sustainability and Socio-Environmental Inequalities in San José de Chamanga, Ecuador

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Abstract: Self-constructed cities refer to impoverished neighborhoods that suffer from inadequate housing. Such cities are the result of individual or communal initiatives that must self-construct their neighborhoods. Most of the self-constructed cities are located near endangered bioregions on the Earth, and their continued growth will inevitably aggravate the human impact on our planet. Dwellers in these areas tackle threats such as poverty, environmental degradation, and disaster vulnerability. The lack of knowledge in planning self-constructed cities causes conditions of injustice. However, appropriate management of the existing natural capital of the surrounding areas of such cities can address the mentioned challenges and the conditions for justice. This paper aims to evaluate the role of Nature-Based Solutions (NBS) in planning procedures, to create conditions of fairness and equity in self-constructed cities. The paper focused on the linkage between the application of NBS and four principles of justice: distributive justice, restorative justice, spatial justice, and interactional justice. Considering data from a review of the literature, scrutiny of past planning and policy measures and a field study with interviews with stakeholders, the empirical result of our study delineates important strategic implications of Nature-Based Solutions for sustainable planning in the case study of San José de Chamanga, Ecuador. It was demonstrated how small-scale, natural-based interventions, instead of broader actions based on a pure engineering perspective, are economically and ecologically profitable, with a positive impact on local communities' well-being and social cohesion.

Keywords: nature-based solution; mangroves; self-constructed cities; (Eco)poverty; social inequality

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1. Introduction

The concept of social and economic inequity has been widely examined in city design and planning to create the conditions for *Just Cities* to distribute wealth, rights, opportunity, self-respect, and decision-making power [1–7]. Such studies have mainly been analyzed in developed cities as resistance to injustice arising out of "capitalism" [2–4,7,8]. However, the problem of justice among the poor population of the Global South regards fundamental human rights, such as shelter and food. There has been a profusion of work since the last century exploring discussions on environmental justice to practices of planning and governing for urban resilience in cities of the Global South, assuming a priori positive relationship between them [9]. The diversity and spatial fragmentation of socio-ecological processes in cities of the Global South highlighted multiple environmental justices and levels/forms of resilience [9].

However, the environmental justice literature has often overlooked the interconnections between the role of power, politics and uneven governance with respect to just transitions in the Global South. In light of this knowledge gap, this paper seeks to highlight the potential of self-constructed cities to become satisfactory and just places to live. The notion of equality and justice initiates with the recognition of physical and social characteristics that are genuine to a particular place or culture [6,7], and that is why we intentionally use the term "self-constructed city" [10,11] to avoid discriminative terms (such as slum or villas miseria[1]) to describe poorer neighborhoods in inner cities. We focus on the justice conditions differentials between two proposals: (i) a compact Just settlement development based on the master plan proposal illustrated in this study and (ii) an Unjust pattern of urban expansion based on the governmental proposal. We draw on the case of San José de Chamanga to demonstrate a practical example of how Just conditions can be created through appropriate urban planning policies and the implementation of Nature-Based Solutions (NBS) concerning these two proposals. The following two sections better clarify the theoretical background paving our empirical study, moving from NBS to Just Cities in order to match the two hegemonic concepts of sustainability and resilience of built-up environments in a unique interpretation of urbanization processes and issues of urban growth vs. depletion of natural capital. In this perspective, the present study intrinsically documents—using various qualitative methodologies—the possible benefits stemming from the application of NBS to urban planning of socio-environmental unequal contexts developing under a mix of formal and informal waves of settlement development, using San José de Chamanga, Ecuador, as a paradigmatic example. Figure 1 summarizes the possible benefits of NBS in the specific context of just cities, focusing on different dimensions of the sustainable and resilient evolution of urbanization processes, as discussed in the following two sections and grounded on the empirical analysis of the case study.

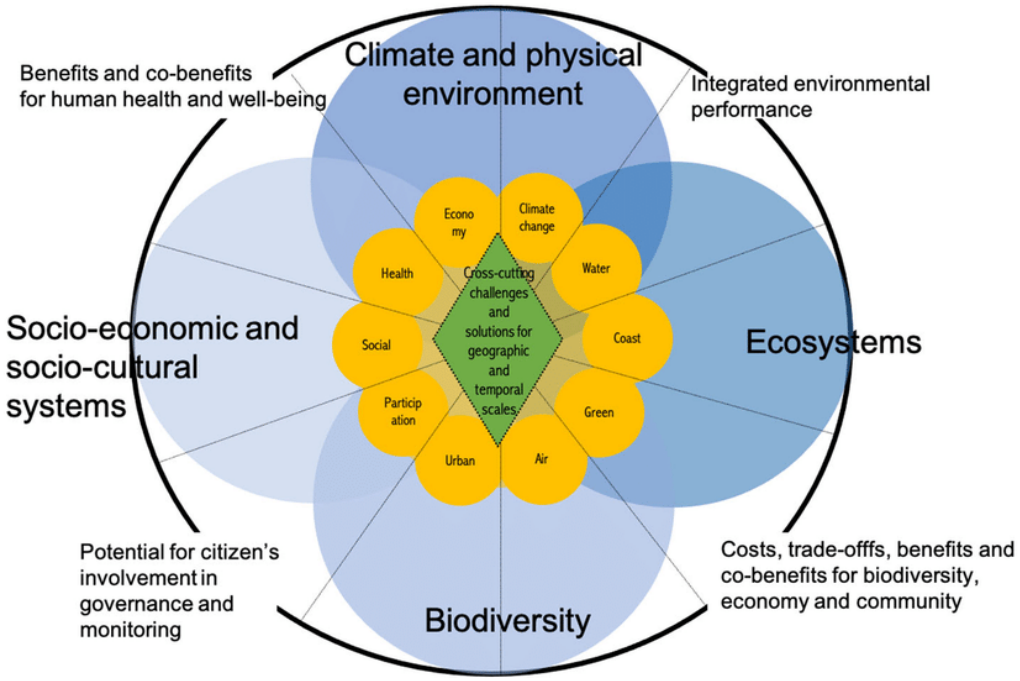

Figure 1. A summary interpretation of possible benefits of Nature-Based Solutions (NBS) in light of the sustainable and resilient evolution of just cities (redrawn and adapted from [16]).

2. Theoretical Background to Environmental Justice

This paper focuses on distributive, restorative, spatial, and interactional justice. *Distributive justice*, also known as economic justice, refers to fairness in what people receive from goods to attention [17–19]. Due to extreme poverty, the lack of livelihood and the low standard of living, Global South communities are mainly dependent on locally available

resources, exploiting their own natural capital [20]. At the same time, these communities find themselves surrounded by ecologically fragile environments, often subject to extreme conditions of degradation and fragmentation. In the era of "ecological scarcity" [21], the vulnerability of the Global South societies turned into a sort of "stable" social and economic inequalities crisis. In this regard, the neologism "eco-poverty or ecological poverty" has been coined to link the state of poverty of a specific population to its "inability" to develop sustainable use of natural resources. Such a vicious circle further aggravates the interdependence between environmental degradation processes and economic and social inequity [22,23]. We refer to the concept of "eco-poverty" to define the reasons for distributive injustice in San José de Chamanga. In Sections 5 and 6, we describe how the loss of mangroves as a natural capital had created an economic injustice in the fishing community of San José de Chamanga.

Restorative justice, also known as corrective justice, is a form of restitution, putting things back as they should be[2]. In this paper, we refer to restorative justice as "a problem-solving approach which involves the community generally, in an active relationship with statutory agencies" [24] (p. 5); we consider mangroves restoration as a form of restitution of the natural capital [25,26]. In this way, restorative justice provides a basis for distributive justice. Environmental degradation leads to the loss of natural capital and increases poverty among low-income communities that rely on such natural resources for their daily needs. The restoration of these resources would lift people out of poverty and create the conditions for economic equity. In terms of restoration methods, we refer to an NBS approach to restore the lost mangroves of the coastal areas of San José de Chamanga. In Section Six, the detail of such restoration is explained.

Spatial justice refers to the fair allocation of resources and services in the planning and governance of the city and how cities and communities are negotiated, planned, designed and managed [19,27–30]. The problem of spatial justice among the poor population of the Global South regards the first and fundamental form of human right—shelter. They must self-construct their neighborhoods. Even though they may locate within the administrative boundary of a town or city, "officially, they do not exist" [15,31]. Consequently, stakeholders and planners refuse to provide any infrastructure and essential services in self-constructed cities [10,15,31–33]. Creating conditions for justice in these urban contexts requires very different proactive managerial and design moves to favor the distribution of space, rights and dignity. We refer to a novel type of self-constructed planning approach that has been coined by David Gouverneur, called Informal Armature (IA) [10]. The IA approach focuses on addressing the urgent city planning demands of the urban poor without ignoring their rights to a feasible shelter. The core of IA regards spatial justice, "One of the most valuable commodities for poorer groups is to have access to very cheap or free land to construct their shelters", then densification of the districts will occur gradually, as they consolidate and expand their dwellings [10]. Consequently, there are tracts of underutilized land within the self-constructed areas that can be used to influence the spatial organization and performance of the existing urban system. These underused tracts can be planned to preserve future mobility corridors and provide needed public space. The IA is not typical land banking, it aims to work with organically evolving forms to improve the spatial organization of the self-constructed areas, and it provides a basis to overcome the lack of provision of infrastructure in self-constructed areas. In Section 3, we demonstrate the application of the IA's design components to offer an array of urban ecologies that can improve the conditions for spatial justice in San José de Chamanga.

Interactional justice refers to the quality of interpersonal interactions and treatments the individuals may receive; it includes truthfulness, respect, and propriety [4,6,7]. One of the central IA's design components addresses interactional justice. In order to deal with the complex issues of self-constructed cities, the IA approach emphasizes the role of planners when they "step back from the position of technocratic leadership and adopt the role of experiential learning, taking the participants to the table and finding points of commonality to work with" [6,7]. Further, the IA entails the ability to adapt to changing conditions

and novel forms of spatial organization, community engagement, and maintenance to "support" a network of new physical and performative relationships [10]. The IA is not a typical top-down urban planning approach; it encourages the "self-constructor" to become a "self-protector" of their habitat. The interactional process is the basis of this paper's methodology. Sections 5.3 and 5.4 explain how the interactional participation of the local community in decision-making procedures helped the authors develop the master plan proposal for San José de Chamanga.

3. Theoretical Background to Self-Constructed City Planning via Informal Armature (IA)

The basic assumption of the IA approach is to find a middle ground between uncontrolled self-constructed development and top-down intervention. The IA considers the vitality of informality and attempts to create a flexible design that supports the efficient use of resources for the inhabitants of informal settlements. Gouverneur focuses mainly on (i) advocating for political acceptance of the proposal; (ii) adapting design principles to local conditions; (iii) introducing initial components or the D.N.A. of the armature; and finally, (iv) monitoring the transformations and the expansion. The D.N.A. of the armature (Figure 2) is the core of his proposal that creates the components of the design and can be categorized as *Protectors/buffers*, seeking to protect specific pieces of land from development; *Attractors*, resources and amenities serving future development; *Productive patches*, economic drivers; *Neighborhood patches*, areas intended for self-constructed settlements; *Custodians*, public stewards managing the settlement and enforcing protector patches and buffer zones [10]. The IA permits the residents to have access to free land to construct their shelters. However, the IA elements adequately guide the process of self-organization and define the direction and location of forthcoming settlements. Gouverneur's IA approach creates a form of *Spatial justice* to provide a fair allocation of resources and services through a negotiating process between the shelter needs of the poor community and the necessity of environmental protection [19,28–30].

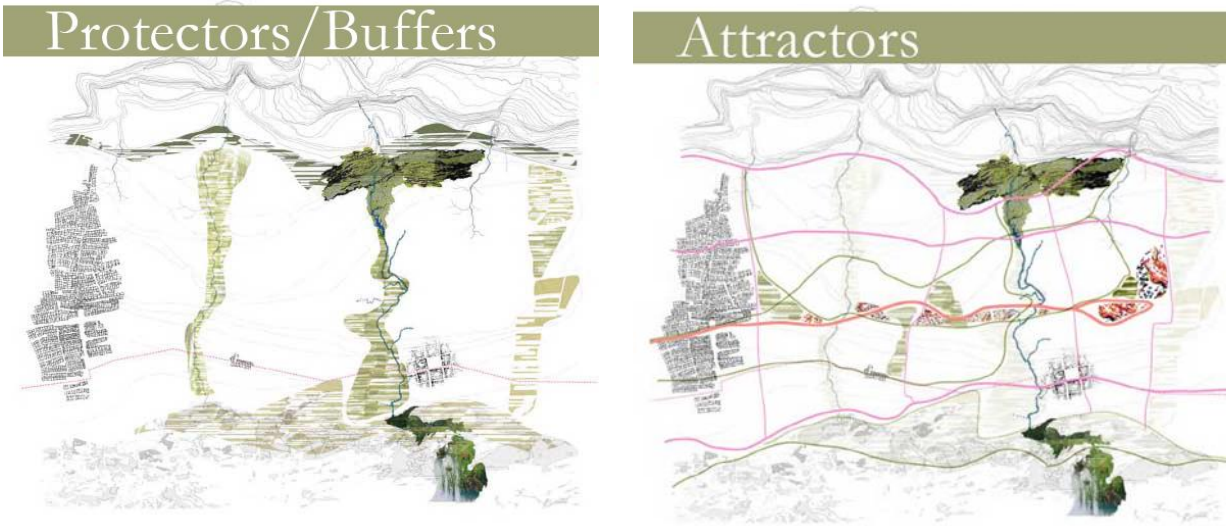

Figure 2. *Cont.*

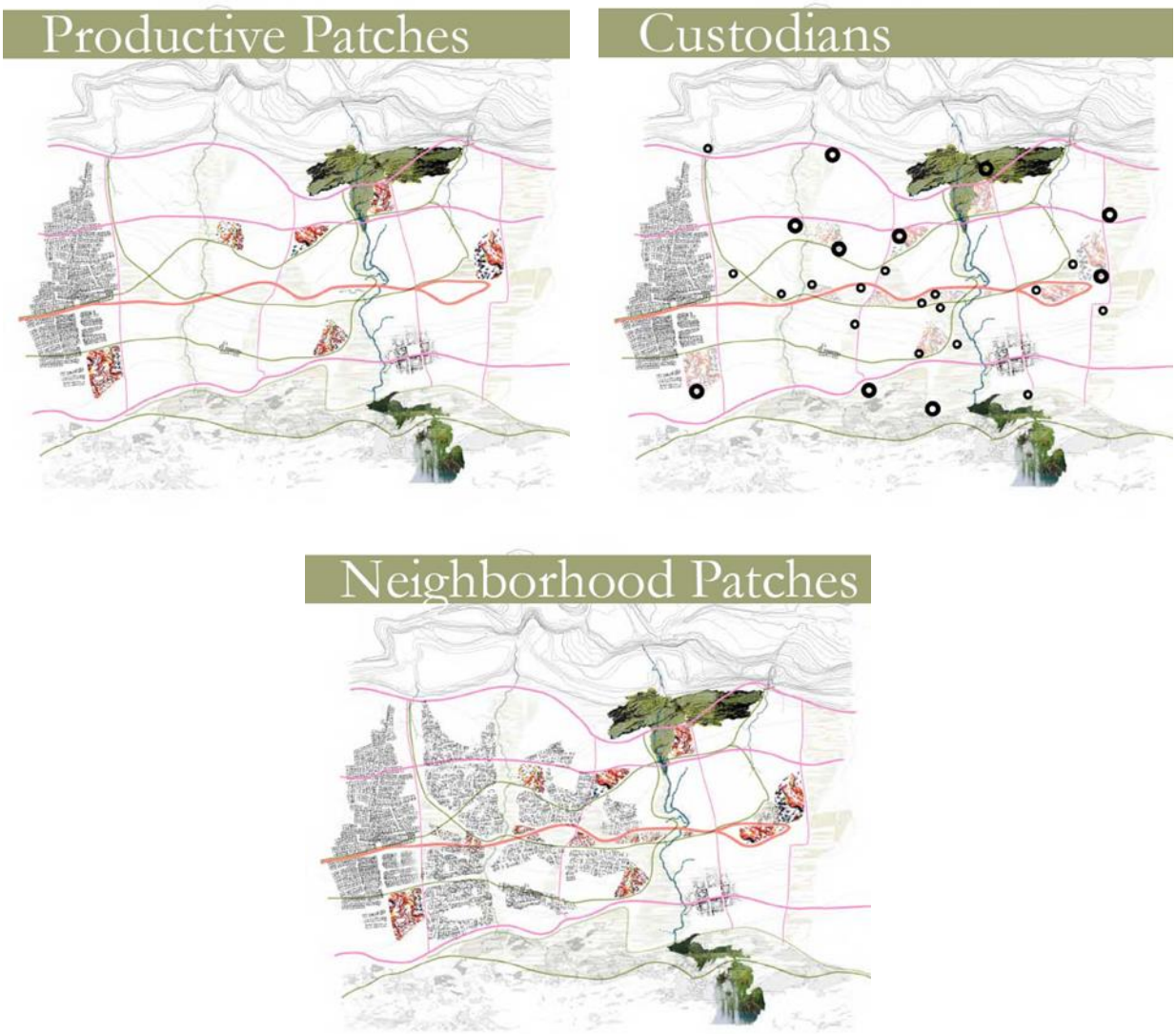

Figure 2. *Informal Armature* © David Gouverneur. *Protectors/Buffers*—Parks, Environmental Protection, Control of Expansion, Water and Waste Management, Agriculture/Grassing, Passive Amenities, Recreation. *Attractors*—Initial Provision of Water, Energy, Food, Materials, Security, Sanitation, Transportation, and Recreation. *Productive Patches*—Separators, Recycling/Construction Sites, Waste Management, Manufacturing, Real-Estate Operations, Metropolitan Services, Sports, Mixed-use Packages. *Custodians*—Stewardship of Public Turf, Icons, Managerial Centers, Information, Governance "The Garden Keepers". *Neighborhood Patches*—Subject to Squatting, Pirate Development, Site and Services Program, Mixed Formal/Informal Operations, Local Centralities and Connectors.

4. Shifting from Unjust to Just Self-Constructed Cities

The principle of fairness in urban development is understood as the fair and equal distribution of space, services, power, rights, and even care [34,35]. Due to the particular conditions in self-constructed cities, the research for urban justice can be mainly defined as poverty alleviation and rights to a feasible shelter (Figure 3). The former is discussed through the correct implementation of NBS [36], and the latter is addressed by an appropriate IA planning approach that has been explained in Section 3.

Figure 3 (top) represents the different dimensions of the unjust city. It includes a lack of rights to access to shelter, which is the result of the unfair allocation of resources and services in the planning and governance of the city (spatial injustice) and how the communities are neglected in the process of negotiation, planning, design and management (interactional injustice). Moreover, the citizens are denied fair access to economic resources,

which leads to poverty. Environmental degradation increases poverty among the poor communities who rely on natural resources—the inability to develop sustainable use of natural resources aggravates environmental degradation processes and economic and social inequity [37–39]. As a result, eco-poverty is the most critical challenge in self-constructed communities (distributive and re-distributive injustice). Figure 3 (bottom) represents the different dimensions of a just city. It demonstrates that planning via Informal Armature can create conditions for dwellers to construct their own shelters and increase their involvement in the decision-making process (Spatial and interactional justice). Furthermore, applying NBS could improve the environmental quality, avoiding the further impoverishment of resources, mitigating the scarcity of resources, and alleviating poverty (distributive and restitutive injustice).

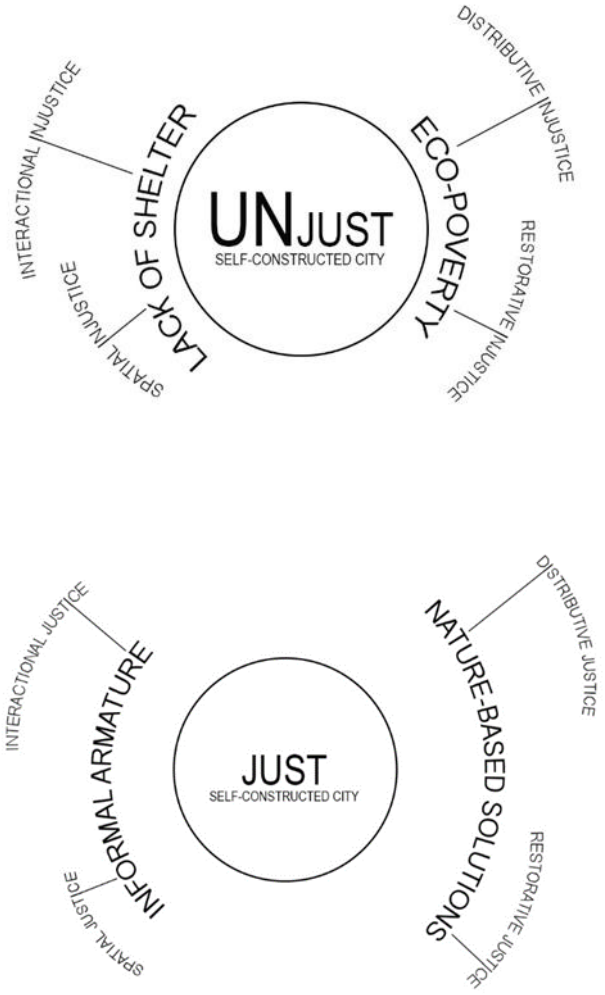

Figure 3. Shifting from Unjust to Just Self-constructed cities- main problems and leading solutions.

In order to shift from the Unjust to the Just self-constructed city, the following actions need to be considered:

- Authorities should implement the idea of using nature to solve environmental problems in their management policies. Among a wide range of ecosystem-related concepts, we emphasize the role of Nature-Based Solutions because they address "societal challenges" as well as the environment [36,40]. According to IUCN criteria[3], NBS's main priority regards the people "who are or will be directly affected by the challenge(s),"[4] and its design "seeks to maintain the productive capacity of ecosystems as well as the production of benefits necessary for human well-being"[5]. Eco-poverty is the main societal challenge in self-constructed cities. The implementation of NBS for restoring

the natural capital creates the condition for economic justice and fairness in what people can receive from their ecosystem. It provides the basis for *distributive justice* [41–43].

- Another IUCN criterion asserts that NBS must "actively engage and empower local communities and other affected stakeholders"[6]; such involvement supports *interactional justice* and constitutes a conversational ground between local dwellers and stakeholders.
- Furthermore, one of the apparent aspects that the IUCN criteria widely highlights is the contribution of NBS to the restoration and sustainable management of ecosystems[7]. A restorative approach is a form of restitution, restoring the natural capital to the community. In this regard, the role of NBS is utterly in line with *restorative justice*. In addition, in the absence of urban regulatory and development strategies, the self-constructed areas' growth exposes the balance of local ecosystems to severe risk and the terrestrial Ecosystem. Such settlements encroach onto environmentally sensitive areas, populating unstable territories with geological and physiological limitations. We suggest a novel planning strategy- "Informal Armature" (IA) [10,32]—"armature" in the sculptural sense of the word- as a wire framework around which a piece of sculpture takes form. Informal Armatures would create public infrastructure around which self-constructed settlements could emerge. In this regard, the role of IA is utterly in line with *spatial and interactional justice*.

Griffin [6] asserts that design can significantly influence social and spatial justice. An appropriate master plan design can lift dwellers of self-constructed cities out of poverty and provide adequate shelter. In the following section, we discuss how the mentioned shift from an unjust to a just, self-constructed city can be explored through a proposal for an academic study in San Jose de Chamanga. We illustrate the diversity of conditions that could be addressed in informal settlements to tackle different issues profoundly connected to inequity and injustice. We build up our proposal based on the principles of justice introduced in the first section of this paper—*Interactional justice*, *Restorative justice*, *Distributive justice*, *and Spatial justice*. The methodology included interviews with local people, reviewing the government's planning proposals, site visits and a literature review of the local economy.

5. Case Study and Methods

5.1. Study Area—San José de Chamanga

San José is a small town in Muisne Canton, below the Esmeraldas Province of Ecuador (Figure 4). Chamanga is situated within a complex network of mangrove ecosystems near Mache River, in the inner part of the Cojimies Estuary. Chamanga comprises a poor community of fishermen in the context of widespread self-constructed settlements.

"A major proportion (33.03%) of economic income is related to fishing, followed by tourism 4.87% and manufacturing 1.98%. Agriculture and livestock are mainly for subsistence and internal consumption" [44] (p. 2). The updated estimation of 2011 indicates a total number of inhabitants equal to 4254 (43.8% women and 56.2% men), and the population density is 28.9 inhabitants/km^2. The mean age is around 19 years [45], and the population is primarily unemployed and uneducated, leading to high poverty rates [46]. Although, between 2001 and 2010, there was an increase in the population (equal to 1.9%), the violent earthquake of 2016 and the subsequent floods brought down the entire community, causing enormous ecological-environmental and infrastructural damages and aggravating the dysfunctions and pre-existing social, economic and planning problems. According to Ecuador Earthquake, Special Regional Report [47], about 250 homes were destroyed. Afterward, with the "Building on the town's existing post-earthquake recovery plan" developed by Ecuador's Public Housing Company (EPV) and Ministry of Urban Development and Housing (MIDUVI) [48], a reconstruction process began, which has led to significant changes in urban organization, services and infrastructures [49]. However, Chamanga requires urgent attention, including providing shelter, potable water and sanitation, communal services and sources of income [50].

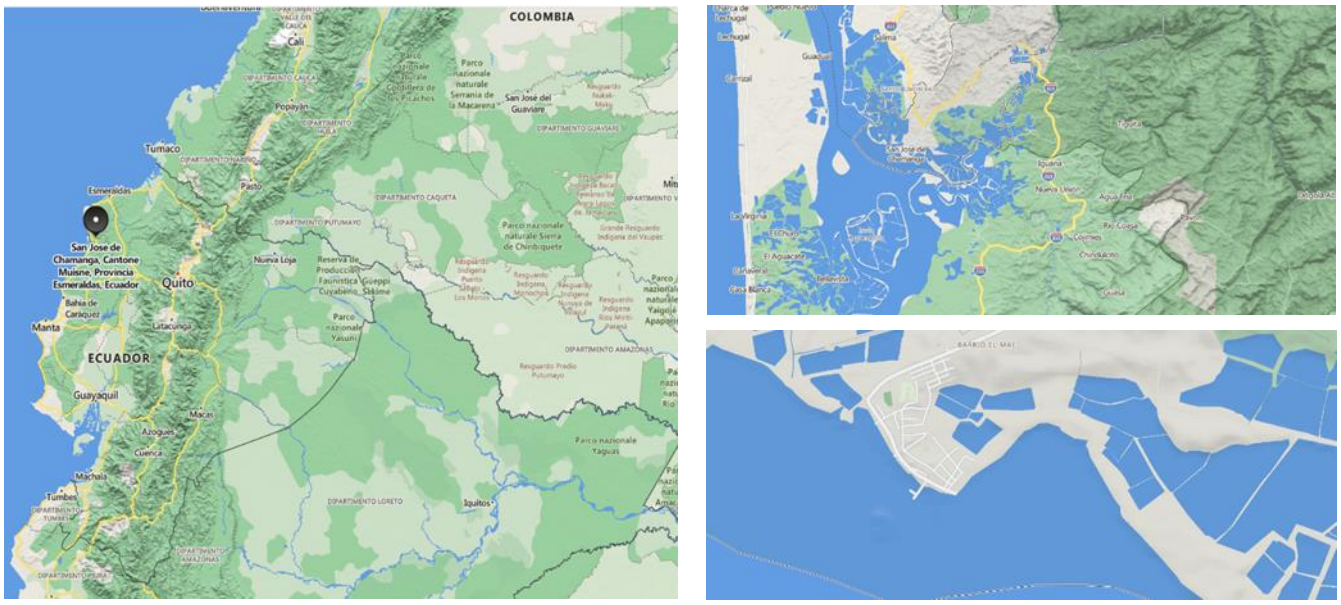

Figure 4. Three maps of San José de Chamanga at three different geographical scales (left: the position of the study site in Ecuador; upper right: the region of san José; upper left: the settlement and road network of the town of San José); redrawn and adapted from Google Maps imagery.

Due to human activities, such as large-scale aquatic farming, 85% of the mangrove ecosystem has been eradicated [46] (p. 85). In such a context, the presence of mangroves represents a vital "gifted" natural resource that acts as a buffer to extreme tidal flooding (Figure 5). Nevertheless, the problems related to the destruction of the mangroves in favor of commercial shrimp farms [50] and poor management of social, economic and environmental resources increase the vulnerability of the territory and its components, increasing the risk of floods and malnutrition of the communities [46] (p. 85).

Figure 5. Landscapes of San José de Chamanga © Shuwen Ye and Aubrey Jahelka.

5.2. Reviewing the Government's Planning-Community Priorities and Governmental Proposals

After the earthquake of 2016, the government has had various initiatives to reconstruct San José de Chamanga. We have examined the government proposal to evaluate how far such urban planning decisions were successful in addressing the sustainable and spatially balanced distribution of services and resources. San José de Chamanga experiences a 2.5-m fluctuation in tides. Natural disasters (earthquakes, flooding and landslides) frequently hit this area. After the 7.8 magnitude earthquake of 2016, President Rafael Correa declared a state of emergency, dispatching 13.500 military personnel and police officers for recovery assistance operations, and many first response organizations arrived soon after. Many of the first response aid groups left Ecuador with no long-term recovery plan resulting in diminishing services. The government has had multiple initiatives to reconstruct San José

de Chamanga. However, they typically lack context and are often insensitive to cultural values and pre-existing conditions or stressors. As is common with many government reconstruction schemes after a disaster, a designated hazard zone was established for the town of Chamanga where reconstruction would not occur. The national government has proposed that all buildings along the waterfront be vacated and removed (Figure 6), and the main road to the town should be rerouted (MIDUVI).

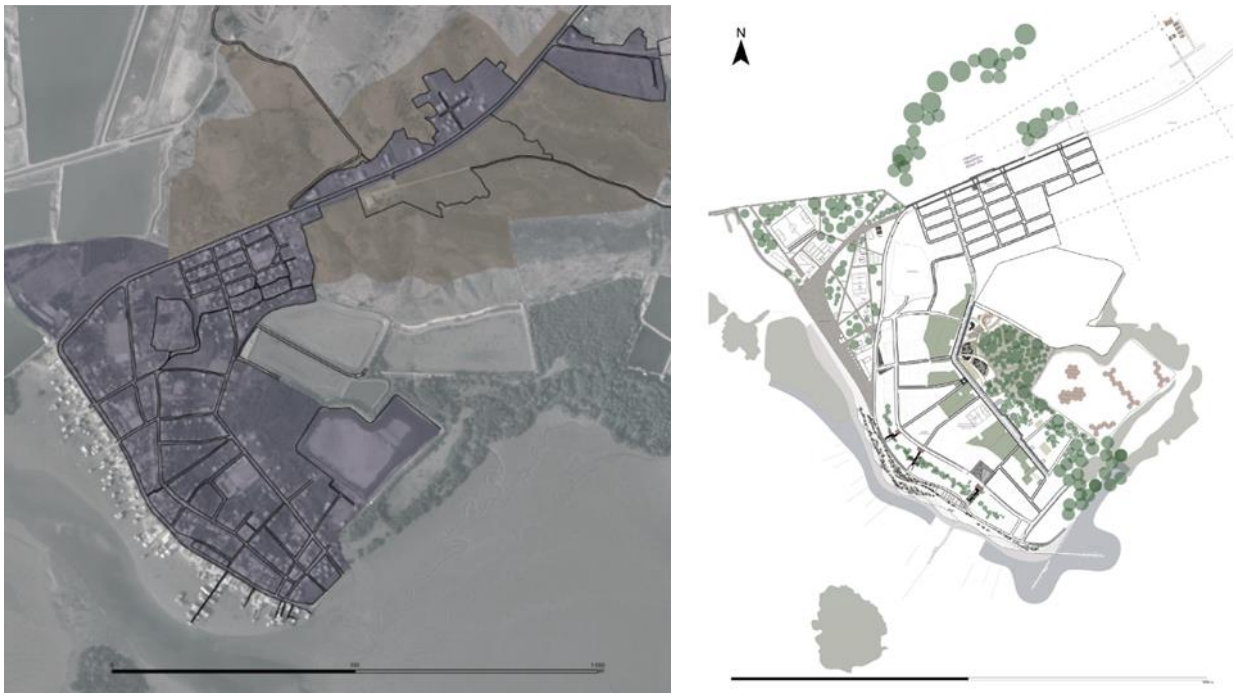

Figure 6. Proposed Urban Development Plan (**left**) Proposed waterfront park (**right**) (Source MIDUVI-Ministry of Urban Development and Housing).

Although the government entities' efforts to develop these plans are respectful, there are some significant concerns with the mentioned proposal. The current main commercial corridor is along the waterfront. The notion that an entire established commercial corridor could be relocated along a new route is implausible. Adding to the uncertainty is the fact that all of the lands along the new route are currently occupied by residential settlements. The government proposal suggests that the entirety of the waterfront, which has been forcibly evicted, should be converted into a park. While this proposal deserves some merit due to research providing credibility to soft infrastructure storm reduction, the proposed park is out of proportion with the town's size. Furthermore, 80% of the residents rely on access to water for their livelihood, not to mention the storage of boats, nets, motors, and equipment. Without the prevalence of a fishing-based community, it is unclear what economic opportunities may exist for the residents. Furthermore, there is no reasonable enforcement mechanism to prevent people from rebuilding the original informal fabric along the coastline; corruption and failed planning programs in the past distrusted the governmental program's reliability. There is a severe need for long-term and thoughtful, holistic planning and design that can mediate risk.

5.3. Field Survey

In February 2017, two co-authors of this paper were fortunate to visit and interview community members of San José de Chamanga (around 100 interviews and semi-structured interviews) on various topics related to the government proposal and existing conditions[8]. Multiple interviews became the foundation of the design strategies in this paper; we summarize the main insights below [46] (pp. 146–158).

1 The government collected the names of those that would receive new houses. They did not explain the process, and people were skeptical that their current houses and land would be taken away. Priority was given to those living in the displacement camp.
2 There is a breakdown in communication between government and local authorities regarding intention, schedules, and projects. There also seems to be a disconnect between the town just wanting to rebuild and the government's intention of rebuilding to avoid risk in the future, which will naturally take more time to implement.
3 The children go to school for only half a day because the school is too small, so they rotate between the older and younger students, leaving lots of time available to get into trouble. They can make far more money by peddling drugs than by fishing or collecting shellfish.
4 Lack of clean water and sewage system are widely mentioned. It caused the outbreak of cholera, amoebic dysentery, and giardia. Water is trucked in and sold. The town has refused a water system because they do not trust paying for piped water due to a lack of trust in the government.
5 There is one fishermen's union. However, there is an entry fee and unclear benefits to the local population. There are only five union members against more than 300 active fishermen. It appeared to be a distrust of any form of organization or formalization of the fishing industry.
6 Concha collecting is one of the only ways women in the town can earn a living. There is still very much a gender-segregated job system. Job performance and viability are based on the estuary's health. By not caring for the mangroves, women's livelihood and only pieces of independence are at risk.
7 "God gave the mangroves to everybody; it seems unfair only a few should take them away from everybody else." A resident named Sergio worked as a contractor for the government's socio-Manglar Policy. Growing mangroves meant replanting; however, shrimp farmers did not want to give up their land to mangroves and would pay to place mangroves in plastic bags to fool inspectors.
8 Fishing stocks have deteriorated, and fishing and shellfish collecting is near guaranteed to remain a poverty-based profession.

The main outcome of the interviews highlights environmental degradation, economic hardship in the community and a lack of trust in governmental strategy.

5.4. Site Visits, Workshop with Local Dwellers and Literature Review

In line with *Interactional justice*, we aimed to include the voice of the local people in shaping their environment, avoiding the typical top-down approach. The authors' proposal has been developed over the last few years as a result of research and crowdsourced input on the values community's desire to combat conditions of injustice. The development projects come together in the form of a public participation workshop[9]. Participants expressed their own experiences regarding "just" or "unjust" aspects of the site. The main outline of the workshop regards the role of mangroves in the local economy.

Mangroves provide essential hatching areas for brackish and open-water fish and contribute to poor dwellers of coastal areas that often rely on fishing and other economies based on the natural environment. The destruction of the fragile ecosystem of mangroves (due to urbanization, industrialization, and deforestation) has impoverished the community of Chamanga, leading to economic injustice. Mangroves are among the most valuable and productive coastline ecosystems and have an essential socio-environmental role[10]. An overview of the result of intensive shrimp farming and the loss of mangroves is provided in Appendix A. To create fairness in terms of the distribution of natural capital, we examined different ancient methods of mangrove restoration and their relation to fishing: *Aquaculture, Chinampa Technology, and Shrimp Farming* are the main findings in the literature review that restore the degraded mangroves and boost the fishing economy. Such restoration emphasized *restorative justice* to put back the lost natural capital of the San José de Chamanga.

6. Results: A Proposal for a Just City in San José de Chamanga

The top-down governmental planning policy did not include the importance of shorelines in the daily life of local dwellers, as mentioned in Section 5.2. Such planning led to interactional and spatial injustice conditions, creating a barrier to just transitions (Figure 1). Furthermore, access to the natural capital of mangroves for fishing creates the conditions for distributive justice, which has been lacking in the planning process. This section demonstrates how the proposal for a *Just* city in San José de Chamanga has been addressed via the implementation of NBS and an appropriate planning approach. Mangrove restoration and IA planning defined the core strategy of the proposal for a *Just* San José de Chamanga. Sections 5.2–5.4 summarised the primary outcomes of our site analysis (data collection, interviews, workshops and literature reviews) regarding existing injustice conditions, and this section illustrates the final master plan proposal and some visual details of the IA and mangrove restoration.

6.1. Mangrove's Restoration and Chinampa Technology—NBS and Distributive and Restitutive Justice

The main pillar of the proposal is creating healthy and restored mangroves to boost silvo-fisheries. One of the technologies for mangrove restoration is Chinampa. Chinampas are an ancient Aztec urban horticulture technique that allows for building vegetative beds on water [20], commonly called floating gardens [61]. The detail of Chamanga Technology can be found in Appendix B. Mangrove restoration is an NBS that restore the natural capital to the community and alleviate poverty, which is in line with *distributive and restitutive justice*. Although the benefits of such restoration are clear, guaranteeing mangroves' survival might be uncertain. To ensure restored mangroves' survival, cultural, social and economic benefits should be introduced to the community. An urban mangrove park's design provides an NBS strategy that is cost-effective and ecologically compatible; such a proposal strengthens nature's role in policy-making processes and planning [62]. Furthermore, it creates a public (educational) space that provides economic benefits to people, and people must manage nature to obtain these benefits. Such NBS planning aims at redefining what beauty is and educates the population about mangroves and how they integrate with the urban system—proving the intrinsic ecological role and the "overall" economic value of mangroves [63–66].

6.2. Informal Armature Planning and Spatial Justice

As discussed before, the disaster response to the earthquake in San José de Chamanga has been derived from political motivations and lack of community participation—conditions for *interactional justice* have been ignored in the planning procedures. Due to the tsunami hazard, the official government plan suggests that the community must be relocated further upland to remove them from the coastal risk zone [46] (p. 85). Such a new location completely disregards the economic heart of Chamanga, which is a fishing community. Such a decision reinforces economic polarisation, social inequalities and spatial injustices typical of the area. Furthermore, the government has planned to build a port at the estuarine tip of Chamanga with a specific design addressing only the peculiarity of the shrimp farming industry (MIDUVI) [46]. This intervention was planned before the earthquake without any participation and communication with the local community. It is estimated that it will economically contribute to sustaining no more than 500 fishing community members. Based on local economic analysis, the port is demonstrated to fail [46].

We suggest that the port area can undergo adaptive reuse practices intended to be socially inclusive, accessible by all, and ecologically sustainable. These assumptions are in line with *spatial justice*. The authors' proposal reinterprets the port area by designing a commercial corridor along the waterfront, which conserves the waterfront as the town's core and the center of social life. Such a master plan is a holistic vision that intertwines mangroves' restoration, economic and cultural aspects, and settlement informality in a unique growth model toward sustainability, resilience and a *just* settlement. Although it provides a structure for the development, the master plan is not based on a rigid model of

planning and considers the vitality of informal settlements and attempts to couple flexible designs and supports the efficient use of resources for the inhabitants, who will have the capacity to shape and benefits from their habitat [10,32]. The recovery proposal of San José de Chamanga presented in this paper is based on the concept of IA explained in Section 3. The IA's components in San José de Chamanga have been planned in the following category (Figure 7):

- Sanitation ponds and the system of Chinampa are *Protectors/buffers* elements that protect specific pieces of land from development or intensive fishing activities.
- The pier infrastructure along the coast is the *Attractor*; this area is the core of recreation and sailing transportation. The commercial corridor along the coast is *Productive patches*, or economic drivers of the city. The productive inland ponds are *Custodians'* managerial centers that enforce protector patches and buffer zones.
- The rest of the areas are *Neighborhood patches*, areas intended for self-constructed settlements.

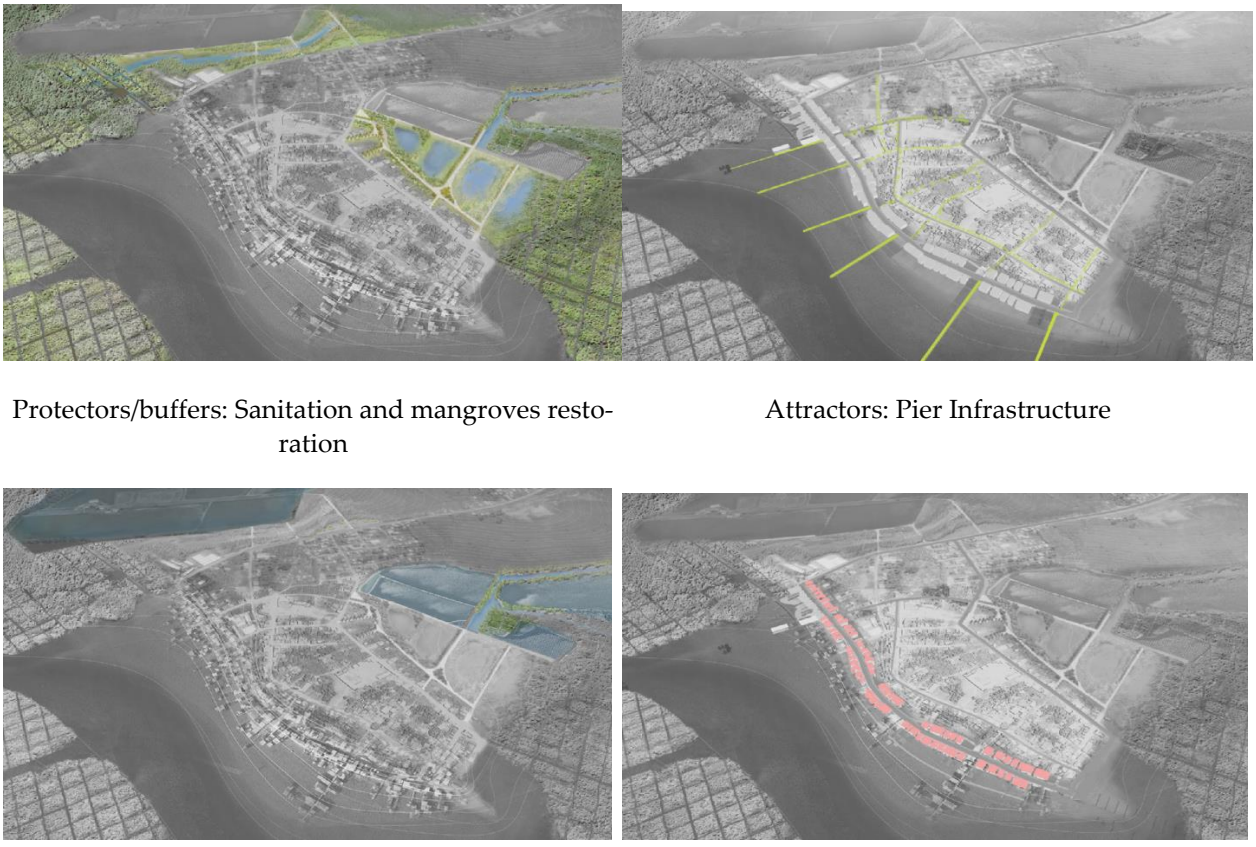

Figure 7. Informal Armature components of San José de Chamanga © Aubrey Jahelka, Shuwen Ye.

IA approach creates a form of *Spatial justice* to provide a fair allocation of resources and services. It avoids a top-down and rigid planning strategy, permitting the residents to have access to free land to construct their shelters; the IA elements adequately guide the process of self-organization and define the direction and location of forthcoming clusters. This proposal (Figure 8) affirms the role of NBS, seeking to recover the canopy of the mangroves, restore the ecological loss, adopting the Silvo-fishery technique to integrate mangroves with brackish aquaculture. The Chinampa system restores the mangroves and boosts fishery activities, improving the conditions for distributive justice (Figure 9). In this perspective, Chinampas can be constructed with sediments from excavated places, creating a system of islands separated by channels [67]. Once the mangroves were restored, the trees themselves would act as a natural amplitude dampener to tsunami and sea-level rise [68].

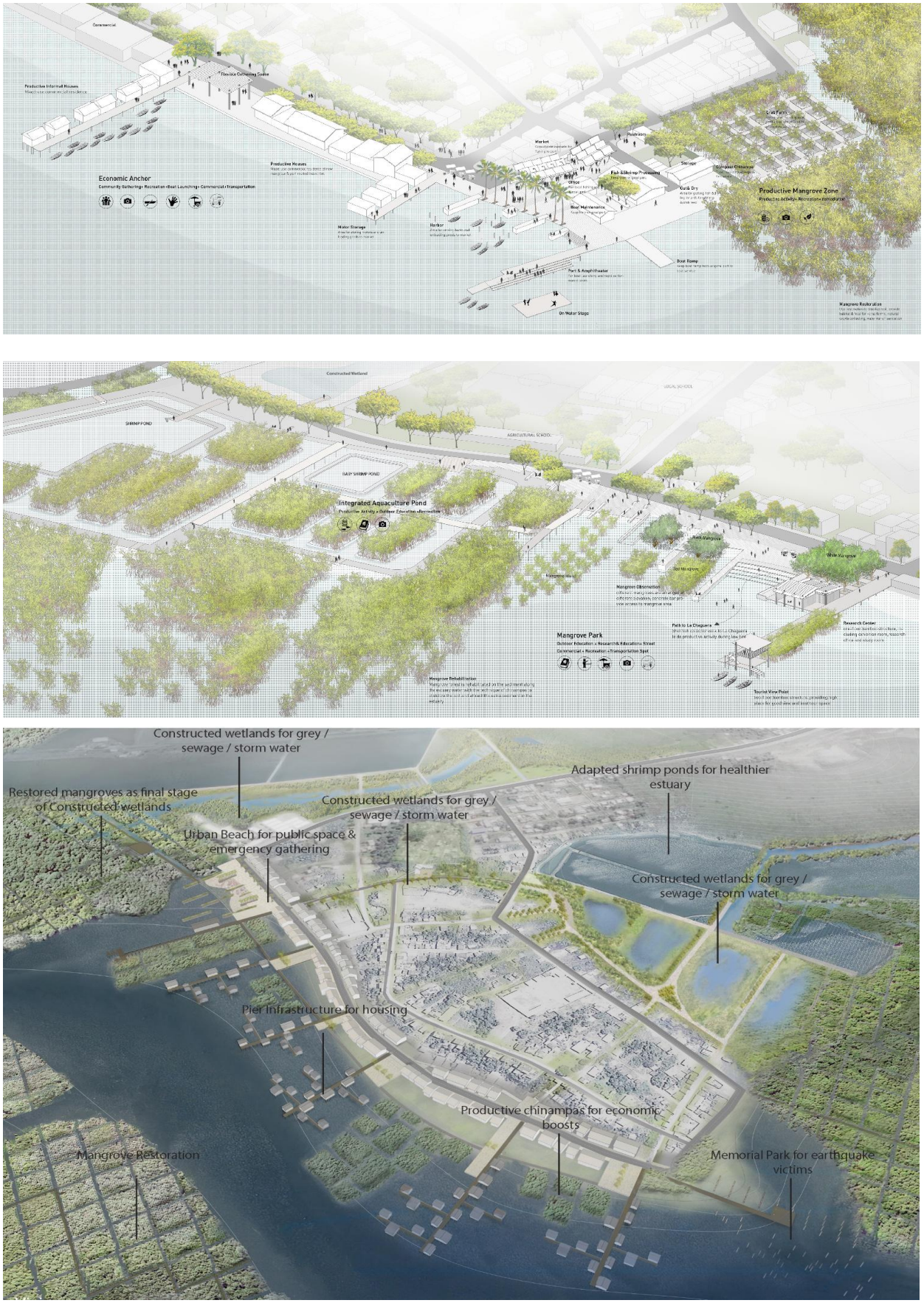

Figure 8. Informal Armature © Shuwen Ye and Aubrey Jahelka.

Figure 9. Master plan proposal © Shuwen Ye and Aubrey Jahelka.

Thanks to NBS, this proposal preserves and stimulates economic opportunities for the residents and addresses inequalities and societal challenges [69–71]. The multifunctionality of NBS is understood through nature's contributions to humans, including multiple economic and social benefits, and automatically leads to socially just results [72].

Such a resilient proposal fulfills essential required issues in an NBS strategy, namely (i) to educate residents in sustainable farming and aqua-farming practices, (ii) to design less intensive but still productive aqua-farming practices, (iii) to develop artificial ecosystems combining productive and natural ponds, and (iv) to develop a protected area system considering both vulnerable, currently protected and unlikely to be protected areas. Incentives to preserve natural environments and align with long-term land-use plans will contribute to a low-cost strategy curbing environmental risks and habitat destruction[11]. As Vandana Shiva [73] states, the survival of nature depends on the survival of human societies modeled on the principles of nature hidden in the lives and beliefs of the world's peoples. The core business of the proposed strategy is the intimate connection with local communities. It creates a sustainable, renewable system, supporting renewability conditions of natural capital, which is the primary management objective to overcome poverty and create just results in the community (Figure 10).

Figure 10. Productive Landscape and social life © Aubrey Jahelka, Shuwen Ye.

7. Discussion

There are many challenges that will face Chamanga in the future, from public health and environmental issues to disaster reconstruction. With minimal resources, these often monumental and decades-long tasks may seem near impossible. However, by finding overlapping solutions that can solve multiple systemic issues, resources can have a compounded

impact in creating the conditions for justice. Chamanga provides a unique opportunity to test multiple hybrid ecological and urban proposals. If successful, these pilot projects can provide the evidence that is needed to initiate so many other desperately needed projects in Ecuador, South America and around the Sothern hemisphere of the world.

The study has focused on the natural resources consumption and justice conditions differentials between two development proposals: (i) a compact model of settlement based on an integrated NBS strategy illustrated in this study, and (ii) sprawled patterns of urban expansion based on the initial governmental proposal. Although the role of the NBS has been emphasized, its positive impacts can hardly be evaluated since such an evaluation requires long-term reliability; due to the constant natural extraction in the southern hemisphere and the poverty condition, NBS's benefits are not easy to be quantified [74–76]. The success of NBS approaches is embedded in the role of the people, those living in and near the ecosystems that need to be protected, managed better and restored. Nature-Based Solutions should be just and fair and recognize the rights of local communities to the direct protection of land and associated natural resources.

Over decades, millions of local people have been displaced in the name of conservation, neglecting the fact that most of the remaining biodiversity is already protected by indigenous people and ancient methods. If the power over the natural capital is fairly distributed, the outcome of protection and conservation would be highly in line with the justice criteria. Nature-Based Solutions need long-term technical and financial support. It will take many decades to bring the needed benefits, and it is essential to find ways to enable marginalized people within these community-based management approaches to be much more involved in creating the conditions for interactional justice. The ability to make decisions and encourage others to behave in a certain way must be around those who need access to natural resources for their daily needs, avoiding any top-down governmental decision. Such power might come from different sources, it might come from having a political mandate, or it might come from legislation.

The restoration of mangroves "ensures a fair and equitable distribution of benefits to both humans and nonhumans" [72]. However, the proposal addresses the conditions of justice mainly from the "human" perspective, focusing on distributive justice to tackle eco-poverty and loss of natural capital. Such a vision is merely anthropocentric; thus, we avoid stretching the justice criteria of the proposal to *ecological justice*.

Diversified urbanization models reflect and justify the lack of a global and unique definition for informal urban processes [77–79]. Informal definitions have also been discussed from a justice perspective to avoid discriminative terms toward these urban phenomena. Using the term "self-constructed" gives a solid comprehension of the importance of transformation processes rather than the final configuration of expanding settlements [80–82].

Compact urbanization is recognized as a truly sustainable way of urban expansion [83]. The results of this study go precisely in the same direction. According to the IA planning approach, the proposal encourages the growth of new clusters around the old center [83]. Furthermore, IA planning could address "the protection of valuable agricultural land, water conservation, food security, the provision of materials for constructing the self-constructed districts, energy production, and alternative modes of economic production" [10]. Although we discussed the adoption of IA initiatives in academic studies of urbanization and professional practices, it can also lead to legal and institutional reforms to create spatial, interactional and distributive justice conditions.

8. Conclusions

The economy of self-constructed cities is based on natural capital. Rapid and uncontrolled informal urbanization increases the vulnerability of local communities to natural disasters, loss of natural capital, poverty and conditions for injustice. In this paper, we scrutinized the adaption of the IA planning approach and the implementation of NBS to guide the self-constructing process adequately. We discussed the reasons for the injustice caused by the top-down governmental planning proposal. It has been suggested that

the restoration of mangroves could create the conditions for a sustainable fishing village in San José de Chamanga, tackling eco-poverty. In southeast Asia and South America (see Appendix C), many countries have been experimenting with different techniques to combine mangrove restoration and shrimp farming. Such Nature-Based Solutions are a win-win strategy to cope with environmental degradation and poverty. Understanding the nature of self-constructed settlements and their socio-economic drivers could lead to a sustainable, spontaneous self-constructed city where the conditions for justice are suitably distributed.

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Appendix A. Loss of Mangrove Habitat in Favour of Shrimp Farm

Figure A1. From 1991 (**left**) to 2016 (**right**)—Loss of Mangrove habitat (green) in favor of shrimp Farm (pink).

Shrimp farmers dig channels to supply the ponds with enormous quantities of freshwater and seawater. Such water diversions alter the natural flow of water that maintains the health of surrounding mangroves as well as ecosystems farther inland and offshore [84–86]. Furthermore, diverting water harm mangroves by preventing their seeds from being dispersed via seawater and the death of trees by cutting off freshwater supplies [87]. The organic waste and massive amounts of chemicals and antibiotics in shrimp farms contaminate surrounding freshwater and coastal waters [88]. The social costs of shrimp aquaculture are high because the profits from shrimp farming are exported, and the jobs it generates are usually temporary. The average intensive shrimp farm survives only two to five years before pollution and disease force it to shut down [89]. Local people are left with a devastated landscape that can no longer support fishing, and all their natural capital is spoiled,

causing more poverty [84] (See Figure A1: The result of shrimp farming in Chamanga). Figures A2 and A3 illustrate a typical landscape transformation of the mangrove ecosystem into aquaculture. As the mangroves disappear, (i) the shrimp ponds' wastewater is released into the estuary, destroying the remaining ecosystem, and then (ii) water is pumped back into the ponds poisoning the shrimps, and water quality decrease. Healthy shrimp farms wholly depend on healthy estuaries.

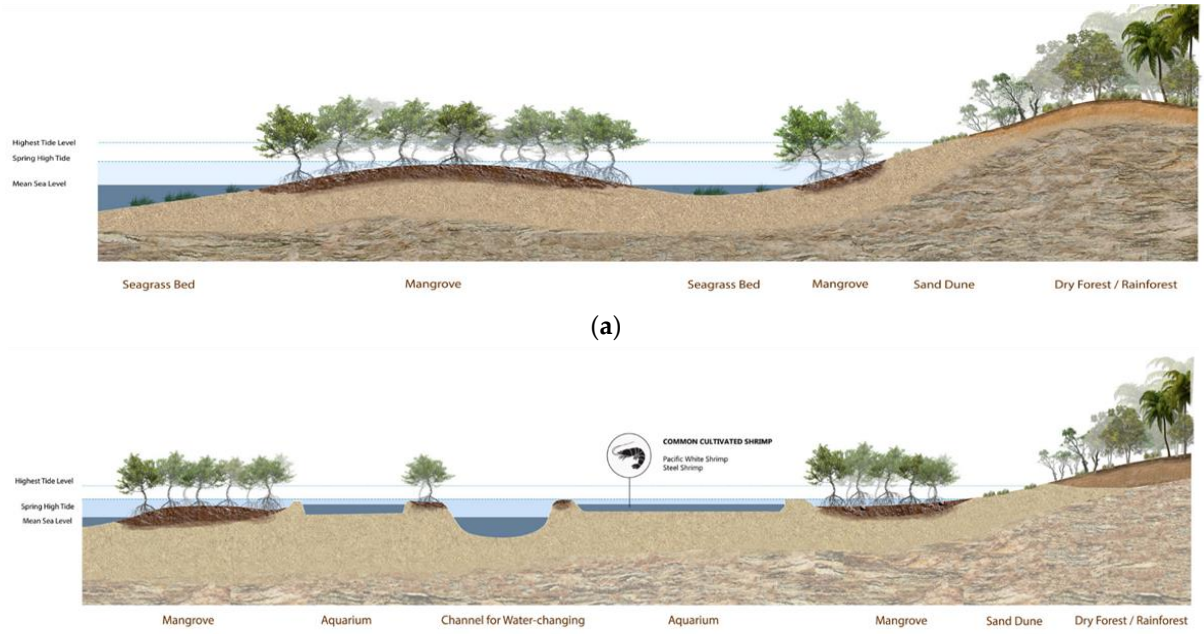

Figure A2. (**a**) A healthy mangrove ecosystem. (**b**) A deforested mangrove ecosystem that suffers from contaminated water, soil erosion, and fragmented mangrove systems can further die-off. © Shuwen Ye and Aubrey Jahelka.

Appendix B. Chamanga Technology

For the last century in Latin America, mangrove forests have been treated as a waste-land. Before the 1990s, Chamanga was surrounded by mangrove forests and bountiful fishing and shellfish stocks. The loss of mangroves has led to an 80% depletion in fishing stocks, economic collapse, and many health issues, including malnutrition [52]. If nothing is done, shrimp ponds will continue to become unproductive and abandoned, leading to further economic and ecological degradation [89].

Many countries in the southern hemisphere pursue various forms of silvo-aquaculture, a win-win strategy for conserving mangroves and fostering economy and employment [90–92]. Silvofisheries is a method developed in Southeast Asia to integrate mangroves into extensive and semi-intensive aquaculture ponds. Mangroves provide food and water purification for the aquaculture pond leading to healthier and longer-lasting aquaculture systems [93]. If the silvo-fisheries methods are adopted using the 20% mangrove utilization, the estuary will annually see economic benefits [94].

One of the technologies for mangrove restoration is Chinampa. The chinampas regularly have a rectangular design, with size varying between 8 m and 100 m and width ranging from 2 to 25 m; the optimal dimensions depend on desired capillary effect, narrow fields are more convenient in case the soil water is deficient, and vice versa [95,96]. In Mexico, a non-profit civil ecosystem conservative organization, ProNatura Veracruz[12], has utilized this ancient technique for mangrove restoration in the Alvarado Wetland system. It is a solution to help mangrove seedlings anchor themselves and become large enough

to withstand tidal forces. A 10 × 10 m grid (Figure A3) allows for a large surface area of natural habitat for animals once a chinampa is built.

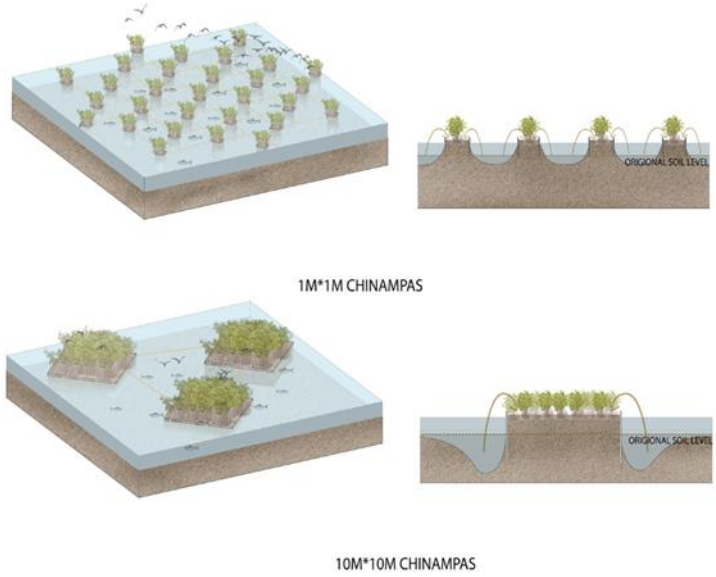

Figure A3. System of Chinampas.

Chinampas have different design variations to ensure mangroves and shrimp pond survival, offering natural and semi-intensive systems based on research from the silvo-fishery system (Figure 8).

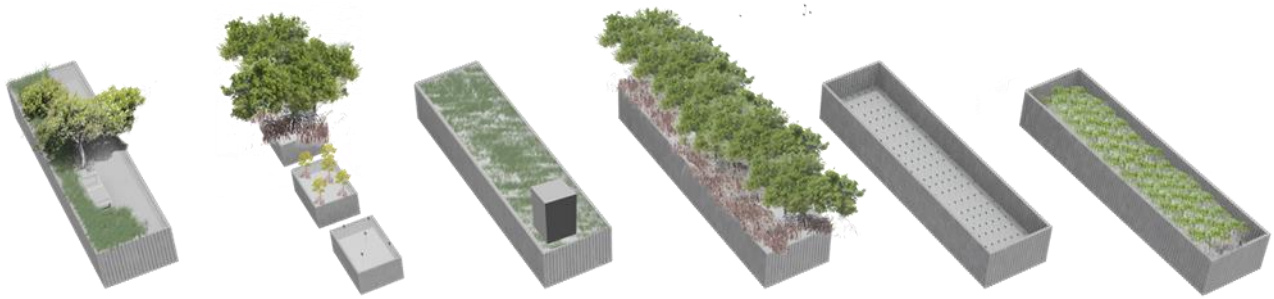

Figure A4. Design Variation of the Chinampa: (**A**). Chinampa as Public Space, (**B**). Chinampa as Restoration, (**C**). Chinampa as Sanitation, (**D**). Chinampa as Mangrove Islands, (**E**). Chinampa as Nurseries, (**F**). Chinampa as Aquaculture. © Shuwen Ye and Aubrey Jahelka.

In Ecuador, particularly in San José de Chamanga, the landscape is segregated, and there is a conflict between government planning proposals and community needs. Ecuador has the first constitution to recognize the rights of nature. The protection of the nation's biodiversity is a priority, as stated in the National Plan "Buen Vivir". Despite protections being in place, many of these ecosystems are at risk of monocultural agricultural practices and government (or private industry) subsidizing clearing for land use or other industrial practices. Furthermore, the Ministry of Environment is annually underfinanced and has a weak capacity for implementation and enforcement. Land trafficking is a severe uncontrolled problem and presents itself as institutionalized corruption within the government land adjudication agency (Instituto Nacional de Desarollo Agrario, INDA). Based on these actual and critical problems, planning for NBS grounded on Chinampas design is suggested by which conflicting ecosystems and unsustainable practices are manipulated to work synergistically, contributing to improving natural capital and reducing poverty.

Chinampa, as an NBS, is a restitutive action that restores the mangroves and addresses economic and societal challenges, creating the conditions for distributive justice.

Appendix C

NBS and Local Communities' Welfare in the Southern Hemisphere: A Brief Review

To increase shared sustainability in environmental planning and design of urban processes among the low-income communities of the Southern hemisphere [97–100], the NBS must take up the task of [69,101,102]:

- enhancing and qualifying anthropogenic urban regeneration interventions to implement human-scale cities' resilience, making them more livable, healthy, and equitable in terms of social justice and territorial cohesion [68,103];
- restoring highly degraded areas where ecosystems have been compromised by aiming at increasing thermal comfort and improving the quality of soils, water and air [64,66,99,100,103];
- re-establishing the balance of some landscape areas—safeguarding and enhancing their ecological-environmental components—for the defense from possible risks and the continuous threats of erosion, landslides, slumps, floods, and the preservation of biodiversity [104];
- "develop climate change adaptation and mitigation strategies to provide more resilient responses and enhance carbon storage" [70,98,105–107] (p. 432).

The following cases demonstrate how various NBS planning approaches in different parts of the southern hemisphere have fulfilled the mentioned points. In Malesia, the "ecoCare Centre focuses on mangrove conservation through nurseries around the Kertih River, Terengganu [. . .] to preserve the river ecosystem, protect the coastal terrain and biodiversity. As a result, it allows locals to continue using the river for their livelihood (fishing, ecotourism, water source, etc.)" [108].

In Indonesia, following the tragic events caused by the Aceh Tsunami in 2004, it was found that if substantial mangrove forests had not been laid out along the coasts, the damage would have been much more significant. In response to this finding, the Government started a Microcredit system for coastal communities to encourage tree-planting programs and a subsistence economy, thanks to further funds issued in the form of loans [108].

Furthermore, the NBS approaches to consider in developing cities focus on promoting another Ecosystem-based Adaptation (EbA). "EbA integrates the use of biodiversity and ecosystem services into an overall adaptation strategy" [109]. That is the case of some cities in Southeast Asia, such as Vientiane, Paksan, Savannakhet and Pakse, on the Mekong River in Laos [110] and, interestingly, in regards to the mangrove ecosystem, is a case study of the Philippines. In Barangay Silonay, on the north-eastern side of Calapan City (Philippines), "[. . .] mangrove protection provided avoided damages for the shoreline protection of USD 206,621 compared to building a seawall, which provided avoided damages of USD 180,046 with a 10% discount rate. Furthermore, mangrove ecosystems provide additional benefits through fisheries contributing USD 174,000 annually to the local community" [94].

Following the ongoing extreme weather events (like the Super Typhoon Haiyan case, which in 2013 seriously affected the province of Leyte, including Tacloban city), the Philippines' Government is taking steps to make NBS more inclusive as part of climate-resilient flood management practices: "Examples of nature-based solutions are protecting and expanding wetlands, widening natural flood plains, restoring coastal ecosystems and investing in forming green areas to reduce run-off. [. . .] In order to build the Province of Leyte back better, development agencies and international donors need to be invested in adopting climate-resilient flood management strategies along with well-designed financial instruments towards innovative solutions" [111] (p. 603). One of the NBS approaches to consider—to manage the urban water cycle (capture, storage and reuse) of developing cities—is Water Sensitive Urban Design (WSUD). This is the case in some cities in Southeast Asia, such as Vinh Yen, Hue, Ha Giang, and Ho Chi Minh City in Vietnam. "WSUD provides diverse measures including wetlands, vegetated swales, bioretention basins or

artificial lakes, rain gardens, green roofs, permeable pavements, infiltration wells, and cleansing biotopes" [112].

Another NBS approaches to consider—to avoid water stagnation (and reduce the risk of floods and restore water security)—is Sponge City's construction. That is the case in most cities in China [43,113,114], such as Ningbo, a city on the southeastern coast of China. The Sponge Cities make it possible to activate an NBS urban drainage system and "recycle 70% of rainwater" [110]. These measures are implemented to increase populations' resilience and the regeneration of urban conurbations exposed to natural and environmental disasters and environmental degradation. This means that if self-constructed cities are appropriately guided, they can reduce poverty, environmental degradation, and disaster vulnerability [115]. Definitively, the various low-income countries of the Global South need a paradigm shift by adopting an NBS approach due to their high population and exposure to extreme weather events, natural disasters and environmental degradation.

Notes

1 Other terms used to refer to such impoverished **neighborhoods** are: squatter settlements or shanty town or shacks [12], favelas (refers to *Favela*, hill outside Rio de Janeiro) villas miseria [13], slum [14] bidonvilles, rookery, gecekondu, skid row, barrio, ghetto, taudis, bandas de miseria, barrio marginal, morro, loteamento, barraca, musseque, tugurio, solares, mudun safi, karyan, medina achouaia, brarek, ishash, galoos, tanake, baladi, hrushebi, chalis, katras, zopadpattis, bustee, estero, looban, dagatan, umjondolo, watta, udukku, and chereka bete [15].This is a note example.

2 "A commonly accepted restorative justice definition, used internationally, is "a process whereby parties with a stake in a specific offence collectively resolve how to deal with the aftermath of the offence and its implications for the future" [24] (p. 5).

3 IUCN [40] defines eight criteria to be fulfilled to define an ecosystem-based approach as a NBS.

4 IUCN [40] Criterion 1.

5 IUCN [40] Criterion 2.

6 IUCN [40] Criteria 5 and 8.

7 IUCN [40] Criteria 4,6 and 7.

8 The results of these interviews have been published online [46].

9 The results of the workshop have been published online [46].

10 Mangroves are ecologically, and economically viable living sources used for medical serums, charcoal, lumber, and food sources. Due to their demands for nutrients, mangroves play an essential role in removing pollutants, heavy metals, and pesticides [51–54] and are considered tolerant plants for wastewater effluents [55,56]. Furthermore, mangroves deter sea water's advancement onto sweet water bodies, preserving biomes, diminishing the impact of sea-level- rise, storms, tsunamis, and erosion [57–60]. The devastation of mangroves has exacerbated landslides and water erosion along the tropical coastlines.

11 IUCN [40] Criterion 4.

12 See: https://www.pronaturaveracruz.org.

References

1. Buitelaar, E.; Weterings, A.; Ponds, R. *Cities, Economic Inequality and Justice: Reflections and Alternative Perspectives*, 1st ed.; Routledge: New York, NY, USA, 2017.
2. Fainstein, S.S. New Directions in Planning Theory. *Urban Aff. Rev.* **2000**, *35*, 451–478. [CrossRef]
3. Fainstein, S.S. *Planning and the Just City*; Cornell University Press: Ithaca, NY, USA, 2006.
4. Fainstein, S.S. The just city. *Int. J. Urban Sci.* **2014**, *18*, 1–18. [CrossRef]
5. Giles-Corti, B.; Vernez-Moudon, A.; Reis, R.; Turrell, G.; Dannenberg, A.L.; Badland, H.; Foster, S.; Lowe, M.; Sallis, J.F.; Stevenson, M.; et al. City planning and population health: A global challenge. *Lancet* **2016**, *388*, 2912–2924. [CrossRef] [PubMed]
6. Griffin, T.L. *Defining the Just City Beyond Black and White*; 2015; Available online: https://www.thenatureofcities.com/2015/10/23/defining-the-just-city-beyond-black-and-white/ (accessed on 7 March 2022).
7. Griffin, T.L.; Cohen, A.; Maddox, D. (Eds.) *The Just City Essays: 26 Visions for Urban Equity, Inclusion and Opportunity*; JMBC, Next City, The Nature of Cities: Philadelphia, PA, USA, 2015.
8. Fainstein, N.I.; Fainstein, S.S. Regime Strategies, Communal Resistance, and Economic Forces. In *Restructuring the City: The Political Economy of Urban Redevelopment*; Longman: New York, NY, USA, 1983; pp. 245–282.
9. Allen, A.; Griffin, L.; Johnson, C. *Environmental Justice and Urban Resilience in the Global South*; Palgrave Macmillan: New York, NY, USA, 2017.
10. Gouverneur, D. *Planning and Design for Future Informal Settlements*; Routledge: New York, NY, USA, 2014.

11. Pojani, D. The self-built city: Theorizing urban design of informal settlements. *Archnet-IJAR Int. J. Archit. Res.* **2019**, *13*, 294–313. [CrossRef]
12. Beard, D.C. *Shelters, Shacks, and Shanties*; C. Scribner's Sons: New York, NY, USA, 1914.
13. Verbitsky, B. *Villa Miseria también es América*; Editorial Guillermo Kraft Ltda: Madrid, Spain, 1957.
14. Ward, W.P. *The Life and Times of Cardinal Wiseman*; Longmans, Green: London, UK; New York, NY, USA, 1987.
15. UN-Habitat. *Slums of The World: The Face of Urban Poverty in The New Millennium?* [online]; UN-HABITAT: Nairobi, Kenya, 2003a; Available online: https://archive.org/details/SlumsOfTheWorldTheFaceOfUrbanPovertyInTheNewMillennium (accessed on 10 June 2017).
16. Roggema, R.; Tillie, N.; Keeffe, G. Nature-based urbanization: Scan opportunities, determine directions and create inspiring ecologies. *Land* **2021**, *10*, 651. [CrossRef]
17. Allingham, M. *Distributive Justice*; Taylor & Francis Ltd.: Abingdon, UK, 2014.
18. Lamont, J.; Favor, C. Distributive Justice. In *The Stanford Encyclopedia of Philosophy*; Edward, N.Z., Ed.; Routledge: London, UK, 2017.
19. Moroni, S. The just city. Three background issues: Institutional justice and spatial justice, social justice and distributive justice, concept of justice and conceptions of justice. *Plan. Theory* **2020**, *19*, 251–267. [CrossRef]
20. Ebel, R. Chinampas: An Urban Farming Model of the Aztecs and a Potential Solution for Modern Megalopolis. *HortTechnology Hortte* **2020**, *30*, 13–19. [CrossRef]
21. Barbier, E.B. *Natural Capital, Ecological Scarcity and Rural Poverty*; The World Bank Research Group: Washington, DC, USA, 2012; p. 38.
22. Nofroni, L. Paesaggi delle ecopovertà nel Mediterraneo. Il paesaggio come strumento di osservazione e di proiezione strategica per il superamento delle iniquità eco-sociali. In *La Ricerca che Cambia. Secondo Convegno Nazionale dei Dottorati Italiani dell'architettura, Della Pianificazione e del Design. Università IUAV di Venezia. 1-2/12/2016*; Fabiani, L., Marzo, M., Eds.; Letteraventidue: Siracusa, Italy, 2017; pp. 311–326.
23. Nofroni, L. The landscapes of Ecopoverty. In *The Origins of the Earth and Man. Oasis Ecosystem, Project to Combat Desertification and for Management of Water Resources*; Vallerini, L., Ed.; Università degli Studi di Firenze, DIDA Press: Florence, Italy, 2018; pp. 94–101.
24. Marshall, T.F. *Restorative Justice: An Overview*; Research Development and Statistics Directorate: London, UK, 1998.
25. Hamilton, M. Restorative justice intervention in a planning law context: Is the "amber light" approach to merit determination restorative? *EPLJ* **2015**, *32*, 164–177.
26. Preston, B. The Use of Restorative Justice for Environmental Crime. *Crim. Law J.* **2011**, 136.
27. Fainstein, S.S. Spatial justice and planning. *Justice Spat. Spat. Justice* **2009**, *1*, 1–13.
28. Pirie, G.H. On spatial justice. *Environ. Plan. A Econ. Space* **1983**, *15*, 465–473. [CrossRef]
29. Stanley, A. Just space or spatial justice? Difference, discourse, and environmental justice. *Local Environ.* **2009**, *14*, 999–1014.
30. Chatterton, P. Seeking the urban common: Furthering the debate on spatial justice. *City* **2010**, *14*, 625–628. [CrossRef]
31. UN-Habitat. *The Challenge of Slums, Global Report on Human Settlements*; [Online]. Revised and Updated Version (April 2010); Earthscan Publications Ltd.: London, UK, 2003; Available online: https://unhabitat.org/wp-content/uploads/2003/07/GRHS_2003_Chapter_01_Revised_2010.pdf (accessed on 30 July 2017).
32. Gouverneur, D. Capacity Building and Education in Latin America. Contributions and Limitations of the Venezuelan and Colombian Experiences, Lessons Looking into the Future. In *Resilient Urban Regeneration in Informal Settlements in the Tropics. Advances in 21st Century Human Settlements*; Carracedo García-Villalba, O., Ed.; Springer: Singapore, 2021.
33. Zárate, L. They Are Not "Informal Settlements"—They Are Habitats Made by People. *The Nature of Cities*. 2016. Available online: https://www.thenatureofcities.com/2016/04/26/they-are-not-informal-settlements-they-are-habitats-made-by-people/ (accessed on 6 June 2017).
34. Davoudi, S.; Bell, D. (Eds.) *Justice and Fairness in the City: A Multi-Disciplinary Approach to "Ordinary" Cities*, 1st ed.; Bristol University Press: Bristol, UK, 2016.
35. Garcia-Zamor, J.C. Social Equity in Urban Development the Leipzig Experience. *Int. Rev. Public Adm.* **2009**, *14*, 1–11. [CrossRef]
36. IUCN. *No Time to Lose: Make Full Use of Nature-Based Solutions in the Post-2012 Climate Change Regime; IUCN: Gland, Switzerland, 2009.*
37. Coward, E.W.; Oliver, M.L.; Conroy, M.E. Building natural assets: Re-thinking the Centers, Natural Resources Agenda and its links to poverty alleviation. In Proceedings of the Conference on Assessing the Impact of Agricultural Research on Poverty Alleviation, San José, Costa Rica, 14–16 September 1999.
38. Scherr, S.J. A downward spiral? Research evidence on the relationship between poverty and natural resource degradation. *Elsevier Food Policy* **2000**, *25*, 479–498. [CrossRef]
39. Gray, L.C.; Moseley, W.G. A geographical perspective on poverty–environment interactions. *Geogr. J.* **2005**, *171*, 9–23. [CrossRef]
40. IUCN. *IUCN Global Standard for Nature-Based Solutions—A User-Friendly Framework for the Verification, Design and Scaling Up of NbS*, 1st ed.; IUCN: Gland, Switzerland, 2020.
41. Baró, F.; Calderón-Argelich, A.; Langemeyer, J.; Connolly, J.J. Under one canopy? Assessing the distributional environmental justice implications of street tree benefits in Barcelona. *Environ. Sci. Policy* **2019**, *102*, 54–64.
42. Liotta, C.; Kervinio, Y.; Levrel, H.; Tardieu, L. Planning for environmental justice-reducing well-being inequalities through urban greening. *Environ. Sci. Policy* **2020**, *112*, 47–60. [CrossRef]

43. Lechner, A.M.; Gomes, R.L.; Rodrigues, L.; Ashfold, M.J.; Selvam, S.B.; Wong, E.P.; Raymond, C.M.; Zieritz, A.; Sing, K.W.; Moug, P.; et al. Challenges and considerations of applying nature-based solutions in low- and middle-income countries in Southeast and East Asia. *Blue-Green Syst.* **2020**, *2*, 331–351. [CrossRef]
44. Martin, J.A.; Hendershot, A.L.; Saá Portilla, I.A.; English, D.J.; Woodruff, M.; Vera-Arias, C.A.; Salazar-Costa, B.E.; Bustillos, J.J.; Saénz, F.E.; Ocaña-Mayorga, S.; et al. Anopheline and human drivers of malaria risk in northern coastal, Ecuador: A pilot study. *Malar. J.* **2020**, *19*, 354. [CrossRef]
45. City Population. *San José De Chamanga, Parish in Ecuador*; 2010; Available online: https://www.citypopulation.de/en/ecuador/parish/admin/esmeraldas/080358__san_jos%C3%A9_de_chamanga/ (accessed on 30 August 2021).
46. Jahelka, A.; Ye, S. *Rebuilding for Resilient Landscapes: A Case Study in San José de Chamanga, Ecuador*; University of Pennsylvania. School of Design: Philadelphia, PA, USA, 2017; Available online: https://issuu.com/aubreyjahelka/docs/rebuilding_for_resilient_landscapes/48 (accessed on 30 August 2021).
47. Humanity Road—Ecuador. *Ecuador Earthquake, Special Regional Report*, *2*; 2016; Available online: https://reliefweb.int/sites/reliefweb.int/files/resources/Ecuador%20Earthquake%20Special%20Regional%20Report%2C%20No%202%2C%2021April2016.pdf (accessed on 30 August 2021).
48. UIC Barcelona. *Reconstructing Chamanga: Improving Public Space in Post-Earthquake Ecuador*. 2017. Available online: http://masteremergencyarchitecture.com/2017/02/27/reconstructing-chamanga-improving-public-space-in-post-earthquake-ecuador/ (accessed on 30 August 2021).
49. Ryokawa, A.; Okabe, A. *Human Behavior Response to Disaster-Caused Environmental Changes: A Case of Fishing Community, San José de Chamanga, Affected by the 2016 Ecuador Earthquake*; MDPI: Basel, Switzerland, 2018.
50. I2UD (s.d.). *Earthquake Reconstruction In San José de Chamanga, Ecuador*. Available online: http://i2ud.org/library/earthquake-reconstruction-in-san-jose-de-chamanga-ecuador/ (accessed on 30 August 2021).
51. Kristensen, E.; Bouillon, S.; Dittmar, T.; Marchand, C. Organic carbon dynamics in mangrove ecosystems: A review. *Elsevier Aquatic. Bot.* **2008**, *89*, 201–219. [CrossRef]
52. Reef, R.; Feller, I.C.; Lovelock, C.E. Nutrition of mangroves. *Tree Physiol.* **2010**, *30*, 1148–1160. [CrossRef]
53. Adame, M.F.; Lovelock, C.E. Carbon and nutrient exchange of mangrove forests with the coastal ocean. *Hydrobiologia* **2011**, *663*, 23–50. [CrossRef]
54. Bayen, S. Occurrence, bioavailability and toxic effects of trace metals and organic contaminants in mangrove ecosystems: A review. *Environ. Int.* **2012**, *48*, 84–101. [CrossRef]
55. Yang, Q.; Tam, N.F.Y.; Wong, Y.S.; Luan, T.G.; Su, W.S.; Lan, C.Y.; Shin, P.K.S.; Cheung, S.G. Potential use of mangroves as constructed wetland form municipal sewage treatment in Futian, Shenzhen, China. *Elsevier Mar. Pollut. Bull.* **2008**, *57*, 735–743. [CrossRef] [PubMed]
56. Huang, Q.; Liu, Y.; Zheng, W.; Chen, G. Phytoplankton community and the purification effect of mangrove in the mangrove plantation- aquaculture coupling systems in the Pearl River Estuary. *Procedia Environ. Sci.* **2012**, *15*, 12–21. [CrossRef]
57. Tanner, E.V.J.; Kapos, V.; Healey, J.R. Hurricane effects on forest ecosystems in the Caribbean. *Biotropica* **1991**, *23*, 513–521. [CrossRef]
58. Alongi, D.M. Mangrove forests: Resilience, protection from tsunamis, and responses to global climate change. *Estuar. Coast. Shelf Sci.* **2008**, *76*, 1–13. [CrossRef]
59. Zhang, K.; Liu, H.; Li, Y.; Xu, H.; Shen, J.; Rhome, J.; Smith, T.J. The role of mangroves in attenuating storm surges. *Estuar. Coast Shelf Sci.* **2012**, *102–103*, 11–23. [CrossRef]
60. Aung, T.T.; Mochida, Y.; Than, M.M. Prediction of recovery pathways of cyclone-disturbed mangroves in the megadelta of Myanmar. *For. Ecol. Manag.* **2013**, *293*, 103–113. [CrossRef]
61. Ortiz, N.; Luna-Guido, M.; Rivera-Espinoza, Y.; Vásquez, M.S.; Manuel Ruíz-Valdiviezo, V.M.; Dendooven, L. Greenhouse gas emissions from a chinampa soil or floating gardens in Mexico. *Rev. Intl. Contam. Ambient* **2015**, *31*, 343–350.
62. Tzoulas, K.; Galan, J.; Venn, S.; Dennis, M.; Pedroli, B.; Mishra, H.; Haase, D.; Pauleit, S.; Niemelä, J.; James, P. A conceptual model of the social–ecological system of nature-based solutions in urban environments. *Ambio* **2021**, *50*, 335–345. [CrossRef] [PubMed]
63. Liu, J.; Opdam, P. Valuing ecosystem services in community-based landscape planning: Introducing a wellbeing-based approach. *Landsc. Ecol.* **2014**, *29*, 1347–1360. [CrossRef]
64. Van den Bosch, M.; Sang, A.O. Urban natural environments as nature-based solutions for improved public health—A systematic review of reviews. *Environ. Res.* **2017**, *158*, 373–384. [CrossRef] [PubMed]
65. Potschin, M.; Kretsch, C.; Haines-Young, R.; Furman, E.; Baró, F. Nature-Based Solutions. In *OpenNESS Ecosystem Services Reference Book*; Potschin, M., Jax, K., Eds.; Springer: Berlin/Heidelberg, Germany, 2016; pp. 1–5. Available online: http://www.openness-project.eu/sites/default/files/SP_Nature-based-solutions.pdf (accessed on 29 March 2021).
66. Song, Y.; Kirkwood, N.; Maksimović, Č.; Zhen, X.; O'Connor, D.; Jin, Y.; Hou, D. Nature based solutions for contaminated land remediation and brownfield redevelopment in cities: A review. *Sci. Total Environ.* **2019**, *663*, 568–579. [CrossRef] [PubMed]
67. Merlín-Uribe, Y.; González-Esquivel, C.E.; Contreras-Hernández, A.; Zambrano, L.; Moreno-Casasola, P.; Astier, M. Environmental and socio-economic sustainability of chinampas (raised beds) in Xochimilco, Mexico City. *Int. J. Agric. Sustain.* **2012**, *11*, 216–233. [CrossRef]
68. Mabon, L. Enhancing post-disaster resilience by "building back greener": Evaluating the contribution of nature-based solutions to recovery planning in Futaba County, Fukushima Prefecture, Japan. *Elsevier Landsc. Urban Plan.* **2019**, *187*, 105–118. [CrossRef]

69. Cohen-Shacham, E.; Walters, G.; Janzen, C.; Maginnis, S. *Nature-Based Solutions to Address Global Societal Challenges*; IUCN: Gland, Switzerland, 2016.
70. Lafortezza, R.; Chen, J.; Van den Bosch, C.K.; Randrup, T.B. Nature-based solutions for resilient landscapes and cities. *Environ. Res.* **2018**, *165*, 431–441. [CrossRef]
71. UNESCO. *Soluzioni Basate Sulla Natura Per la Gestione Dell'acqua*; UNESCO: Paris, France, 2018.
72. Pineda-Pinto, M.; Frantzeskaki, N.; Nygaard, C.A. The potential of nature-based solutions to deliver ecologically just cities: Lessons for research and urban planning from a systematic literature review. *Ambio* **2021**, *51*, 167–182. [CrossRef]
73. Shiva, V. *Monocultures of the Mind, Perspectives on Biodiversity and Biotechnology*; Zed Books: London, UK, 1993; pp. 19–20.
74. Sitas, N.; Prozesky, H.E.; Esler, J.K.; Reyers, B. Opportunities and challenges for mainstreaming ecosystem services in development planning: Perspectives from a landscape level. *Landsc. Ecol.* **2014**, *29*, 1315–1331. [CrossRef]
75. Biasi, R.; Colantoni, A.; Ferrara, C.; Ranalli, F.; Salvati, L. In-between sprawl and fires: Long-term forest expansion and settlement dynamics at the wildland–urban interface in Rome, Italy. *Int. J. Sustain. Dev. World Ecol.* **2015**, *22*, 467–475. [CrossRef]
76. Cohen-Shacham, E.; Andrade, A.; Dalton, J.; Dudley, N.; Jones, M.; Kumar, C.; Maginnis, S.; Maynard, S.; Nelson, C.R.; Renaud, F.G.; et al. Core principles for successfully implementing and upscaling Nature-based Solutions. *Environ. Sci. Policy* **2019**, *98*, 20–29. [CrossRef]
77. Carlucci, M.; Grigoriadis, E.; Rontos, K.; Salvati, L. Revisiting a hegemonic concept: Long-term 'Mediterranean urbanization' in between city re-polarisation and metropolitan decline. *Appl. Spat. Anal. Policy* **2017**, *10*, 347–362. [CrossRef]
78. Zambon, I.; Serra, P.; Sauri, D.; Carlucci, M.; Salvati, L. Beyond the 'Mediterranean city': Socio-economic disparities and urban sprawl in three Southern European cities. *Geogr. Ann. Ser. B Hum. Geogr.* **2017**, *99*, 319–337. [CrossRef]
79. Cecchini, M.; Zambon, I.; Pontrandolfi, A.; Turco, R.; Colantoni, A.; Mavrakis, A.; Salvati, L. Urban sprawl and the 'olive'landscape: Sustainable land management for 'crisis' cities. *GeoJournal* **2019**, *84*, 237–255. [CrossRef]
80. Chelleri, L.; Schuetze, T.; Salvati, L. Integrating resilience with urban sustainability in neglected neighborhoods: Challenges and opportunities of transitioning to decentralized water management in Mexico City. *Habitat Int.* **2015**, *48*, 122–130. [CrossRef]
81. Duvernoy, I.; Zambon, I.; Sateriano, A.; Salvati, L. Pictures from the other side of the fringe: Urban growth and peri-urban agriculture in a post-industrial city (Toulouse, France). *J. Rural Stud.* **2018**, *57*, 25–35. [CrossRef]
82. Nickayin, S. *The Urban Forest in the Age of Urbanization*; River Publisher: Gistrup, Denmark, 2021.
83. Di Feliciantonio, C.; Salvati, L. 'Southern' Alternatives of Urban Diffusion: Investigating Settlement Characteristics and Socio-Economic Patterns in Three Mediterranean Regions. *Tijdschr. Voor Econ. En Soc. Geogr.* **2015**, *106*, 453–470. [CrossRef]
84. Ashton, E. The impact of shrimp farming on mangrove ecosystems. *Cab Rev. Perspect. Agric. Vet. Sci. Nutr. Nat. Resour.* **2008**, *3*, 12. [CrossRef]
85. Barbier, E.B. *Shrimp Farming and Mangrove Loss in Thailand*; Edward Elgar Publishing: Cheltenham, UK, 2004.
86. Hamilton, S.E. The Impact of Shrimp Farming on Mangrove Ecosystems and Local LivelihoodsAlong the Pacific Coast of Ecuador. Ph.D. Thesis, University of Southern Mississippi, Hattiesburg, MI, USA, 2011.
87. Huitric, M.; Folke, C.; Kautsky, N. Development and government policies of the shrimp farming industry in Thailand in relation to mangrove ecosystems. *Ecol. Econ.* **2002**, *40*, 441–455. [CrossRef]
88. Kautsky, N.; Rönnbäck, P.; Tedengren, M.; Troell, M. Ecosystem perspectives on management of disease in pond farming. *Aquaculture* **2000**, *191*, 145–161. [CrossRef]
89. Primavera, J.H. Socio-economic impacts of shrimp culture. *Aquac. Res.* **1997**, *28*, 815–827. [CrossRef]
90. Sukardjo, S. Tumpang sari pond as a multiple use concept to save the mangrove forest in Java. *Biotrop Special Publication* **1989**, *37*, 115–128.
91. Primavera, J.H. ntegrated Mangrove-Aquaculture Systems in Asia. In *Integrated Coastal Zone Management*; Springer: Berlin, Germany, 2000; pp. 121–130.
92. Oswin, S.D.; Ali-Hussain, S. Integrated mangrove Shrimp Silvofisheries: A pioneer organic shrimp culture model in India. *Aquac. Asia* **2001**, *4*, 5–9.
93. Bosma, R.H.; Nguyen, T.H.; Siahainenia, A.J.; Tran, H.T.P.; Tran, H.N. Shrimp-based livelihoods in mangrove silvo-aquaculture farming systems. *Rev. Aquacult.* **2016**, *8*, 43–60. [CrossRef]
94. Baig, S.P.; Rizvi, A.R.; Pangilinan, M.J.; Palanca-Tan, R. *Cost and Benefits of Ecosystem Based Adaptation, Global Ecosystems Management Programme*; IUCN: Gland, Switzerland, 2016.
95. Martínez, J.L. *Manual de Con-Strucción de Chinampas*; Instituto Mexicano de Tecnología del Agua: Mexico City, Mexico, 2004.
96. Renard, D.; Iriarte, J.; Birk, J.J.; Rostain, S.; Glaser, B.; McKey, D. Ecological engineers ahead of their time: The functioning of pre-Columbian raised-field agriculture and its potential contributions to sustainability today. *Ecol. Eng.* **2012**, *45*, 30–44. [CrossRef]
97. Albert, C.; Schröter, B.; Haase, D.; Brillinger, M.; Henze, J.; Herrmann, S.; Gottwald, S.; Guerrero, P.; Nicolas, C.; Matzdorf, B. Addressing societal challenges through nature-based solutions: How can landscape planning and governance research contribute? *Landsc. Urban Plan.* **2019**, *182*, 12–21. [CrossRef]
98. Frantzeskaki, N.; McPhearson, T.; Collier, M.J.; Kendal, D.; Bulkeley, H.; Dumitru, A.; Walsh, C.; Noble, K.; Van Wyk, E.; Ordóñez, C.; et al. Nature-based solutions for urban climate change adaptation: Linking science, policy, and practice communities for evidence-based decision-making. *BioScience* **2019**, *69*, 455–466. [CrossRef]

99. Mussinelli, E.; Tartaglia, A.; Bisogni, L.; Malcevschi, S. The role of Nature-Based Solutions in architectural and urban design. *Techne* **2018**, *15*, 116–123.
100. Xing, Y.; Jones, P.; Donnison, I. Characterization of nature-based solutions for the built environment. *Sustainability* **2017**, *9*, 149. [CrossRef]
101. European Commission. *Towards an EU Research and Innovation Policy Agenda for Nature-Based Solutions & Re-Naturing Cities: Final Report of the Horizon 2020 Expert Group on 'Nature-Based Solutions and Re-Naturing Cities'*; European Commission: Bruxelles, Belgium, 2015.
102. Wild, T.; Freitas, T.; Vandewoestijne, S. *Nature-Based Solutions: State of the Art in EU-Funded Projects*; European Commission: Bruxelles, Belgium; Luxembourg, 2020.
103. Kabisch, N.; Frantzeskaki, N.; Pauleit, S.; Naumann, S.; Davis, M.; Artmann, M.; Haase, D.; Knapp, S.; Korn, H.; Stadler, J.; et al. Nature-Based Solutions to Climate Change Mitigation and Adaptation in Urban Areas: Perspectives on Indicators, Knowledge Gaps, Barriers, and Opportunities for Action. *Ecol. Soc.* **2016**, *21*. Available online: https://www.jstor.org/stable/26270403 (accessed on 30 August 2021). [CrossRef]
104. Morris, R.L.; Konlechner, T.M.; Ghisalberti, M.; Swearer, S.E. From grey to green: Efficacy of eco-engineering solutions for nature-based coastal defence. *Glob. Chang. Biol.* **2018**, *24*, 1827–1842. [CrossRef] [PubMed]
105. Kabisch, N.; Korn, H.; Stadler, J.; Bonn, A. *Nature-Based Solutions to Climate Change Adaptation in Urban Areas—Linkages Between Science, Policy and Practice*; Springer Nature: Tokyo, Japan, 2017.
106. Rizvi, A.R.; Baig, S.; Verdone, M. Ecosystem Based Adaptation: Knowledge Gaps in Making an Economic Case for Investing in Nature Based Solutions for Climate Change. *Iucn* **2015**, *48*, 1–62. Available online: http://www.iucn.org/sites/dev/files/content/documents/the_economic_case_for_eba_en_1.pdf (accessed on 29 March 2021).
107. Seddon, N.; Sengupta, S.; García-Espinosa, M.; Hauler, I.; Herr, D.; Rizvi, A.R. *Nature-Based Solutions in Nationally Determined Contributions: Synthesis and Recommendations for Enhancing Climate Ambition and Action by 2020*; IUCN: Oxford, UK, 2019; Available online: https://portals.iucn.org/library/node/48525 (accessed on 29 March 2021).
108. UNDP. *Solutions Snapshot. Nature-Based Solutions*; UNDP: Washington, DC, USA, 2018.
109. Secretariat of the Convention on Biological Diversity. *Secretariat of the Convention on Biological Diversity. Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change, CBD Technical Series*; Secretariat of the Convention on Biological Diversity: Montreal, QC, Canada, 2009.
110. Sales, J. *Nature-Based Solutions Are at the Heart of a Major New Project Helping Four Cities in Laos*; 2019; pp. 1–5. Available online: https://gca.org/nature-based-solutions-are-at-the-heart-of-a-major-new-project-helping-four-cities-in-laos/ (accessed on 30 August 2021).
111. Park, J.; Hong, I. *Innovative Solutions for Climate-Resilient Flood Management in the Poorer and Vulnerable Province of Leyte, The Philippines*; Springer Nature: Singapore, 2020.
112. ADB. Nature-Based Solutions for Cities in Viet Nam: Water Sensitive urban Design. 2019. Available online: https://www.adb.org/publications/nature-based-solutions-cities-viet-nam#:~:text=Water%20Sensitive%20Urban%20Design%20integrates,vibrant%20centers%20of%20community%20life (accessed on 7 March 2022).
113. Li, H.; Ding, L.; Ren, M.; Li, C.; Wang, H. Sponge city construction in China: A survey of the challenges and opportunities. *Water* **2017**, *9*, 594. [CrossRef]
114. Xia, J.; Zhang, Y.Y.; Xiong, L.H.; He, S.; Wang, L.F.; Yu, Z.B. Opportunities and challenges of the Sponge City construction related to urban water issues in China. *Sci. China Earth Sci.* **2017**, *60*, 652–658. [CrossRef]
115. Parker, R.; Kreimer, A.; Munasinghe, M. (Eds.) *The International Decade for Natural Disaster Reduction (IDNDR). Informal Settlements, Environmental Degradation, and Disaster Vulnerability: The Turkey Case Study*; [Online]; The World Bank: Washington, DC, USA, 1995; Available online: http://documents.worldbank.org/curated/en/693531468761060935/Informal-settlements-environmental-degradation-and-disaster-vulnerability-the-Turkey-case-study (accessed on 31 July 2017).