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Grassroots Innovation for Urban Greening within a Governance Vacuum by Slum Dwellers in Dhaka

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Abstract: The nature-based solutions of slumdwellers are paramount to the ongoing integrity of major cities in the global South. The paper investigates the urban-greening decision-making of slum citizens whose civic participation finds support in shared governance initiatives: non-governmental organizations (NGOs) and community-based organizations (CBOs). The background informing the conceptual framework guiding this research derives from socio-technical transitions scholarship on critical niches in grassroots innovations. The objective of this research is to examine how slum dwellers are implementing urban greening in Dhaka, Bangladesh. The research considers how slum dwellers manage a governance vacuum through civic participation with NGOs and CBOs. The methods in this study comprise qualitative fieldwork in Dhaka and semi-structured interviews with stakeholders and citizens. The research findings show that a governance vacuum requires an adjustment to the perspective on grassroots innovations to endure in the global South in contexts where there is limited opportunity locally for intermediaries to achieve scale. There is a limit to the extent that the critical niches perspective applies to grassroots innovations in greening Dhaka's slums; therefore, we contribute nuance as a refinement to the approach. The study offers a complementary explanatory framework for how NGOs, CBOs and other intermediaries at the grassroots contend with, and even thrive within, a vacuum of governance in the enactment of urban greening in Dhaka's slum settlements.

Keywords: slums; urban green infrastructure; green space; Bangladesh; multi-level perspective

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1. Introduction

> Green infrastructure is a challenge in urban slums. In any slum, the basic query is: where is the space? Undoubtedly, green infrastructure is a noble idea, but it is a quite arduous task for us to motivate slum households. While trying to make them understand, they usually offer the counter argument: we have a water problem, we don't have enough food, and we live here hand-to-mouth. Then, who will take care of the plants in the long run, since we are transient here?

In the above interview for this research, an official of a seasoned non-governmental organization (NGO) in Bangladesh expresses frustration, even resignation, about scaling up urban greening projects in low-income settlements within Dhaka's urban core. Local agencies face ongoing attenuation in the policy sphere towards urban greening projects due to disconnects between policymaking and grassroots innovations. Such despondency is resplendent in Bangladesh, where intermediaries of sustainable niches face a governance vacuum. The reason for this vacuum is a debilitating malaise in policy circles stemming from a nexus of limited resources, endemic corruption, complex bureaucracy, administrative ennui and recruitment cronyism that obviates the urban greening that could benefit slum dwellers. Despite formidable hurdles and administrative inertia, slum dwellers and grassroots organizations nevertheless undertake urban greening in their locales. These

efforts are attracting global attention and are circumventing the governance vacuum at the local level in order to find support and investment.

The term 'vacuum' means a space entirely devoid of matter or, in its use as an idiomatic phrase, without links to the outside world. Governance over urban greening in Bangladesh is entrusted to municipal corporations who lack resources, vision and support for meaningful change to benefit slum residents. The governance vacuum is an acknowledged impedance to urban agriculture and the improvement of biodiversity more generally in the global South, particularly in informal settlements (see [1], p. 28). The need to 'leapfrog stacked vulnerabilities' [2]—in this case, poverty, internal migration pressures, livelihood uncertainties, unplanned development, corruption, and many others—in Bangladesh demands stop gaps in slums for urban greening that derive from shared governance initiatives with civic actors. While the governance vacuum is certainly present in many countries' efforts on urban greening—for instance, in the United Kingdom where it is an imperative due to volatile issues such as climate change [3]—it is generally an unfamiliar feature in the global South, where policymakers are compelled to engage with communities unable to enact community gardening or rewilding legitimately [4,5]. In the global North, intermediaries offer policymakers advice and a connection with electorates and are held to account for their efforts by the media and the mechanisms of the state. It is not so in the global South, and certainly not in urban slums, where municipal authorities face overwhelming pressures and challenges due to burgeoning populations of internal migrants and corruption in the management of public and private space.

The research addresses a gap in the current field on the governance vacuum by incorporating it into a framework presently established in the socio-technical transitions canon of scholarship (see [6]) to explain how fringe, or niche, actors can scale up their innovations through taking advantage of windows of opportunity and protected spaces that derive from pressures at a transnational, global, scale. The socio-technical transitions approach, chiefly the Multi-Level Perspective (MLP), abstracts thinking about processes on a spectrum between the global and the local scales over time. After leading scholar in the field Frank Geels, the MLP underlines the importance of radical innovations in socio-technical transitions and the conceptual framework is known for fostering debate through its elaborations and criticisms [7].

A sister theory deriving from, and complementary to, the MLP is grassroots innovations, which are particularly relevant for the global South, in sustainable development, where there is a lack of funding and support for fringe activities and where urban greening is relegated to titular authorities unaccountable to communities of the urban poor [8]. Grassroots innovations in this context directly pivot off a governance vacuum by interfacing with global flows of support and investment that are not aligned with national or local regimes.

Before we proceed further, we would like to define some of the terms that we use in this paper. Urban greening is a term for policies and initiatives that integrate natural ecosystems into the built environment in a multi-functional way [9]. Urban greening refers to both flora and associated infrastructures that support its use in buildings and dwellings [10]. Beyond its importance for wellbeing [11] and aesthetic beautification, urban greening can address challenges such as flooding [12], heat stress [13], food security [14], air pollution and other threats to homes, communities and cities, in ways that grey infrastructure cannot. While an attractive option for the global South—many countries being tropical or subtropical [15]—there is a litany of hurdles that make it complex to implement, notwithstanding widespread poverty and the post-colonial legacy of many countries within this region.

The second term we deploy, grassroots innovations, is a social theory that intimately connects with community development initiatives in juxtaposition to the concept of innovation in a business or market sense. Grassroots innovations aim to bring out broader social change through bottom-up action and, crucially, policy attention to communities who are disempowered [16,17]. Grassroots innovations serve a unique role in the global South: community projects primarily focus on ensuring the basic needs of marginalized people and are in many cases an 'only option left' [18]. Even though Bangladesh is marked as a

pioneer of niche activism, there are few instances of grassroots innovation in the country documented in scholarly studies, particularly on greening in urban areas ([19], p. 4). The studies that do exist highlight the lack of momentum and the shortfall between aspirations and actual change in community efforts [20]. A key reason for this dearth of scholarship is a governance vacuum that sees grassroots intermediaries' actions fall on deaf ears: there is a vacuum across multiple levels of governance in nation states such as Bangladesh which disrupts niches' scope to scale up to affect mainstream regimes. The governance vacuum is dissimilar to policy failure and policy mobility [21]. Indeed, policies on urban greening in Bangladesh are not failures per se, due to their stasis between implementation and debate.

Notwithstanding the governance vacuum, NGOs do attract support, often internationally, and continue to aspire to invoke momentum to ultimately affect policy. Throughout the twenty-first century, more than 2400 local and international NGOs have been active nationwide in Bangladesh [22]. Community involvement in green infrastructure at the grassroots is extensive in Bangladesh's rural areas; however, urban greening does not feature prominently in grassroots innovations within cities, where major populations reside. That is not to say that NGOs are inactive in urban contexts. In recent times, NGOs and CBOs have been at the forefront of interventions in informal settlements in Dhaka and other cities in supporting basic service provisions to slum households, primarily electricity, water, gas and sanitation. Urban greenery, dissimilar to these other forms of infrastructure, demands policy support given a pell-mell of space, resources, education and livelihoods are at play. A key insight in this paper is that scholarly research on social change through grassroots innovations can reconcile the conundrum that NGOs and CBOs' efforts are not achieving scale and failing to garner sufficient support to provoke political attention in urban greening, despite the many instances of community engagement.

To understand the existing dynamics of grassroots innovations for urban greening in Bangladesh's urban context, we consider a complementary analytical perspective nested within this area of inquiry: critical niches [23]. To aid this perspectival shift, we propose a nuance to this approach. In aiming to contribute to this seam of theory from the field of socio-technical transitions, we consider its appropriateness for this research in the context of urban agriculture and greening more specifically. To date, research on urban greening emphasizes market-driven innovations and inclusivity for the ultra-poor is not the norm here, whether it is vertical gardens on office blocks or public parks [24,25]. Instead, we attend to values-driven community-based initiatives which are under-researched in the context of poverty in the global South. Our aim is to understand how political inattention limits the scope for growth and aspirations of scale for intermediaries operating outside of government in Korail, Dhaka's largest slum settlement. According to the Bangladesh Bureau of Statistics (BBS), approximately 1.06 million people live as 'floating populations' in slums in Dhaka, with up to 50,000 estimated to live in the urban core informal quarter, Korail.

Drawing on semi-structured interviews in Dhaka with representatives in 13 local NGOs and five CBOs, our research question is: how do grassroots innovators in urban greening respond pragmatically to a governance vacuum? In our research, we provide examples of urban greening initiatives at the community level that have the aim of a more equitable and just urban environment for slum dwellers in Dhaka. Finally, we extend our analysis by suggesting that engaging with a governance vacuum is crucial for inquiries on critical niches in urban greening in a global Southern context.

The structure of the paper is as follows: in the next section, we unpack the concept of urban greening and grassroots innovations and review the relevant literature, with a focus on Bangladesh. In Section 3, we review the methods and field site. In Section 4, we appraise the conceptual framework, introducing a nuanced perspective on critical niches to the theory of grassroots innovations. In Section 5, we describe NGO's and CBO's roles in grassroots innovations in Dhaka's slums applying the grassroots innovations framework to the empirical research. Finally, we discuss the challenges and opportunities of grassroots innovation in Bangladesh and draw concluding remarks.

2. Literature Review

Urban greening is an emergent topic in the social sciences. It is applied to the global South specifically in the disciplinary areas of urban planning and ecology. The term is fluidly reflective of wellbeing and gentrification [26] on the one hand and urban resilience and disaster management [27] on the other. As Matthews et al. [28] note, these two different shades of urban greening derive from unique political and socio-cultural contexts. After Mell, urban greening is 'an approach to urban planning that helps to deliver multi-functionality and draws heavily on the promotion of ecological network capabilities' ([29], p. 3). Others operationalize the term for strategically planned and managed natural lands and open spaces that ensure multiple environmental, social and economic services to urban communities [30–32].

The concept of urban greening is embedded within the network of natural and designed vegetation and plantations within cities [33,34]. In order to delineate the specifics of urban greening, we can narrow the meaning to storm water management [35–37], air quality control [38–40], biodiversity preservation [41–43], urban heat-island mitigation [44–46], flood proofing [47–49], and climate-change adaptation [32,50].

Given the usefulness of urban greening to resilience and wellbeing, it could be thought that it is high on the agenda in the global South; however, this is not the case in Bangladesh. Government leadership, both at the national and local levels, is central to implementing green infrastructure [51]. Paradoxically, those areas that require the most intervention, namely, informal settlements such as slums, are generally beyond the remit of urban governance efforts towards greening [52]. There is interest in urban greening at the intragovernmental level, for instance, the European Commission ([53], p. 5) clearly emphasizes 'socially inclusive green growth' for people regardless of whether they are rich or poor. However, as yet, slum communities face limited opportunities for participation in urban greening due to the phenomenon we identify as a governance vacuum.

Action on urban greening is urgent in Bangladesh. Currently, Dhaka is the second most polluted city in the world according to the US Air Quality Index; pollution relates to five of the top 10 causes of death in Bangladesh [54]. Dhaka's green spaces and resources are primarily dealt with by various government ministries, chiefly, the Ministry of Environment and city agencies such as Rajdhani Unnayan Kartipakkha (RAJUK), a Bangladeshi public agency responsible for coordinating urban development projects and approvals. Notwithstanding confusion about whose remit urban greening lies under, local governance bodies, such as the municipal Dhaka City Corporation (DCC), have embarked upon multiple initiatives to make the city more sustainable through greening with NGOs and CBOs. These projects include waste disposal, sewerage management, roadside plantations, public parks and playground maintenance. For instance, to popularize and encourage green infrastructure, the DCC has adopted the slogan 'plant a tree and save the environment' ([55], p. 44). Another example is DCC's announcement that landlords who plant gardens on their rooftops, verandas and in front of vacant properties will be exempt from a 10 per cent holding tax. Similarly, RAJUK incorporates some rules in building codes that rainwater harvesting is compulsory for urban dwellers. Despite these small-scale efforts, there are preciously few long-lasting and scalable projects in urban greening that are relevant for city dwellers in slums.

The consequences of the governance vacuum we highlight are resplendent in Dhaka's urban core slum Korail, where urban greening is neither a major concern for urban planners, nor policy makers. A hub for scores of internal migrants from rural areas measured in the hundreds of thousands annually, Korail is excluded from green infrastructure planning. Reasons vary from property disputes where slum dwellers either squat or rent through informal landlords, to corruption because much of the land is owned by *mastaans*, local criminals. Another source of exclusion is electoral confusion: the majority of slum dwellers do not have formal citizenship or proof of identity, despite offering a sizeable vote bank in electioneering. Dissimilar to the rest of Dhaka city, the varied politics of actioning urban greening in slums appear insurmountable to policymakers, who avoid tabling issues

despite pressure from intragovernmental agencies, such as the United Nations (UN), to target urban greening in relation to global sustainable development goals [56]. In slums, one of the noteworthy urban projects is the Urban Partnerships for Poverty Reduction (UPPR) scheme funded by the UN Development Programme, which targets 3 million slum dwellers in 30 cities, including Dhaka [57]. The prime component of UPPR is to provide training to slum dwellers, distribute seeds, and encourage them towards urban agriculture.

Since the 1980s, development activities in the country have been regulated by the voluntary organizations that derive support from donor citizens and intragovernmental organizations with limited support from the government. From the 1990s to the present, there has been an important transition in urban management policy as NGOs and CBOs have attempted to invoke projects in collaboration with the government and other stakeholders close to power [58]. Islam highlights four ingredients of community development projects in which NGOs intervene with policy in mind: 'improving participation, social networking, partnership and development ownership' ([22], p. 479). Examples include rooftop afforestation [59], flood-proof cluster housing [60], and floating gardens [61]. Intractable issues diminish efforts to participate in urban greening for policymakers and are a root cause of the refractoriness of the governance vacuum. In the next section, we consider the theory of grassroots innovations with regards to urban greening and establish the significance of sustainable niches for this framework.

The term 'grassroots innovations' is designed to contrast with market-based innovations that are motivated by profitmaking and within the milieu of capitalism, business and markets [62–64]. Grassroots innovations, on the contrary, are understood to be inclusive bottom-up processes arising from local contexts and suggestive of various solutions for equity and social justice [65,66]. Grassroots innovations offer low-cost and small-scale opportunities for people who have limited resources in society [67]. Scholars share a consensus that this kind of action addresses challenges through community empowerment and engagement with policymakers [16,66]. Overall, grassroots innovations are promulgated through dialogue between communities and intermediaries, for instance, NGOs, and other actors in civil society instead of by the direct mandates of government [16,68].

Studies on grassroots innovations primarily began two decades ago. Since then, the concept has gradually been evolving in scholarly research to occupy a space between individuals and policymakers: a bridging concept to describe how niches affect mainstream society, or in socio-technical transitions jargon, the 'system' or 'regime' [69]. After Smith and Seyfang, grassroots innovation can be defined as: 'a network of activists and organizations generating novel bottom-up solutions for sustainable development and sustainable consumption; solutions that respond to the local situation and the interest and values of the communities involved' ([70], p. 585). Among the European countries, the UK is marked as a breeding ground for grassroots innovations; for instance, more than 5000 community groups are involved in projects with government support [71]. Some other noteworthy grassroots-innovation examples are community currency movements [72,73]; community energy groups [74]; eco-villages [75]; and organic food co-operatives [76,77]. Aside from these UK examples, studies on community-based renewable-energy transitions in European countries (e.g., Germany, the Netherlands and France) foreground place and local entrepreneurship with councils [78]; local policy interaction [79]; experiments in municipal autonomy [80]; and networking with and learning from local-government supporters [81].

Grassroots innovations theory includes different perspectives, chiefly, strategic niche management (SNM), niche advocacy and critical niches. A review of these perspectives is out of the scope of this paper and the gamut of previous work elsewhere: the latter critical niches perspective is of cardinal importance for this paper's progress in the field [23]. The critical niches perspective is relevant for urban greening in Korail since it does not preclude more transformational pathways to sustainability, in this case, through urban greening. The following discussion frames critical niches according to four aspects: local experiments, knowledge priorities, niche intermediation, and politics, with reference to the governance vacuum in each case.

After Smith et al. [23], critical niches are neither promoted solely in terms of instrumental solutions, nor by convincing others such solutions matter, but rather in questioning system conventions and debating the critical implications of urban greening, understood very differently to the norms in those regimes. A working definition is that the critical niches perspective:

> Argues the developments that really matter are those that challenge regimes and point to alternative, emancipatory possibilities regardless of elite policy agendas. Workable solutions are not the priority: rather material critique that unsettles and debates prevailing terms for societal issues. ([23], p. 413)

Grassroots innovations have nuances in the context of Bangladesh's slum settlements that make the critical niches perspective suitable. Elite policy agendas highlight the need for evictions of slum residents, reductions in the annual flows of migrants from rural areas into slums, and the privileging of private property owners either within slum settlements or in proximity. The critical niches perspective, instead, emphasises challenging regimes through emancipatory possibilities, invoking resistance to political agendas and attempting to provoke debate through pragmatic action. There are four aspects to grassroots innovations in this perspective: local experiments, knowledge priorities, niche intermediation and politics. In each of these instances, we next discuss the specific challenges within the context of greening Dhaka's slums.

The reviewed literature shows how grassroots innovations are, for the most part, located in the global North where policymakers can interact meaningfully with intermediaries and communities. Dissimilar to the global North, the standard settings of innovative ideas hardly fit and are often seen as 'illusive' and 'fuzzy' in the context of the global South [65]. In South Asia, noteworthy grassroots innovations are the Honey Bee Network (HBN) and the People's Science Movement (PSM), with the former coordinating activities with an autonomous body, the National Innovation Foundation, of the Department of Science Technology, Government of India and the latter chiming well with state- and national-level interests in education and science, technology, engineering and mathematics (STEMs) promotion in India [74,82]. Next, we consider the methods we deployed to research grassroots innovations in Bangladesh.

3. Methods

The field site for this study was Korail, the largest and densest slum in Dhaka City, situated on 90 acres in the centre of Dhaka near the affluent suburb of Gulshan [83]. The quarter has more than 120,000 inhabitants, many recent migrants from rural areas; hence, its proximity to Mohakhali Bus Terminal (Figure 1). Recent scholarship styles these newer residents as 'climate migrants' [84] due to the significant trend for rural workers to be amongst their ranks. These residents have migrated in response to drought-, flood- or storm-induced poverty—this point is pertinent to our study since these migrants have latent competencies in agriculture and horticulture applicable to urban greening [20].

Intermediary grassroots actors such as NGOs and CBOs in Bangladesh are broadly categorized into two groups. The first group belongs to developmental NGOs while the other encompasses advocacy and voluntary organizations. For the requirement of our discussion, we cover all forms of grassroots intermediaries (including CBOs) working directly or indirectly on urban greening projects. We define 'NGOs' as private and non-profit organizations bearing a distinctly autonomous character and working for the welfare of disadvantaged communities [85]. By contrast, CBOs comprise of volunteers and activists who work informally and according to a network rather than an organizational structure [86]. Advocacy and voluntary organizations bear similar characteristics to CBOs but are instead regulated by a distinct board of trustees aiming for philanthropic assistance.

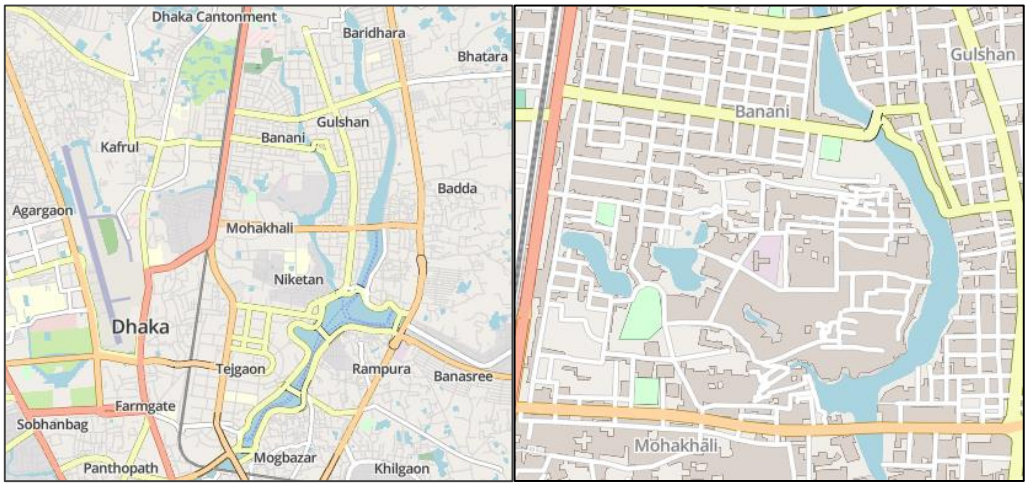

Figure 1. Map of Dhaka City (**left**) and Korail Quarter between Banani and Mohakhali (**right**) (Source: OpenStreetMap).

In order to unpack the grassroots innovations of local agencies, we use the qualitative research method of semi-structured interviews [87]. Interviewing in qualitative research is appropriate for exploratory studies that understand the city as a methodological resource as well as a site, per se [88]. For our study, qualitative methods were crucial to gain new insights about urban greening and grassroots innovations. The interpretation of qualitative data derived from a nuanced interpretation of urban greening projects ranging across fields of activity.

Our current study is based on the primary experiences of grassroots intermediaries chiefly based in Dhaka. Initially, our focus was on the relevant intermediary actors working on urban greening in Korail slum (Table 1). As the research progressed, we widened our gaze to other intermediaries working in different slums in Dhaka in order to include the broader spectrum of environmental issues across cities in Bangladesh. Since NGOs' client and project lists are complex, we narrowed the case selection based on three criteria: environment-oriented activities, urban greening projects and slum upgrading schemes. For the specific NGOs selected for interviewing, we relied on a review of online and promotional material to gauge their goals and activities. In many cases, we cold called the NGO's offices directly to access the details of current projects and activities. We also used snowballing and purposive recruitment methods to locate relevant NGOs working in slum contexts. Table 1 is a brief summary of the key features of intermediaries selected for the study.

In total, we undertook semi-structured in-depth, qualitative interviews with 13 local NGOs and five CBOs during two stints of fieldwork. Fieldwork lasted for three consecutive months (October–November 2016 and January 2017). In addition, in 2018, the research team revisited the NGOs and CBOs for follow-up interviews to gather further data and gain updated information on their activities. The interviews lasted, on average, an hour using the local language (Bengali) and the notes were translated into English by one of the authors, who is a native speaker. The research process involved multiple semi-structured interviews accompanied by field-site observations (Figure 2). Following the granting of ethics approval, the research team contacted families in Korail via key 'gatekeepers' who are respected leaders or elders in the community. These individuals facilitated access to relevant families and households who had undertaken activities with NGOs and CBOs sites and applied them to their own situations. The team also contacted the leadership of NGOs and CBOs and were introduced to participants with expertise in the topic area. Site visits involved observations of slumdwellers engaging with the NGO and CBO sites in Korail. Following the fieldwork period, the research team followed up with the participants to ask further questions and to receive updates on their latest interactions with the topic area.

Table 1. The extent of NGOs' activities relating to urban greening in Dhaka city. Source: Authors.

No.	Name and Year Founded	Description
1.	Aparajeyo Bangladesh (AB), 1995	The project aims to educate slum children in Korail by operating schools with urban greening in the curriculum.
2.	Alor Pothe Nobojatray (APON) Foundation, 2008	The project's aim is tree plantation with the community in Gulshan's Jhil Par area.
3.	Bangladesh Poribesh Andolon (BAPA), 2000	Seeks to organize nationwide movement on environmental protection. The organization works as stock taker in Mirpur and Hazaribag slums to ensure livelihood and water security.
4.	Bangladesh Youth Environmental Initiatives (BYEI), 2009	Providing environmental education and awareness-raising programs for youth demographics.
5.	Bangladesh Rural Advancement Committee (BRAC), 1972	Conducting urban development programs in Korail focusing on eco-housing.
6.	CHANGE, 2012	*Botol Bati* project to reduce CO_2 emissions in slums and install solar lights for indoor plantations (hydroponics).
7.	Coalition for Urban Poor (CUP), 1989	Aims to enhance overall wellbeing through ensuring basic rights of slum dwellers in relation to accessing green space.
8.	Dushtha Shasthya Kendra (DSK), 1989	The project aim is to manage waste in sustainable ways in Korail.
9.	Green Savers, 2012	Runs oxygen bank and school gardening project in various schools.
10.	JAAGO Foundation, 2007	The project aims to educate slum children through operating educational programs.
11.	Manabic Shahajya Sangstha (MSS), 1974	Encourages social development projects focusing on waste management, home gardening and street planting.
12.	Surovi, 1979	Invests in education projects in Korail and other slums.
13.	Work for Better Bangladesh (WBB), 1998	Works towards preserving parks, playgrounds and open spaces, especially for disadvantaged groups.

Along with interviews (primary evidence), we deployed direct observation (primary evidence) and examined NGO brochures and campaign material (secondary evidence) to triangulate data and improve the accuracy of the thematic analysis. Witnessing NGOs' activities within the communities through direct observation allowed us to obtain rich insights into their urban greening activities. To apply and test the critical niches perspective, we enquired about their respective activities and how the projects contribute to the niche development of urban greening.

Dissimilar to our research with NGOs, we had to rely on a somewhat different methodological approach to engage with relevant CBOs whose activities are primarily based in Korail. We targeted five CBOs working in Korail, the largest slum in Dhaka in terms of population, size and density. In many cases, CBOs are organized by NGOs under some specific guidelines and structural arrangements. In Korail, CBOs have little or no formal qualifications and usually work in collaboration with intermediaries to maintain slum dwellers' basic services such as water and sanitation. Since CBOs are difficult to reach via email or posting a formal letter, we recruited gatekeepers to recommend the participants and facilitate access.

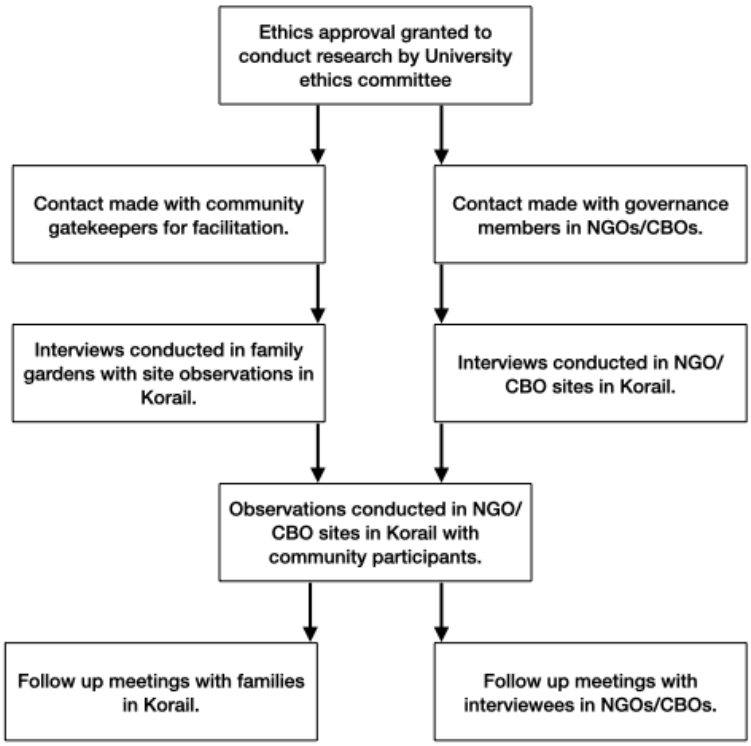

Figure 2. Flow chart of methods (Source: Authors).

4. Results: Critical Niches on Greening Dhaka's Slums

This section explores how local actors diffuse the processes of grassroots innovation in urban greening throughout Dhaka's slums when there is no reciprocity in the regime to sustainable niches. Reflecting on the governance vacuum, the critical niches framework opens an alternative avenue of inquiry into how slum dwellers and NGOs and CBOs undertake nature-driven solutions, with the absence of representation affording experimentation and access to global information flows that might not have been tolerated by officials. To understand how urban greening and grassroots innovation interact, we delineate a community-driven approach to the evolution and future development of intermediary actors at the niche scale from the perspective of critical niches (see [23]). In order to understand how each example diffuses its innovations, we provide a detailed analysis of case studies pertinent to four types of critical niches. In each case, we point out that while the critical niches perspective certainly applies some nuances to it are appropriate due to the governance vacuum in Dhaka, which requires adjustment across the categories of 'local experiments', 'knowledge priorities', 'niche intermediation' and 'politics'.

4.1. Local Experiments: Platform of Hope

Between 2008 and 2011, the NGO BRAC collaborated with a local family to create the highly publicized Ashar Macha (Platform of Hope) with the leadership of internationally qualified (Sheffield and Lund Universities) architect Khondaker Hasibul Kabir. In this experiment, Kabir innovated a platform over Gulshan Lake in Korail built of bamboo and connected to a community to be a meeting place for slum dwellers to socialize in.

High-profile experiments prove useful for local niche intermediaries, as an NGO Programme Manager reflects:

> We believe that the whole of Dhaka is an outdoor living room where everyone has equal rights, including slum dwellers . . . Urban households living in a particular place will not go to another locality for entertainment . . . Like Ashar Macha, something needs to be done first on a small-scale. Slum dwellers have the equal rights to enjoy outdoor activities rather than staying in 50 square feet shacks.

The local experiment attracted international media interest and the support of intra-governmental organizations in order to draw attention to urban greening in Korail in the absence of local political support.

First, norms were challenged of how the slum is understood as a contested space through promotion of a vision of the urban commons that is radically different from the reality, wherein the media portrays informal developments such as *ad hoc* structures and shared gardens as an incursion demanding action—often in a conflictual manner such as eviction—by the municipal authorities.

Second, values of cooperation, play and collaboration wherein residents become stewards of the site symbolized an alternative to discourses prevalent in Bangladesh that informal urban development represents a 'problem' for the government. This is in marked contrast to the typical notion of slum residents as competing for space in the urban commons with Dhaka's other citizens.

Third, the local experiment revealed structural issues within the dense confines of the slum: a lack of safe places for children to play or for people to socialize in. Recent efforts by the city's governance send mixed messages to slum residents that their activities in the urban commons are an antithesis to urban greening and a liveable city. For instance, Dhaka South City Corporation (DSCC) Mayor Mohammad Sayeed Khokon conflates urban greening with clearances from public spaces in a busy commercial district:

> I am trying my best to make Dhaka a clean, green liveable city. There is a visible change in how the city looks . . . you could not walk on the footpaths of Gulistan before as it was occupied by hawkers, vendors, illegal parking, you name it; but now you can. ([89], no pagination)

Fourth, Ashar Macha was an antagonistic work, serving as a demonstration against the escalating conflicts that, since 2012, have made slum living even more harrowing for residents leading up to a planned mass demolition to make way for the government-funded Hi-Tech Park (Mohakhali ICT Village) on the site of Korail. Notwithstanding the media interest, Ashar Macha no longer exists in Korail since being demolished during a major slum eviction in 2012 [90]. In April 2014, Dhaka District Administration removed a further 2000 structures from Korail's waterside and reclaimed 170 acres of public land that made thousands of slum dwellers homeless: the land legally belongs to Bangladesh Telecommunications Company Limited (BTCL). As a continuation of efforts to evict slum dwellers, the government has recently declared that Korail's informal settlements will be replaced by high-rise buildings within the Hi-Tech Park as a part of Dhaka's overall development plan, with limited options for incumbents.

4.2. Knowledge Priorities: World Environment Day

The second example we flag is the JAAGO Foundation's adoption of the World Environment Day to encourage tree-planting events in schools within Korail and across wider Dhaka. Here, the novelty of collective action according to a global event unsettles the issue of urban ecological degradation that is understood as out of the citizenry's control. Class and municipal boundaries are collapsed within this wider campaign, which actions urban greening in a coordinated fashion.

First, in terms of promoting knowledge about urban greening, the World Environment Day activities promote critical awareness that reframes issues, since the NGO positions students in schools as advocates who can enact urban greening given the necessary pedagogic framework. Students become representatives of the sustainable niche and their involvement intimates a proto regime that combines global interests in urban greening with the future ubiquity of environmental stewardship. As an NGO manager notes:

> Yes. Every year, we celebrate World Environment Day by planting trees in different areas of Dhaka city. Now we are working on a more sustainable environment by creating eco-leadership clubs in different schools. With the help of these clubs,

we provide various kinds of trees to students to inspire them for planting trees in their schools.

Second, JAAGO Foundation attracts funding support from private beneficiaries for the tree-plantation program and, in doing so, highlights the social structures dominating an issue. In 2013 and 2014, the NGO organized funding and support from Coca Cola Bangladesh, Islamic Relief Bangladesh, the National Human Rights Commission, Beximco Pharmaceuticals, Za and Zee Ice-Cream, and Kazi Food Industries Ltd. demonstrating that NGOs are able to circumvent policymakers in undertaking urban greening with the support of industry and market incumbents who provide assistance in the absence of municipal or state resources, demonstrating pressure from the existing regime that is formative of alternative social structures deriving from public and private partnerships.

Third, by enlisting large numbers of volunteers from a range of schools across Dhaka to physically undertake the task of urban greening, the NGO unsettles political certainty about ambiguities around the form and depth of community involvement in changes required to transform structures. Enmeshing the practices of urban greening within the school curriculum ensures that knowledge about tractable barriers to successful development of urban greening projects is conflated with the routine and processual knowledge that is necessary to derive persuasive evidence for policy change.

Fourth, in terms of outputs relating to societal issues, JAAGO Foundation's targeting of a global ecological awareness campaign in order to encourage students to participate in urban greening serves to fulfil a pedagogic demand for knowledge transfer that involves practical skills and the diversification of leadership that is ultimately responsible for urban greening. By encouraging the citizenry to enact urban greening, the intermediary becomes a reliable carrier of solutions for the current governance vacuum.

4.3. Niche Intermediation: Tree Plantation Program

Our third example is the 'tree plantation program' that the NGO APON Foundation implemented on Gulshan Lake adjacent to Korail in 2016. APON planted 10 trees with the aim to create greater awareness among city dwellers about the importance of a green environment and to compensate for the removal of trees both by slum residents and municipal authorities. To mitigate the adverse impact of climate change and ensure a healthy urban life, APON intends to expand the scope of the 'Tree Plantation Program' across the country.

First, the efforts by APON Foundation aim to facilitate critical reflection on the integral function of trees in Dhaka for slum residents' livelihoods. Urban parks are generally regulated in Dhaka in order to prevent asset stripping for firewood and construction. Through working with slum residents to maintain the trees and prevent illegal felling, APON created a soft enclosure from bamboo poles and signs explaining the site's intended use (Figure 3). Here, APON seeks to highlight that slum residents can be stewards of green spaces if given adequate information and resources.

Second, through the tree-plantation program, APON Foundation are challenging the terms of debate around access to greenspace in the city. Slums in Dhaka have the fewest canopy trees in the city due to the density of residential space. Parks nearby to slums such as Korail are not easily accessible to slum residents who are regarded as a threat to them. For instance, Gulshan South Park, only made public in 2007 following a slum clearance of 416 families who had allegedly illegally lived in the space for 25 years, is a fenced enclosure with gates which is only open between 11 a.m. and 3 p.m. with access maintained by guards.

Figure 3. Plantation near Gulshan Lake by APON Foundation in collaboration with slum dwellers (Source: Authors).

Third, the activities reveal power and its operations. Municipal authorities do not formally operate within Korail in terms of planting, pruning or maintaining street trees given the dense nature of informal settlements and the shifting organization of streets and houses. Any trees in the public domain tend to be utilized by street traders as shade or by slum residents as meeting places. Away from stores, hotels and schools, public trees in Korail suffer from limbing and illicit felling for firewood and building supplies. Here, the NGO acts as a proxy intermediary between slum residents and government authorities by planting on the former's behalf and, dissimilar to World Environment Day, offering longer term stewardship of urban greening.

Fourth, and finally, APON Foundation also mobilize political programmes through collaborations with government authorities on specific activities, for instance, with the Ministry of Women and Children Affairs for Child Rights Week 2017. Due to the lack of governmental support for urban greening, there is a limit to such efforts and interviewees discussed efforts to appeal to global actors in this domain in future, including United Nations International Children's Emergency Fund (UNICEF), Save the Children and the Global Fund for Children.

4.4. Politics: Gulshan Lake Pollution

Gulshan Lake is a source of biodiversity in the urban core and is also a water supply for irrigation for Korail slum dwellers practising gardening. In 2001, the government declared the lake as a critically threatened ecological area in response to perceptions that slum residents were impacting the lake's ecology. However, intermediaries also highlight the role of industrial and formal development in pollution, for instance, private companies creating new residential precincts [91]. Gulshan Lake is in a vulnerable condition due to a combination of overcrowding and a lack of adequate sanitation and waste management in Korail alongside industrial and domestic waste dumping, illegal landfilling and encroachment by private developers. BAPA claims that, despite losing 55–60 per cent of greenery spaces in Dhaka, the government is reluctant to implement ecosystem legislations relating to wetlands in the urban core. According to an NGO's leader:

> We are relentlessly providing support to the government to halt further deterioration of the environment. Initially, the government accepts our different plans but does not execute afterwards. For example, we, in collaboration with another seven organizations, have finalised the Dhaka Area Plan (DAP, 2008–2015) which

we have forced the government to implement. Now DAP has been fully cancelled. However, we again have formulated a new DAP committee to reactivate the plan.

In various cases, wetland laws and regulations are not properly executed due to the presence of corruption and influence of vested groups. In response to the governance vacuum, BAPA quite often bypasses the government and fills this gap by political partnerships with a wide range of actors such as voluntary organizations, academicians and NGOs.

First, in 2007, BAPA and other environmentalists organized a roundtable discussion, attracting media attention, urging the government to stop developers' encroachment on Gulshan-Banani Lake to halt further ecosystem degradation. Here, targeting structural elements in Bangladesh's planning regimes that privilege private interests and solely focus on slum residents as the impacting factor gave space for different politics to emerge.

Second, a number of environmental NGOs are currently working on biodiversity projects and wetland preservation with slum residents due to the governance vacuum around the preservation of water bodies in proximity to urban slums, such as Korail. BAPA acts as an antagonistic pressure group who regularly arranges activities such as demonstrations, seminars, and public protests to draw attention to politics.

Third, with their various initiatives, grassroots innovators apply pressure to the government for transformative restoration of wetlands and lakes. In 2010, RAJUK—a government development authority—undertook the further initiative of creating access roads for private residential plots, named the Gulshan-Banani-Baridhara Project, a move BAPA opposed in the media.

5. Discussion

At the beginning of this paper, we asked the question: how do grassroots innovators in urban greening respond pragmatically to a governance vacuum? For our analysis, we offer a nuance to the existing conceptual framework of grassroots innovations to understand the realities of realizing urban greening in Dhaka's major slum, Korail. Elaborating on the global model in the MLP, which consists of temporal phases and three analytical levels, we progress the paradigm through highlighting how obduracy in politics and power has the effect of stultifying system change and resisting long-term transitional progress in the mid-level regime. As Figure 4 shows, the governance vacuum in the socio-technical system creates an opportunity for the grassroots innovations that scaled up in the experimentation phase to achieve partial stabilization in the second phase. While this is not full system change as understood in the MLP's ideal global type, the process does serve to perpetuate further opportunities for socio-technical transitions in future.

A key remaining issue is whether critical niches can leverage international media interest in local contexts in order to drive political will towards diminishing the governance vacuum for future activities in urban greening. The long-term effects of the local experiment Ashar Macha are unclear, with the project continuing to feature on global design and architecture websites, but appearing as a single event, rather than incremental change. The inclusion in a travelling exhibition at the 2018 Swiss Architecture Museum does show scale can be achieved globally. The media attention to Ashar Macha has raised sympathy for the evicted from the site of the private mixed residential and commercial Hi-Tech Park through grassroots intermediaries raising the challenges of resettling incumbents in the slum and this indicates its status as a symbolic event nevertheless intimates positive action.

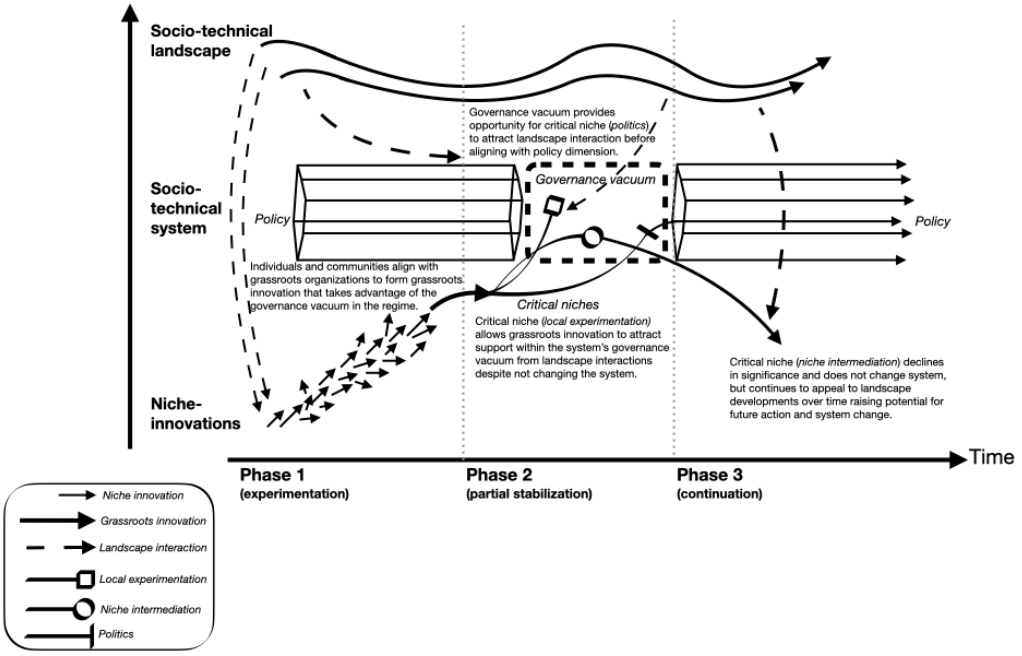

Figure 4. Multi-Level Perspective on the role of grassroots innovations in a governance vacuum. Inspired by Geels ([7], p. 191). (Source: Authors).

With JAAGO Foundation's World Environment Day event there is uncertainty about the ongoing stewardship of the efforts of participating students, who could be disinclined to maintain their commitment over the urban greening implemented during their curricular activities. Moreover, there is limited guarantee of private investments of funds, labour and time following the event's cessation. Media attention does not tend to foresee enduring change manifesting from the event itself, instead focusing on the activities of the day and notional support of the sponsors.

In the case of the APON Foundation, activities were oriented towards oversights in planning around the urban commons, particularly in the provision of parkland to all members of society. Finally, BAPA foreground the politics around lake access and pollution through various strategies that unsettle the widespread sense that slum residents are culpable for ecological degradation.

A key finding is that Southern grassroots innovators depend more upon global-level intermediary activity than those in the global North in order to overcome the governance vacuum in Bangladesh. Through undertaking a sustained critique of municipal inaction, shared governance for urban greening between civic actors and NGOs/CBOs underscores the potency of their events to realize change in the absence of leadership or local investment. The activity we documented in our research included worldwide awareness events, publicity campaigns, and, to a lesser extent, financial or logistical relationships with overseas organizations, although, as the case of BAPA showed, these can cede autonomy and need to be negotiated carefully through responsible and transparent actors.

5.1. Local Experiments in a Governance Vacuum

There is a further array of points to make in relation to the finer details of the critical-niches framework. Regarding *local experiments*, critical niches raise various practical and socio-economic issues in relation to the situations of slum dwellers and their capacity to attend to urban greening via high-profile events that do not guarantee returns on investments of time, funds and energy. Local experiments require novelty and originality and there is a high level of risk in their execution. As a critical niche, they are prone to antagonizing otherwise dormant authorities and even motivating escalated responses that have the opposite effect of undermining urban greening efforts, as is witnessed in slum

clearances that tend to remove or even destroy *ad hoc* urban greening as a part of official due process.

Critical niches emphasize provocations that challenge norms and resist object solutions, in the process garnering media or public awareness in order to empower slum dwellers and raise awareness of their potential input to urban greening projects. In Bangladesh, local experiments face economic and structural resistance, such as land scarcity, poverty, lack of know-how and livelihood insecurity. Despite promising high returns on investments by slum dwellers, local experiments can be understood as overtly critical and potentially inflammatory to authorities, thereby triggering reprisals and hostility in place of the governance vacuum. There is also a general stigma towards slum dwellers in the media that is critical of their activities and purported impacts on urban infrastructure and green spaces, which diminishes the plausibility of local experiments to garner policy support for most local experiments and this serves to neuter the efficacy of this type of critical niche.

5.2. Knowledge Priorities in a Governance Vacuum

For *knowledge priorities*, there are two sides that are relevant for critical niches, the pragmatic knowledge to undertake urban greening effectively and the ambiguities about the form and depth of community involvement and the endemic hurdles to radical transformations in slum settlements. In this case, there is a shortfall of knowledge due to the lack of a foundation in routinized education within Bangladesh for the many inhabitants who have migrated to slums from remote rural areas. Furthermore, the flux of slum inhabitants due to flows of migrants into cities such as Dhaka renders knowledge transfer efforts impotent and priorities are to the ongoing sustenance of basic types of knowledge at the expense of policy-facing technical or evidential knowledge.

Knowledge priorities can work to dispel the governance vacuum when applied as a critical niche by informing slum dwellers of their legislative or regulatory options. By providing them with a conceptual arsenal to justify their efforts in urban greening through recruitment of like-minded supporters, particularly amongst younger cohorts via educational curricular activities, this type of critical niche can scaffold slum dwellers' efforts and give them the resources to take advantage of competing claims to urban greening that might arise in official policies, were the governance vacuum not in place.

5.3. Niche Intermediation in a Governance Vacuum

Niche intermediation is primarily disorganized in Bangladesh's urban slums and undeveloped in terms of networking with intermediaries able to attract policy support. Niche actors' concerns centre on ensuring basic standards of living—that is, electricity, water and sanitation, housing, and household waste collection—and in responding to major, yet unfortunately regular, disasters. Crises include fires and flash floods, which occur annually in slums, and derail urban greening efforts. Urban greening certainly touches on many of these issues, but only indirectly, and not as a core priority of either niche intermediaries or policymakers. Instead of investing time and funds in specific urban greening projects, many intermediaries involve themselves in activities that generate or contribute to livelihoods, thereby encouraging urban greening indirectly.

By allying themselves with broader programmes of change that serve to underline the motivations for critical niches, slum dwellers can legitimate their investments and also make them more resilient to opposition or hostility in the instance of the governance vacuum diminishing. In the research, the wider influence of NGOs/CBOs, notably those that are a facet of overseas or international umbrella institutions, came into play in niche intermediation for urban greening. By piggybacking from wider activities slum dwellers were able to aspire to longevity in their efforts.

5.4. Politics in a Governance Vacuum

Politics in critical niches are antagonistic in nature towards fringe efforts to invoke social change and urban greening in slums is backgrounded by political movements

whose commitments to formal, property-owning, citizens take precedence. In Dhaka's slums intermediaries whose remit includes urban greening challenge prevailing discourses circuitously (i.e., by attempting to ensure the property or citizenship rights of slum dwellers) and generate critical knowledge for transformative action. Usually, grassroots initiatives on urban greening encounter barriers deriving from social structures persistent in regimes. Niche actors try to create influence by means of shared discussions and joint actions in order to influence political agents. The rationale of contributing a nuance pertinent to grassroots innovations in the global South via the critical niches perspective is twofold.

First, politics around urban greening for slum dwellers can be capricious and the governance vacuum does have the unintended consequence of providing protected spaces for grassroots innovations. The critical niches that unfold with urban greening driven by slum dwellers in concert with NGOs/CBOs found sympathetic channels in particular oppositional campaigns that sought to champion their efforts in order to bolster political support. Second, while election terms and shifts in government could unsettle these critical niches, politics did serve to provide opportunities for initiatives to take hold and highlight the ineffectiveness of the situation within the milieu of the governance vacuum.

6. Conclusions

The research highlights the role of a governance vacuum in obstructing or delaying socio-technical transitions, a point with relevance for the global South, where system change occurs infrequently, spontaneously, and even sporadically through profound political shifts that have deep ramifications for the urban poor. A governance vacuum can have the effect of exacerbating inequalities and injustices once system change does happen, for instance, in a military conflict, uprising or revolution. The critical niches perspective assumes a general level of policy pliancy that is not extant in Bangladesh for urban greening within informal settlements and this research has contributed a finer resolution towards understanding socio-technical transitions in the global South. For slum dwellers, nothing seems to change regardless of political grandstanding; nevertheless, their efforts in niche innovations attract critical attention to obduracy and neglect of urban greening.

The limits of this research are the uncertainties about whether critical niches offer perpetuity for urban greening or only fleeting instances of social change. An important aspect to consider for future progress in this conceptual framework is whether critical niches are sustainable over longer periods of inaction and how action can be sustained in the face of obduracy in the governance vacuum. A caveat to our approach is that the nuance in this paper does not refer to concrete solutions to a governance vacuum per se but should instead be considered as niche-level 'remedial' efforts to articulate more fully disconnects and confrontations that occur when grassroots innovations do not garner scale towards regime change, for instance, in windows of opportunity where urban greening remains low on the political agenda despite the efforts of grassroots innovators.

For future research, other perspectives on grassroots innovations might be appropriate to analyse other niche activities in Bangladesh—suggestions could be microcredit, female empowerment, or poverty alleviation through technological innovations—; however, we argue that the perspective is not durable enough as it stands to engage effectively with the social and structural issues extant in greening Bangladesh's urban slums due to the high rate of attrition of intermediaries from urban greening projects and the endemic ultra-poverty of the slums.

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