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Exploring Participatory Design for Sustainable Landscape for Public Housing Neighborhoods in Singapore

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Abstract

Singapore's reputation as a green city is largely achieved through political will, strong policies, and effective execution of policies. While greening Singapore for most of the past five decades can be generally described as a public-sector led approach, where citizen engagement was not necessarily the focus, in recent years the public sector is increasingly interested in engaging the community in the planning and design of public green spaces. As this is a nascent movement, there remain considerable gaps in the types, process, and efficacy of participatory design. In this paper, we describe a research project that aims to provide a sustainable landscape design framework—based on the concept of ecosystem services—through a participatory process. Our study focuses on public housing estates, locally referred to as "HDB" (Housing and Development Board) estates, which houses 80% of Singapore's population in high-rise, high-density towns. We describe the research process, in which we include multiple stakeholders in the planning and design of HDB neighborhood landscapes. They include relevant public agencies, design professionals, residents, and NPOs/NGOs. We also discuss the lessons learned through such a process. Since a participatory approach to landscape design remains to be fully explored in Singapore, we anticipate that this research project could provide valuable insights into the adoption of participatory design in Singapore to promote a more bottom-up approach to the planning and design of public green and open spaces.

Keywords: Participatory design; ecosystem services, landscape design, Singapore, design framework

1. Introduction

Through five decades of active urban greening, Singapore can rightly claim to be a green city, one in which there is a pervasive presence of greenery in large parts of the city. Such a status can be attributed to a clear vision backed by political will, effective laws and policies, and able execution of greening policies (Tan, 2016). In spite of this achievement, the city-state continues to carry out policies and programs, such as the LUSH (Landscape for Urban Spaces and High Rises) programme and the Landscape Excellence Assessment Framework to further promote urban greening. Additional evidence of the continued focus on greening as a key urban development feature of the city-state can be seen in the sustained financial expenditure on greening programmes over the last decade (Tan, 2016: 182).

In examining the urban greening history of Singapore, it can also be said that the primary approach adopted in the formative years of the greening programme is a public-sector led approach in its planning and execution. This is one in which the public sector takes on a primary role in the planning, design and management of public green spaces with little involvement from the citizenry, which is a general reflection of the predominant mode of urban planning up to early 1990s (Soh and Yuen, 2006) and governance (Leong, 2011) This has changed in recent years, with increased efforts to seek public feedback on key public green space developments, such as the Jurong Lake Gardens[1], as well as township development of the Bidadari estate[2] and Tengah Forest Town[3]. On a larger scale, public engagement is also seen as an integral part of national land use master planning, highlighting the increased emphasis on seeking input of the community[4]. For landscapes and nature conservation in particular, there is also a growing Community in Bloom programme[5], which has seen the proliferation of community gardens being set up in neighbourhoods through self-organized community efforts, as well the more recent Community in Nature programme[6], which seeks to "connect and engage different groups in the community to conserve Singapore's natural heritage".

Yet it can also be said that the public sector's efforts to involve the community in the design of their living environment is still in its budding stages in Singapore, one which requires not just the public sector, but different stakeholder groups to take ownership and explore methods of collaboration (Mohan, 2013). Recent research conducted in Singapore clearly points to the role

[1] https://www.nparks.gov.sg/juronglakegardens/faqs
[2] http://www20.hdb.gov.sg/fi10/fi10296p.nsf/PressReleases/59C49C5CADB16CA048257BD6002D8A64?OpenDocument
[3] http://www.hdb.gov.sg/cs/infoweb/press-releases/corporate-pr-unveiling-the-masterplan-for-tengah-08092016
[4] https://www.ura.gov.sg/uol/master-plan.aspx?p1=view-master-plan
[5] https://www.nparks.gov.sg/gardening/community-in-bloom-initiative
[6] https://www.nparks.gov.sg/biodiversity/community-in-nature-initiative

of the built environment in influencing community bonding in Singapore, but it also raises questions on what would be the suitable means for effective participatory planning in Singapore (Cho et al., 2014). The need for active efforts in community engagement for developing community bonds, sense of belonging and eventually social resilience is well-recognized, as is the recognition that more efforts need to be invested to develop the awareness, methods and processes of effective community engagement.

In the context of planning and design of community green spaces, a participatory approach is necessary for achieving sustainable landscape—that is, landscape that promotes human wellbeing in an ecologically-wise fashion and one in which the community has sense of ownership and care. A sustainable development encompasses sustainable communities, which is addressing sustainability as a local level (Gyorgy, 2004, McGinley & Nakata, 2012). Such a view also resonates with the clear position reflected in Singapore's urban planning approach, in which sustainable development is not just about the physical environment but also about "putting the community at the heart of development" through building rooted and cohesive communities (URA, 2012). Involving the community in the design and management of their environment and exploring various approaches to achieve is thus a relevant area of work. Residential landscapes, in particular should be given specific emphasis, as they are a key determinant of human wellbeing given their omnipresence in the daily lives of residents. As of 2015, 80%[7] of Singapore's population lives in public housing estates designed, built, and managed by Singapore's public housing agency—the Housing Development Board (HDB). Public housing estates are locally referred to as HDB estates. The HDB neighborhood landscape (Figure 1), given that it is closely associated with most Singaporeans, presents both a grand opportunity and challenge to promote an alternative design approach to sustainable landscape.

Since December 2014 we have been conducting a research project based on the concept of ecosystem services to develop the Neighbourhood Landscape Planning and Design Framework (NLPDF) to achieve sustainable, or what we considered socio-ecologically wise, HDB neighbourhood landscapes. We adopt a research process that not only involves relevant public agencies and design professionals but also HDB residents, and the purpose of this paper is to report on our exploration on such a participatory research process and the lessons learned through the process. Since a participatory approach to landscape design in Singapore requires further understanding in Singapore, as with different methods of participatory planning in general (Cho et al., 2014), we hope to provide some insights into the adoption of such an approach in Singapore.

[7] http://www.singstat.gov.sg/statistics/latest-data#22

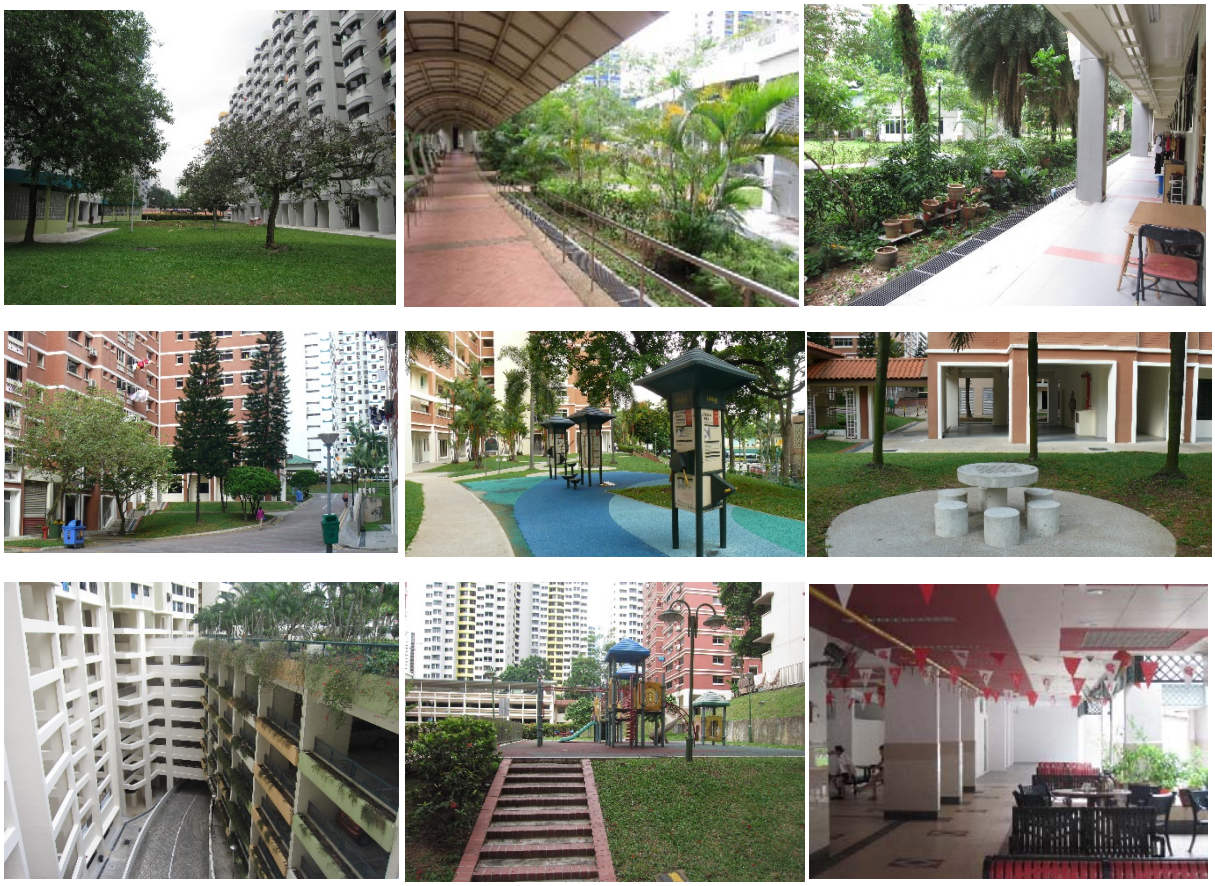

Figure 1. HDB neighbourhood landscapes

In the remainder of this paper we first provide a background of the design and planning process of HDB neighborhood landscapes. Then we briefly introduce our on-going research project—NLPDF, followed by a description of the participatory process adopted in the project. Finally, we discuss the lessons learned from this part of our study.

2. Current Design and Planning Process for HDB Neighbourhood Landscape

For HDB neighbourhood landscapes, in the 1960s when HDB needed to build as many estates as quickly as possible to house a large population, its approach to landscape design was simple greening, e.g. through provision of green open spaces and simple recreational facilities like playgrounds. This is a reflection of a similar emphasis on rapid greening of the city in the formative years of greening the nations. In the last one to two decades, with increasing emphasis on diversity and liveability, the greening of HDB neighbourhoods has shifted to a more sophisticated approach to consider sustainability in its town development, as seen in the implementation of water sensitive urban design, green roofs, roof gardens, high-rise and vertical greenery (HDB, 2013). In general, for majority of new housing estates development, the conceptual plans for neighbourhood landscapes, as with the rest of the residential buildings,

amenities, and other infrastructure are conceived by professional design teams before these are used for consultations with other stakeholder groups, including other sector agencies, NPOs/ NGOs as well as the public. One of key challenges of consultation is that it is not possible to seek the input of future community in a new estate, for the simple reason that the community is still not present when the overall design of a housing precinct and its amenities, including the neighbourhood landscapes, has already been determined. This is by no means, unique to public housing, nor to Singapore, and we elaborate on this point later in the paper.

Besides new developments, HDB has also carried out the Neighbourhood Renewal Programs (NRP) since 2007 in existing mature estates built between 1989 and 1995. NRP is intended as a consultative approach for public engagement with objectives including improving the physical environment, strengthening community bonding, and fostering a greater sense of ownership through resident involvement (CLC, 2015). NRP is fully funded by the government and encompasses two stages of public engagement—public consultation and Consensus Gathering Exercise. Public consultation is first carried out through various platforms like Town Hall meetings, mini-exhibitions, dialogue sessions, house-to-house surveys and block parties (HDB, 2015). Feedback gathered through these activities are then considered and if feasible, fed into the design proposals for the Consensus Gathering Exercise, where residents are required to indicate their support. The NRP proceeds only if 75% of votes are in favour. The support level for past NRP proposals is usually high, averaging 89%. However, it has been pointed out that there is insufficient breadth and depth in community engagement through the use of survey as the main method of engagement, and community engagement would only occur after a schematic design has been drafted (CLC, 2015).

This observation perhaps reflects the constant dilemma between achieving outcome, versus focusing on process in community engagement. As noted by Fainstein, in the US in which community engagement has been entrenched in urban planning, there is a risk that community input is “a kind of routinised thing where the stalwarts appear at meeting after meeting, and no one else very much bothers” (CLC, 2013). Also suggested by Fainstein, on the other hand in Singapore, there is arguably a stronger emphasis on achieving outcomes of urban planning, and less on the process that leads to the outcomes. To balance the two objectives is obviously a challenge, and is strongly context dependent, i.e. on the socio-political state of the city. Nevertheless, given the strong public sector interest in community engagement, there should be greater exploration on means and outcomes of fresh approaches to community engagement. In particular, how could participatory approach be implemented for the design of HDB neighbourhood landscapes as an exploratory method of dealing with the *process* of neighbourhood landscape development?

3. The Research Project: The Neighbourhood Landscape Planning and Design Framework (NLPDF)

The participatory planning work that we report in this paper is part of a larger research project. The purpose of this research project is to develop a transdisciplinary planning and design framework to enhance the ability of HDB neighbourhood landscapes towards socio-ecologically wise landscapes that deliver more values to residents and improve environmental and ecological qualities. The framework, which is still under development, is tentatively named the Neighbourhood Landscape Planning and Design (NLPDF). The ultimate goal is for NLPDF to serve as a guideline for designing new and retrofitting old HDB neighborhood landscapes.

3.1. Why focusing on HDB neighbourhood landscape?

HDB neighbourhood landscape is a prevalent form of greenery in Singapore, accounting for almost 30% of total vegetation cover of all managed green spaces in Singapore, about three times the area of all Singapore's public parks combined (unpublished data). HDB neighbourhood landscapes, rather than national gardens, destination parks or nature reserves, provides HDB residents with the most direct and frequent contact through greenery, or natural elements. Neighbourhood landscapes thus have large potential to contribute to individual and community well-being as the connection or contact with nature has been positively linked to well-being (Capaldi et al., 2014a), community attachment (Arnberger and Eder, 2012), pro-environmental attitudes and values (Halpenny, 2006; Stedman, 2002; Vaske and Kobrin, 2001), and a sense of place and identity (Jorgensen and Stedman, 2001; Jorgensen and Stedman, 2006; Proshansky, 1978; Stedman, 2003). Through explicit design approaches and considerations developed in the NLPDF, our research project aims to improve the potential of neighbourhood landscapes to deliver greater landscape values and improve the quality of the environment.

3.2. Landscape services provided by HDB neighbourhood landscape

In this research project we consider "landscape" a conceptual construct as much as it is a space—it is "simultaneously a natural and a cultural space" (Cosgrove, 2004). Landscape "delivers a wide range of services that can be valued by humans for economic, socio-cultural and ecological reasons" (Termorshuizen and Opdam, 2009). To emphasize the ability of HDB neighbourhood landscape to provide multiple ecosystem services, we term these ecosystem services "landscape services", specifically pointing to the contributions of landscapes to

human wellbeing (Bastian et al., 2014). The landscape services that HDB neighbourhood landscape could potentially provide are listed in Table .1

Table 1. HDB neighborhood landscape services

Provisioning Services	
Fresh produce	The ability of neighbourhood landscapes to provide opportunities for communities or individual residents to grow their own food.
Water for irrigation	The provision of irrigation water through rainwater harvesting, as well as through hydrologic cycling and nutrient cycling to maintain the quantity and quality of the water of the aquatic system.
Regulating Services	
Heat mitigation	At the micro-scale where vegetation can be used to shade buildings, structures and footpaths to produce favourable microclimate conditions.
Erosion control	The retention of soil through vegetation root matrix and soil biota.
Stormwater and domestic waste water treatment	Removal of water-borne pollutants and silt by vegetation, biota, and soil to improve water quality.
Abatement of noise pollution	Using urban soil and plants to attenuate noise pollution through absorption, deviation, reflection and refraction of sound.
Vector control	The control of vector populations (mainly mosquitos) through predator-prey relationships.
Flood hazard mitigation	Mitigation of flood by landscapes through their ability to allow infiltration, detention and storage of stormwater.
Socio-cultural Services	
Mental and physical health	The contribution of natural elements to emotion, mood, stress reduction, fatigue release and to the promotion of physical health.
Sense of place	The emotional, cognitive and conative information provided by the landscape and the human-environment relationship, shaped by the physical traits of the landscape.
Aesthetic appreciation	The quality of the landscape perceived through a range of visual criteria such as prospect, refuge, organized complexity, diversity, extent, colour, naturalness degree, coherences, mystery, order.
Social relations	The ability of neighbourhood landscapes to promote neighbouring and other relationships with the cultivation of pro-social attitudes and behaviours.
Educational values	The potential of landscape to promote environmental education
Recreation	The open spaces in neighbourhood landscapes for recreation
Heritage landscapes and specimens	The recognition that cultural landscapes emerge and accrue values to communities when humans associate with the larger environment and become seen as part of a society's heritage
Spiritual and religious fulfillments	The spiritual and religious associations of humans with landscapes or types of plants
Supporting Services	
Maintenance of soil quality (physical, chemical, biological)	Recognition that soil is a natural stock of capital which supports many ecosystem processes
Provision of habitat for species, including pollinator species	Urban landscapes serving as habitat for diversity of species by providing food, water and shelter.
Nutrient cycling	When microbes decompose organic matter into inorganic constituents, nutrients are returned to terrestrial or aquatic ecosystems to support vegetative growth at the base of a food chain which in turn support other organisms higher in the food chain.
Water cycling	The interception, evapotranspiration, infiltration, retention, and storage of water by the landscape to regulate the surface runoff and river discharge.

Between different landscape services, tradeoffs inevitably exist. The provision or increase in one service may compromise the provision of another (Bennet et al., 2009; Raudsepp-Hearne et al., 2010). Focusing only on certain services could result in unexpected losses of other services that are equally important to human wellbeing (Bennett et al., 2009). For example, there may be tradeoff between the regulating service of heat mitigation and recreation, in the case of, for example, sports that require open turf.

To plan and design for multiple landscape services of an HDB neighbourhood, it is important to recognize and accept that tradeoff between different landscape services exist. Who, then, should determine the prioritization of different landscape services when tradeoff exists? Participatory design, when incorporated into the design process of HDB neighbourhood landscape, allows the residents—who are most directly affected by the result of landscape design—to have a say in such decision-making. Proponents of participatory design have cited empowerment and an increased sense of belonging to and ownership of the neighbourhood as a major benefit of participation (Hester, 1990; Sanoff, 2006). When majority of residents take part in the making of their own living environment, it could help to foster place attachment to their own neighbourhood.

4. The Participatory Research Process

The participatory research approach adopted in NLPDF involves two objectives. First, it is to gather inputs for NLPDF that is currently under development and to test its feasibility. For this purpose, we have carried out an Analytical Hierarchical Process (AHP)—a structured decision-making process developed by Saaty (2008), and we also involve three landscape design firms. The second objective is to understand the attitudes of regular Singaporeans towards participatory design. For this purpose, we involve Participate in Design (P!D), a local non-profit organization that specializes in participatory design, and we also carried out participatory design workshops with HDB residents. In this section we provide more details for all the participatory activities in the research process.

4.1. Analytical Hierarchical Process (AHP): May – October 2016

Because of the existence of tradeoff between different landscape services, the prioritization of various HDB neighbourhood landscape services is important in the planning and design process. We adopted the Analytical Hierarchical Process (AHP), a structured decision-making process developed by Saaty (2008), to explore the perceived importance of different landscape services by different stakeholders.

The participants involved in AHP are those directly or indirectly involved in the planning and design process of HDB neighbourhood landscape. They include public agencies, academics, NPOs, landscape professionals, and HDB residents. Public sector agencies who are the collaborators in this research project include HDB, National Parks Board (NParks), which is responsible for the planning, design, and maintenance of Singapore's green and open spaces; and Urban Redevelopment Authority (URA), which is the authority of Singapore's land use planning and conservation. Academics include the research team of this research project and comprises professors and research staff from National University of Singapore and Chinese University of Hong Kong. NPOs/NGOs include members from Ground-Up Initiative and Participate in Design. The NPOs/NGOs that responded to our questionnaire all share the mission of giving empowerment to regular people. Landscape professionals include members from Singapore Institute of Landscape Architects. HDB residents include 15 people who live in the vicinity of Tengah, a forested area that is slated to become a new HDB town in western Singapore and is the study site of this research project. Since the future residents of Tengah cannot be identified, those who live in nearby HDB estates of Choa Chu Kang are involved as a proxy.

In AHP, each participant was asked to complete a questionnaire, which contains 16 landscape services (including all services listed in Table 1 except for the supporting services) and a scale for pairwise comparison. In the pairwise comparison the participant compared and rated the more important landscape service for human and environmental wellbeing in HDB neighborhood landscape. Before the 15 HDB residents commenced the questionnaire, we held a focus group with them to explain each landscape service to their understanding. The results from all participants were then computed to determine a final collective ranking, which will then serve an important reference for the prioritization of landscape services in NLPDF.

4.2. Landscape design firms trying out NLPDF: April – November 2016

In order to test the feasibility of NLPDF, we carried out a design exercise to include three landscape design firms to try out the first draft of NLPDF, using Tengah—the forested area slated to become a HDB new town—as the study site. These firms include Ramboll Studio Dreiseitl Singapore, Classic Design from Taiwan, and Dongsimwon Landscape from South Korea. Classic Design has expertise in participatory design, while Dongsimwon Landscape is experienced in ecological landscape design for high-rise residential estates. The overseas companies are involved so as to provide fresh design perspectives on the neighbourhood landscape of Singapore. The mix of local and overseas landscape design firms also allows for exchange of ideas in the design processes and design thinking.

The three firms were asked to develop the design schemes for the landscape of the Tengah new town by following NLPDF. As participatory design is one of the design approaches specified in NLPDF, the three firms were required to incorporate it into the design process. In a four-day workshop during June 22-25, 2016 all three firms gathered in Singapore to familiarize themselves with Tengah and with design and planning issues relevant to HDB neighborhood landscape. In early October, each design firm submitted their design scheme, along with an assessment report on how exactly NLPDF was used in the design process and on the applicability of NLPDF. The assessments by the three design firms will be analyzed and synthesized as an important reference for us to improve the feasibility of NLPDF.

4.3. Participatory design with HDB residents

During the aforementioned workshop in June, each design firm also held a participatory design session called Co-Creation Workshop with the HDB residents in Keat Hong in Choa Chu Kang, a neighborhood abutting Tengah to the west. As mentioned earlier, since the potential residents of Tengah cannot be identified, HDB residents in Choa Chu Kang were involved as a proxy for future Tengah residents in the design exercise. As the development of Tengah would likely affect the nearby Keat Hong residents, they can also be considered stakeholders.

Besides the Co-Creation Workshops in June, there are plans to hold a small exhibition of the three design schemes early next year, where the Keat Hong residents who participated in the Co-Creation Workshops will be invited to the exhibition to provide their feedback on the design schemes. The feedback from Keat Hong residents is also expected to help to improve NLPDF.

4.4. P!D facilitating the participatory process: April 2016 – January 2017

As the three design firms are not familiar with community engagement in Singapore, we involve Participate in Design (P!D), a local non-profit organization that specializes in participatory design, in the design exercise to serve as a bridge between the design firms and the Keat Hong residents. Currently P!D is the only organization in Singapore that specializes and work exclusively on participatory design. Arguably P!D's emergence represents an emergent demand on citizen participation in Singapore.

In the design exercise, P!D worked closely with three design firms, taking on the role of recruiting the Co-Creation Workshop participants, collecting information on Keat Hong community, helping with logistics of the workshops. Prior to the Co-Creation Workshops by the three firms in June, P!D conducted the groundwork with the Keat Hong community with no

involvement from the design firms, such as building relationships with community partners, getting permission from the Grassroots leaders[8], conducting site studies and observations, producing publicity posters, and coordinating with Town Council and Residents Committee. P!D also conducted other participatory activities including in-depth interviews with the community members and online survey to gather opinions from the Keat Hong community. Insights from these preliminary studies were compiled into a report for the three design firms as input in the design process. The participatory activities that P!D has conducted or helped organized to date are listed in Table 2.

Table 2. Participatory activities conducted by P!D

Activity	Description	Purpose	No. of participants	Location
May 2016				
In-depth interview with Residents Committee members and residents	Questions ranging from their personal values to ideas and opportunities to create in the public HDB space were asked	To understand stories and experience and gain insights into underlying needs and aspirations of the community	7 interviewees	N/A
May 2016				
Man-on-the-street interview	Questions ranging from their personal values to ideas and opportunities to create in the public HDB space were asked	To understand stories and experience and gain insights into underlying needs and aspirations of the community	60 residents	5 neighbouring sites
22 May				
Stories market	Pop-up stations were set up in the neighbourhood to engage passers-by on their views	To understand how residents view nature in relation to the built environment in their neighbourhood	90 residents	Void deck of Choa Chu Kang HDB block and Neighbourhood plaza
28 May				
Neighbourhood explorer challenge	Explorative journey around neighbourhood	To make residents think more about each of the landscape spatial typologies in their neighbourhood	P!D members & residents	7 stations in Choa Chu Kang neighbourhood, including Tengah forest
01- 02 June				
Field observations	Site studies on neighbouring sites	To gather information on how people are currently using the spaces	N/A	5 neighbouring sites
16 June				
Focus group for AHP	Each neighbourhood landscape service and the process of AHP is explained in simple terms to the residents	For residents to understand the NLS in order to complete the AHP questionnaire	4 NUS 2 P!D members 15 residents	Lam Soon Community Centre
23 June				

[8] The term "grassroots" in Singapore refers to volunteers appointed by The People's Association (PA) to serve in various grassroots organisations (MCI, 2016).

Neighbourhood site visit and walking trail with design teams	Design teams are led on a walking trail and introduced to the common landscape spatial typologies of a HDB estate	To allow the design teams to familiarize with a typical HDB estate	10 designers 5 P!D members	Keat Hong neighbourhood
23 June				
Co-Creation Workshop with Classic Design and residents	Residents were shown a presentation on "pattern language" and wrote down the pattern they liked and disliked. They were then asked to imagine themselves as designers of the future HDB development and using 5 wooden cubes to decide how they would develop the plot of land.	To educate residents on patterns and scale, to find out how residents tend to develop a plot of land	5 designers 5 P!D members 16 residents	Lam Soon Community Centre
25 June				
Co-Creation Workshops with Dongsimwon Landscape and residents	Residents were asked to list the pros and cons of the spatial typologies of South Korea as well as the design intentions of a hypothetical HDB development at the site	To find out what residents' opinions of various spatial typologies and design intentions	3 designers 5 P!D members 13 residents	Keat Hong Zone 4 Residents' Committee
25 June				
Co-creation workshops with Ramboll Studio Dreisetl Landscape and residents	Residents were to use brainstorming, forced connections, model making to imagine their ideal living neighbourhood	To find out resident's idea of ideal neighbourhood	3 designers 5 P!D members 18 residents	Keat Hong Zone 4 Residents' Committee
18-26 Aug				
Post workshop online survey	Questions collected from design and research teams are put together as survey questions to the residents	For residents to address questions from design teams, primarily their preferred type of spaces	24 residents	Online

5. Lessons Learned from the Participatory Research Process

As this participatory research process is still ongoing, instead of drawing conclusion, in this section we outline a few issues or challenges observed in the process. In particular, we focus on the issues arising from the interaction with HDB residents.

5.1. Understanding the concept of landscape services

To involve the residents in the process of creating their own neighborhood landscape that is socio-ecologically wise, it is necessary for them to first understand the concept of landscape services. While the concept of ecosystem services, on which our idea of Neighbourhood Landscape Services is based, is widely discussed in academia, it is little known by the general public. How the concept of landscape services can be effectively communicated to a layperson, who may not even have environmental awareness, can be challenging.

It was expected that HDB residents might not readily comprehend the concept of Neighbourhood Landscape Services. In the event called "Stories Market" held by P!D in May 2016, pop-up stations were set up in the neighbourhood to engage passers-by. Slightly more than half of the 90 participants are elderly above 50 years old who may not have had much education or may not understand English. In order to communicate the concept, P!D reinterpreted various HDB neighbourhood landscape services identified in Table 1 and translated them into simpler, more friendly terms (Table 3).

Table 3. Translation of HDB neighborhood landscape services

Neighbourhood landscape Services	Translation to participants
Provisioning Services	
Fresh produce	Providing edible plants
Water for irrigation	Recycling rainwater for watering plants
Regulating Services	
Heat mitigation	Providing shade
Erosion control	Preventing loss of soil
Stormwater and domestic waste water treatment	Absorbing and cleaning rainwater / Clean rainwater and waste water
Abatement of noise pollution	Using greenery to block the noise
Vector control	Using nature to prevent dengue
Flood hazard mitigation	Buffering storm surge using landscape
Socio-cultural Services	
Mental and physical health	Promoting wellness and relaxation
Sense of place	Promoting social activities through green space
Aesthetic appreciation	Promoting attractive sceneries and pleasing ambience
Social relations	Fostering community bonding
Educational values	Providing opportunities for learning from nature
Recreation	Inspiring recreational use through nature
Heritage landscapes and specimens	Strengthening and reflecting local culture and identify with heritage values
Spiritual and religious fulfillments	Providing space for religious practices to enhance spiritual well-being
Supporting Services	
Maintenance of soil quality (physical, chemical, biological)	Regenerating soil quality naturally
Provision of habitat for species, including pollinator species	Providing suitable environment to attract wildlife
Nutrient cycling	Allowing vegetation to grow in the natural way
Water cycling	Regulating water flows naturally

Besides setting up the voting stations at the void deck and neighbourhood plaza, P!D members went around the neighbourhood to capture votes and opinions from other residents. The purpose of the Stories Market is to understand how HDB residents view nature in relation to their built environment and to understand their views on the different neighbourhood landscape services. This event was marketed through social media and word of mouth as *"How might we use nature to make your living environment and daily lives better? Your Involvement will Help HDB design greener neighbourhood!"* The concept of Neighbourhood Landscape Services

was reframed into questions that are relatable to their daily life and immediate living environment. Alongside images and descriptions of the Neighbourhood Landscape Services, the 4 questions in Box 1 were posed to the passers-by.

Box 1

1. Which are the top 3 factors that are most important to you?
2. Why are these factors important to you? (Choose 3)
3. Which are the top 3 factors that are least important to you?
4. Why are these factors not important to you? (Choose 3)

"Factors" in Box 1 are translated Neighborhood Landscape Services (the right column in Table 3). Table 4 shows the top five most and least Neighborhood Landscape Services to the Stories Market participants. It is observed that participants were more comfortable with talking about the landscape services they are more familiar with in their living environment, and they found the non-tangible services (e.g., nutrient cycling, erosion control) difficult to understand, even when these terms have been translated and simplified.

Table 4. Most and least important neighbourhood landscape services

Most important factors	Least important factors
Habitat for species	Spiritual and religious fulfilments
Fresh produce	Nutrient cycling
Heat mitigation	Erosion control
Physical and mental health	Flood control
Social relation	Maintenance of soil quality

While the result from the Stories Markets provides some insights, it is far from clear how much a regular Singaporeans could really grasp the meanings of these neighbourhood landscape services and whether the ranking by one person would be dramatically different from another. To incorporate participatory design in NLPDF and to make community participation meaningful, it is paramount for the participating residents to have a clear understanding of neighborhood landscape services. They need to understand the benefits (including the long-term ones) of all neighborhood landscape services, as well as the tradeoffs among them, so as to make informed decision on the prioritization. In particular, we anticipate that regulating services, among others, might be most difficult for a layperson to comprehend because many of them are intangible or invisible/less visible processes, such as vector control and flood hazard mitigation. It is therefore important to explain these services in a way that could be easily understood, which could be a challenging task.

5.2. Unknown future HDB residents

A major challenge in implementing participatory design in any future HDB neighbourhood is that its residents are not known before the site planning commences. The public are informed of the location, indicative prices, preliminary designs, and the number of available units through HDB sales launches either on newspapers and on the website. Interested buyers will then check their eligibility to purchase a flat, eligibility for loans, and ability to pay the down payment and other fees before submitting an application for a flat. At the end of the application period, HDB ballots the applications for queue position and inform the applicants of the outcome. Such a process makes it not possible to involve future residents—since they are unknown—in the early stage of the planning and design of their HDB neighbourhoods.

In our design exercise, because the future residents of Tengah are unknown, we involved the residents from Keat Hong community, which is right next to Tengah, as the proxies. However, using proxies in the participatory design process is not a genuine form of participation since the proxies are after all not as emotionally attached and invested to the design and development of a new neighborhood that they do not call home. It will not help to develop a sense of ownership, which is central to the idea of participatory design (Creighton 1992).

Therefore, involving future HDB residents in the early stage of the design of HDB neighborhood landscape would require some major change in the current process of HDB project development, sales, and application, which may be difficult in the short term. The feasibility of such change is beyond the scope of our research project. However, the current process does not necessarily preclude any form of community participation in HDB neighborhood landscape. Unlike architecture, landscape—dominated by natural elements—is more dynamic and continues to evolve. The changing nature, hence some inherent flexibility, of landscape provides some opportunity for its users to participate in its evolution over time through tending it. Furthermore, some "white space" can always be left intentionally for the future residents to work on latter on. Despite the existing constraint of unknown HDB residents, HDB and design professionals can work together to make some degree of community participation possible.

5.3. Motivating civic participation

In order to attract participants for the participatory activities mentioned in 4.3 and 4.4, vouchers and meals were promised as incentives. P!D, which has accumulated many experiences in participatory design over the past years, considers incentives as necessary to encourage participation in Singapore, where there lacks a culture of civic participation. It is unknown

whether it is truly the case that residents would not actively participate in any design and planning related activity associated with their living environment unless some reward is guaranteed. However, the idea that some reward is necessary perhaps reflects some level of indifference to civic participation.

Admittedly, some form of encouragement is always necessary before a culture of citizen participation is formed. The question is whether appealing to direct benefits, such as vouchers and food, is an appropriate form of encouragement. Would it eventually lead to a misconception that civic participation is merely something external to their everyday life and therefore must be incentivized by some form of reward? How to motivate people to actively participate in public affairs, including the design of their everyday neighborhood landscape, is a challenging yet important issue that requires much more research and action.

Nevertheless, many of the HDB residents involved in our research project were inspired by the idea of participatory design. After each Co-Creation Workshop held by the design firm and P!D, the participants were asked to provide their feedback on the workshop activity and their views on participatory design in Singapore. The participants were presented the four statements in Box 2 and asked their degree of agreement on each. In general, they were mostly positive about the participatory experience and believed that it is important for residents to be involved in the decision-making process of neighbourhood improvement projects. However, participants were mixed in their sentiments towards whether their inputs would make a real impact. Some felt that agencies and professionals are better equipped to make decisions on the planning and design of the neighbourhood, while others think that it is necessary for participatory efforts to be held at a bigger scale and their inputs should be taken more seriously. Many agreed that the state of neighbourhood should be a shared responsibility between the public agencies and residents.

Box 2

1. I feel that it is important for me to be involved and participate in neighbourhood improvement projects.
2. We should leave neighbourhood improvements to the government agencies and town councils because it is their responsibility and not mine.
3. I believe that this workshop/project will not lead to improvements for future HDB developments.
4. As a resident, I would not want the right to have a say in the decision making process of any physical improvement.

In general, after the participatory activity, the participants seem to gain new insights and hold more balanced perspectives on the issues raised. They better appreciated the multiple challenges involved in the decision-making for the neighbourhood and understood that there can be different and even opposing views. Apart from having their opinions heard, through the Co-Creation Workshops the participants were also educated on the design process; the importance of neighbourhood landscape; and the diversity of needs, interests, and perspectives within a community.

6. Concluding Remarks

In this paper we have presented the participatory process of a research project that aims to develop a design framework for socio-ecologically wise neighborhood landscapes in Singapore's public housing estates. Instead of confining this research project within the academia to the researchers ourselves, we strive to make the research itself as participatory as possible to involve as many relevant stakeholders as possible. We note that participatory design itself is not necessarily a focus but only one of the many components of our research project, but we use this research project as an opportunity to explore participatory design in Singapore, as participatory design has attracted increasing interests in NGOs/NPOs, government agencies, and academics.

With changing demographics, higher expectation from the more educated populace, and the reach and use of social media, we expect that more attention would be paid to community engagement in the planning and design of public spaces. Incorporating some degree of participatory design into HDB neighbourhood landscape is useful to engender the benefits of community engagement arising from greater use and ownership of such important spaces.

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