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Urban Green Spaces in Singapore

Between interests of economic goals with place-making, guided citizens, and ecological ambitions in a 21st century global city

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Modul: GEO 94 Internationales Forschungsprojekt
Wintersemester 2022/2023

Tübingen, den 31.03.2023

Cover picture: 2065 Garden, part of the
SG50 Community Show Garden at
HortPark Singapore (own picture)

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1 Introduction

Singapore is, as GOH (2013 p.°564) introduces it, “at once city, nation, and island” and has undergone rapid and impressive developmental processes since its independence in 1965. A common narrative about Singapore describes its evolution from a trading port in malarial swampland to a global financial centre, a smart, clean, and sustainable metropolis, and an urban role model not only in Southeast Asia but far beyond. Due to the high population density, resource scarcity, and tropical climate faced by the low-lying island nation at the southern tip of the Malay Peninsula, Singapore faces the challenge of adapting to its unique circumstances and has overcome previous obstacles thanks to its unique and innovative approach to adapting and applying available technologies and techniques, according to QUAH (2018). Today, the island nation is highly regarded for its well-planned and rigorously implemented urban planning to contribute to economic growth, socio-environmental health and well-being, and conservation of the natural environment.

One of the main aspects that distinguish Singapore compared to other urban areas around the world is its strong focus on a clean and especially green environment, which has gained international interest and prestige. BEATLEY (2016 p.°64) even referred to Singapore's greening as the “foundation for the economic prosperity and high quality of life that Singaporeans today enjoy”. TAN (2006) describes how the development of urban greening shaped Singapore's further urban planning and infrastructure development and influenced the city's overall image as a sophisticated and sustainable green city. Because of the experimental approach and innovative ideas attributed to it in urban development, particularly in the integration of greenery into the urban environment, Singapore has been the site of numerous research studies with diverse backgrounds. One topic that has received less attention is the introduction of Urban Political Ecology as an analytical lens on the island nation, with most of the contributions to it published by GULSRUD & OOI in 2014.

Thus, this research aims to observe the current trends in urban development focusing on the urban green in Singapore with a broad view of the influences from the dimensions of sustainability, namely through social, economic, and environmental interests that are controlled by the Singaporean public authority. The research expects to find traces of global and local influences in these interest positions and therefore relies not only on careful observations during a field trip, but also on expert interviews, opinions and explanations, and figures on the workforce, finances, and park area development from the Annual Reports of the National Parks Board (NParks).

Three more detailed examples of different Singaporean landscapes are used to explain how urban greenspace can but need not, be managed by the city-state and which individual interests are shaping them. It then discusses findings from the literature against the backdrop

of its observations and lessons learned and concludes with an overview of how urban greening has been established in Singapore as a measure to help make Singapore not only a socially united island nation, but also an economically sophisticated international hub in the context of the increasing importance of sustainability in the 21st century.

2 Research background

Academics have engaged with Singapore's urban development in a variety of ways, including defining the development model led by government agencies, the nature of engagement and overall success in key areas of regional and urban development, and the social and environmental contributions of ongoing development in urban areas, particularly around green spaces. At the botanical and biological levels, urban biodiversity has been extensively researched, contributing to valuable insights into these areas, and social behaviour has been studied in the context of strong political interference regarding aspects of urban green aesthetics. Several scholars have addressed urban green in Singapore by highlighting its status quo and emphasizing the experimental features and innovative ways within it. The evolution of these green spaces has been less critically researched but traced primarily through historical sources. In most cases, this research was complemented and supported by qualitative expert interviews and discussions that revealed motives and ambitions in the development of urban greening. One of the key articles supporting this research approach is the work of Natalie Marie Gulsrud and Can-Seng Ooi, who introduced Urban Political Ecology in their research 'Manufacturing Green Consensus – Urban Greenspace Governance in Singapore' in 2014 (GULSRUD & OOI 2014). Given Singapore's rapid development and narrative upgrading, these research approaches are seen as profitable for reassessment and further consideration of aspects and influences on Singapore.

The following subsections, therefore, provide a review of the literature consulted as part of this study, introduce an understanding of Urban Political Ecology and other relevant concepts deemed helpful to the analytical approach in this report, and supplement understanding by consulting explanations of the historical development of urban green space in Singapore.

2.1 Between governance and socio-ecologic interests

QUAH (2018 p.°5) attributes Singapore's economic and development success to five factors, including the role of the single-party government and its methodology of addressing urban challenges through practical, scientific, and innovative technological modalities, ideas, or solutions that can be guided by global precedents. According to the MINISTRY OF FOREIGN AFFAIRS (MFA 2018), these modalities and ideas are addressed in a long-term urban planning framework, a concept plan with guidelines for strategic land use and transportation, which

serves as a basic reference for a more detailed master plan. The long-term strategies are enabled by Singapore's political system and a high proportion of land owned by the state (KOH 2021 p.°72, SANTANGELO 2019 p.°16). "Governed by a single-tier state apparatus, one that has the political will and power to maintain complete control and management of what is essentially a 100% urbanized environment" (GOH 2013 p.°564), Singapore's urban planning model incorporates a more technology-driven, smart, and sustainable approach and has earned international acclaim (MIAO & PHELPS 2019 p.°327). BRAND (2013 p.°225) notes whether the "no-fuss, top-down approach with very little participation [...] is equally capable of providing urban infrastructures that facilitate sustainable behaviours" and concludes for the case of Singapore that it is (BRAND 2013 p.°235; MIAO & PHELPS 2019; ZEIDERMAN & DAWSON 2022). BEATLEY (2016 p.°52) notes that "implementing of a green vision for Singapore [...] becomes easier to achieve when it is a priority of a strong government" which in Singapore's case "exerts a significant degree of control over daily life".

The form of greening implementation in Singapore can still be considered as either weak or strong ecological modernization, according to NEO & POW (2015 p.°406), who explain that contemporary eco-city ideas in architecture and urban planning and design are mainly weaker forms when they evolve towards technological and economic approaches, instead of being open, democratic, diverse and ecological (see also CAPROTTI 2014 p.°1297). According to them, these concepts risk becoming "another product of global urban entrepreneurialism – a capital-driven growth strategy producing new (non-sustainable and unjust) materialities of urban-nature" and raise again the question of "whether the pursuit of urban sustainability via the eco-city is simply a legitimization strategy for pro-growth entrepreneurial cities or neoliberal urbanism" (NOW & POW 2015 p.°411). Today's concepts also differ from the original ideas of eco-city research and urban ecology (NEO & POW 2015 p.°405). However, there are no fixed boundaries or categories, and each implementation of green must be analysed for its functions (see also BULKELEY & CASTÁN BROTO 2013 p.°373).

In the field of urban greenery itself, NEWMAN (2010 p.°149) conducted a general application of green urbanism to Singapore and highlighted seven characteristics, namely the Renewably City, the Carbon Neutral City, the Distributed City, the Biophilic City, the Eco-Efficient City, the Place Based City and the Sustainable Transport City. Of these characteristics, the Biophilic City in Singapore is a more developed model, as also shown in the follow-up research by NEWMAN (2014). MCDONALD et al. (2018 p.°9) also state that "Singapore may be the most advanced example of a Biophilic City" compared to other cities. NEWMAN (2014 p.°64) emphasizes that although "Biophilic Urbanism, as demonstrated in Singapore, is unlikely to recreate the pre-urban ecosystem", the concept enables urban environments to integrate nature into highly artificial urban landscapes, with high-rise buildings even contributing to three-dimensional green space opportunities and possibilities to create more diverse ecosystems

within urban areas (NEWMAN 2014 p.°62). BEATLEY (2016 p.°64) similarly mentions the opportunities in Singapore of combining dense urbanism with greenery to benefit both biodiversity and the livelihoods of citizens.

Despite its advanced status in the field of Biophilic Urbanism, it seems that more research has been conducted on community gardens in Singapore so far, as they shift their mode of operation and become more involved in food production. NEWMAN (2014 p.°53) puts the number of projects in 2014 at 480, and TAN & NEO (2009 p.°537) consider that local participation in community garden projects needs to be improved so that they contribute to the needs and interests of the residents involved, as these community gardens are run by residents' committees and are indirectly linked to government policy. Similarly, MONTEFRIO et al. (2021 p.°1474) examine the expectations and interests under which community gardens are designed in constant negotiation between productive and aesthetic aspects. They also draw on a theoretical approach to community gardens that have been interpreted by various scholars as either contributing to urban food access and equity, urban renewal and sustainability or as part of a complex hierarchy of power in which those in power can negotiate how community gardens are “implicated in neoliberal urban economic development and capitalist accumulation” (MONTEFRIO et al. 2021 p.°1460).

They further contend that community gardens underlie narratives of aesthetic politics and that their impact changes as structures gain prominence in green or sustainable urban development policies, similar to other elements of green urbanism. GUY et al. (2015) observe the impact of aesthetic politics by examining eco-art projects, particularly the stilt house that was part of the exhibition at ArchiFest 2011 in Singapore and conclude that eco-art and eco-aesthetics contribute to urban development. Like community gardens, MONTEFRIO et al. (2021 p.°1464) outline how “much of the city’s landscaping needs maintained by private contractors that place emphasis on “horticultural presentation” (rather than functionality) in their practice” and that urban development in Singapore has set standards for green urban elements in terms of their aesthetics. Furthermore, HENDERSON (2013 p.°222) attributes a characteristic aesthetic to Singapore’s clean and precisely planned urban landscape, as she notices that its “distinctive and defining characteristics have given rise to a particular and dynamic pattern of park development in which order and the exercise of authority has been a prevailing motif, mirrored in park landscape and the treatment of the natural environment”.

2.2 The history of Singapore’s greening

At least since the publication of the 1991 Concept Plan along with a Green Plan in 1992 and related action programmes in 1993, (GOH 2018 p.°563, GULSRUD & OOI 2014 p.°83, TAN et al. 2013), urban planning in Singapore has been particularly concerned with the progressive implementation of ecosystems in the urban environment that contribute significantly to the well-

being of citizens, provide a valuable climate adaptation measure, and restore local biodiversity. Urban green spaces not only help the natural environment of flora and fauna to thrive, but also contribute to health, well-being, and recreational opportunities for Singapore citizens (HENDERSON 2013, LOKA & LENG 2014). However, even before and shortly after Singapore's rather unambitious independence in 1965 (GOH 2013 p.°566), campaigns such as the tree-planting campaign or the Garden City campaign were introduced in the 1960s (GULSRUD & OOI 2014 p.°81), with the 'Garden City' originating from late 19th century United Kingdom, where it has been introduced by Sir Ebenezer Howard (ROWE & HEE 2019 p.°41).

POW (2018 p.°1214) observes that it is "equally important to note [...] that the Singapore model was not constructed on an entirely clean slate as the foundation of the city-state was built on British colonial planning and administrative influences from the Raffles Town Plan in the early 1820s to the post-war UK New Town planning movement in the late 1940s and 50s". In addition, it is significant that the Singaporean state was able to acquire more than 90% of the national land, which was later reallocated to various state agencies for further development and maintenance for different purposes (POW 2018 p.°1214).

Before these rapidly changing post-independence years, Singapore's urban design was not as different as other Southeast Asian cities, according to GUY (2015 p.°44), as "Singapore featured a main commercial centre, including low rise buildings and busy streets in which trading took place, surrounded by diverse land uses and a network of fishing villages [...] which] were composed of traditional stilt housing known as the kampong". The kampong house historically spread throughout the region through migration and embodied a traditional, knowledge-based form of housing adapted to the local climate. Nevertheless, the green Garden City campaign of the 1960s led to the destruction of most of these traditional houses in all parts of Singapore (GULSRUD & OOI 2014 p.°87). As the urban area was restructured to develop modern Singapore, agricultural land declined drastically, leaving little farming for domestic food production, while the greening of the modern city was focused on the city centre and rural roadsides (MONTEFRIO et al. 2021 p.°1463). POW (2018 p.°1214) explains that "the Singapore developmental model has been achieved at considerable societal costs including the destruction of traditional urban neighbourhood" referring not only to kampong houses but also to historic shophouses. Although these developments are mainly attributed to the economic and physical development of urbanization, the social impacts of greening in Singapore have not yet been considered.

Since independence, Singapore has adequately advanced and implemented long-term development strategies, such that HARRISON & CROESE (2022 p.°4) speak of a "strong master planning tradition" that differs from well-researched Western practices and is more widely applied internationally (HARRISON & CROESE 2022 p.°5).

In these master plans or early concept plans, greening became an integral part of urban development immediately after independence, as both TAN (2006) and POW (2018) emphasize the historical intertwining of urban development, its planning principles, and the creation of green spaces. One of the central motives in the first years after independence was to improve urban space, both in terms of visual and aesthetic appearance and quality of life for residents. Images of “the architect of the new nation, then Prime Minister Mr Lee Kuan Yew” (TAN 2006 p.°46), inaugurating Tree Planting Day in 1963 by planting a tree and declaring Singapore a ‘Garden City’ show the strong political commitment to these plans. As early as 1971, the young nation implemented the goal of developing Singapore as a ‘Garden City’ in its first concept plan. In the following decades, several new parks and gardens were created, such as East Coast Park, which, according to KOH (2021 p.°67), serves as a valuable “first impression” for international visitors arriving in Singapore via Changi Airport.

These ambitions increased in the 1990s when the benefits of lush green spaces were considered more intensively and began to influence urban planning in more diverse ways. With the introduction of a greenway network, the Park Connector Network (PCN), linking different parts of the city, greenery was considered a contributor to infrastructure and transportation (TAN 2006). In the case of Singapore, the PCN was established to connect different parks and make them more accessible to residential areas, as the name suggests (example on both sides of the Whampoa River in Figure 1). According to NEWMAN (2014 p.°50), “the plan is to make it possible to walk or bicycle around Singapore by travelling through the parks”. In addition, the PCN enhances the ability to implement greenways in urban areas.



Figure 1: Whampoa Park Connector running along Whampoa River (own picture)

According to the MFA (2018 p.°39), one-tenth of Singapore's land area is set aside for parks and conservation, and although already “more than 80% of households live within 400 metres or a ten-minute walk to a park [, Singapore professionals] aim to expand this to more than 90% of households by 2030, by creating more neighbourhood and regional parks”. Similar statements were made in BEATLEY's (2016 p.°64) study, which emphasized that population growth did not impede comparable growth in green space between the 1980s and the later 2000s.

In the early 2000s, Singapore altered its urban narrative from a 'Garden City' to a 'City in a Garden' (KOH 2021, MFA 2018, MONTEFRIO et al. 2021, NEWMAN 2010). KOH (2021 p.°65) explains that with this branding, a tremendous change occurred, which he attributes to a "new phase of reinvention" with a "new approach", as in a "garden city, land and space are selectively set aside and developed [...] But setting a city within a garden goes into an entirely new, much more holistic, dimension altogether". Here, further ambitions were pursued to connect parks and gardens and create a network of paths for cyclists and pedestrians. The creation of Gardens by the Bay also drew attention to Singapore's ambitions. KOH (2021 p.°68) summarizes that Singapore's ambitions in greening the urban environment "so many years ago, and the way it is now taking this initiative to a whole new level, will stand the country in very good stead for the future". Under the narrative of a 'City in a Garden' becoming a 'City in Nature', Singapore has recently refocused attention on wilder, more natural implementations of environments, emphasising its tropical rainforest history (ROWE & HEE 2019 p.°53, SANTANGELO 2019 p.°17).

The National Parks Board (NParks) lists the following measures to conduct:

1. create 'world-class gardens'
2. rejuvenate urban parks and enliven our streetscape
3. Optimise urban spaces for greenery and recreation
4. Enrich biodiversity in our urban environment
5. Enhance competencies of our landscape and horticultural industry
6. Engage and inspire communities to co-create a greener Singapore"

(MFA 2018 p.°39)

The natural environment, some of which is integrated into the built environment through vertical installations on building facades, integrated into the city's public spaces, or accessible to Singapore citizens in the relatively large-scale parks, gardens, or nature reserves along with the PCN, is recognized as an integral part of the metropolis's densely populated urban landscape. A "pervasive green network of nature reserves, parks, park connectors, tree-lined roads and other natural areas built within and around HDB [Housing and Development Board, Singapore's large-scale public housing authority] estates" (MFA 2018 p.°37) is complemented by a dedicated green building master plan that promotes the implementation of green infrastructure on walls and roofs of urban buildings through the Skyrise Greenery Initiative (MCDONALD et al. 2018; NEWMAN 2010 pp. °166). MCDONALD et al. (2018 p.°9) also mention the Landscape Replacement Policy, which requires that new buildings at least replace the loss of ground-level nature by implementing greenery in the vertical of the buildings. One of the most famous examples is the luxurious Oasis Hotel in the downtown area, which is said to replace the lost ground-level nature by 900% through its impressive green facade (MCDONALD

et al. 2018 p.°9). In addition, a master plan for street greening and ABC guidelines for water-sensitive urban design were implemented to address environmental planning issues. A fruit tree planting program and additional community garden programs have been established to encourage resident participation in urban food production and gardening. In addition to these plans, other efforts are underway to improve human-nature interactions through wildlife viewing and environmental education (NEWMAN 2010 pp.°166). These examples provide a broad overview of the policies and programs implemented by the Singaporean government to improve greening and citizen interaction with the natural environment, including programs that focus only on HDB development.

NEWMAN (2014 p.°48) states that “biophilic concepts have been attempted in Singapore and are now setting global best practice” and goes on to explain how urban greening has become a “symbol for Singapore” through “the combination of plants, landscaping and innovative engineering” (NEWMAN 2014 p.°53). This goes hand in hand with various issues, as ROWE & HEE (2019 p.°103) mention that “biodiversity, carbon sequestration, tree modelling and management, green building installation and development, alongside sundry ecosystem studies” and others play a central role in urban greening ambitions and research.

These developments in urban greening have attracted international attention and made Singapore's urban development and greening a reference for city branding and urban sustainability, inspiring other cities around the world (BEATLEY 2016 p.°64, KOH 2021). Indeed, KOH (2021) describes the history of establishing the ‘Garden City’ brand (among other aspects and orchid cultivation in Singapore) as a major contribution to bringing Singapore to the forefront of international attention and reputation in urban development and planning. He also emphasizes that “being seen as leading in greening is a precious resource in today’s world beset by serious concerns of environmental degradation, rapid urbanisation and the damaging effects of climate change” (KOH 2021 p.°66).

2.3 Research questions and objectives

CAPROTTI (2014 p.°1286) clarifies that recent research on urban sustainability and green urbanism has often relied only on the identification of these green or eco ‘experiments’ conducted in the discourse of green urbanism (BULKELEY & CASTÁN BROTO 2013 p.°374). Although this research does not focus on Singapore, it is nonetheless noteworthy that Singapore draws on its identification as an experimental sphere where small levels of government in a densely populated city allow for the development of innovative experiments, unseen designs, and future technologies. In addition, BULKELEY & CASTÁN BROTO (2013 p.°374) call for future research to consider experiments in eco-cities in terms of how they exercise governance, which should be explored for Singapore through aesthetic policies in

community gardens (see i.e., MONTEFRIO et al. 2021 p.°1460) but could also be applied to a broader urban context, as this research demonstrates.

Similarly, GULSRUD & OOI (2014 p.°79) conclude their summary of research on Singapore's greenery by noting that there has been "limited critical analysis of the political and social construction of the city-state's green identity".

The present study aims to build on this approach by identifying different interests and motives in the dimensions of sustainability, namely in the social, economic, and ecological spheres. Thus, these dimensions cannot only be considered separately, but they even form a specific nexus in the form of their interrelationships, as RANDRUP et al. (2020 p.°923) explain. Despite the recognition of the diversity and multiplicity of relationships in the field of economy, socio-political interests and ecology, this study is based on a simplified model of sustainability dimensions, which is distinguished into three categories and thus allows a clearer but broad structure of the background of interests.

Considering the previously mentioned and consulted research, several questions arise regarding the strategies for implementing green urban projects in Singapore. HARRISON & CROESE (2022 p.°2) suggest that future research should include "involve in-depth case-based research regarding the role, interests and engagement of local actors in urban master planning and the transnational circuits that underpin them". Although their proposal is based on research on urban master planning in African cities (influenced and supported by Singaporean planning authorities), this conceptual approach seems applicable to Singapore, as community gardens are subject to similar influences. BULKELEY & CASTÁN BROTO (2013 pp.°373) in concluding their study of the rise of green 'experiments' worldwide, call for further in-depth research to "understand how, why and with what effect experiments take shape within specific urban contexts" and "to understand how such interventions serve the interests of some rather than others". GULSRUD & OOI apply an analytical lens of urban political ecology to understand "who has produced Singapore's green city vision, how has the green vision discourse impacted the political and physical landscape of the city and whom has benefited from this green identity making" (GULSRUD & OOI 2015 p.°80) by tracing historical narratives in the development of urban green spaces contextualized with urban place-making and green city branding, as well as the attribution of social and environmental values.

"In this sense urban political ecology takes to task the nature/ culture logic suggesting that there is nothing unnatural about human-produced environments because cities are specific historical results of socio-environmental processes (Davis, 1996; Harvey, 1996; Heynen et al., 2006; Wachsmuth, 2012). Cities are also by-products of capitalism and in this sense urban nature is as much a commodity as steel, glass, and concrete are because urban nature is produced

under 'capitalist and market-driven social relations' (Heynen et al., 2006: 5). In a capitalist city, such as Singapore, urban political ecology argues that the urban environments of the city are 'controlled, manipulated and serve the interests of the elite at the expense of marginalized populations'".

(GULSRUD & OOI 2014 p.°80)

The wide field in which Political Urban Ecology can be discussed and applied from different perspectives has been shown by the article of ZIMMER (2010), which contributes to the overall understanding, but therefore could not define the views applied here. Following this, the issues raised by GUSLRUD & OOI (2014) will be evaluated based on their stated aspects.

In addition to ecological and social interests, it is assumed that processes of city branding, or image building contribute to aesthetic norms that are implemented through globally oriented policies. These experiments contribute to urban development in different ways and are also shaped by different interests. Contributions can also be found in the ecological services that urban green spaces provide, as they offer opportunities for research and innovation in tropical ecology as well as urban planning (ROWE & HEE 2019). SANTANGELO (2019 p.°18) suggests, that landscapes in Singapore can be "evaluated on a global to local scale; towards the one end in terms of their appeal in a global scenario [...] or, towards the other end, in terms of their capacity to blend into the everyday life of Singaporean citizens".

These questions are summarized in the general research framework:

In the context of a global best practice example for urban planning, economic growth, and sustainable and green urbanism, which wants to expand its growth and know-how export, how is Singapore itself influenced by ecological, social and (international) economic interests? How can Singapore embrace its role as a model for sustainable urban development, create internationally acclaimed green experiments, and still meet local needs for environmental and social structures? How do Singapore's urban spaces conform to be world-class while serving local interests, as global cityscapes influence green urbanism? Do green elements, such as parks, show different dimensions in their orientation depending on the interests they serve? How do professional planners and consultants perceive their influence on Singapore's urban green spaces, and from what perspectives are they shaped into world-class aesthetics or local pragmatic functionality?

Since green urbanism in Singapore is primarily characterized by powerful political leadership, one can ask how the various institutions of leadership shape the urban ecology (e.g., parks), which actors and stakeholders participate in the development process, and what their goals are. Further, one can ask how these goals are perceived as specifically influenced by local or global interests. In this context, green urbanism could theoretically be embedded as influenced by different interest groups (i.e., GULSRUD & OOI 2015, SANTANGELO 2019).

In summary, the research aims to understand the influences of local, national, and global factors on urban green planning processes in Singapore, how the interests of various stakeholders, from policymakers to civil society actors who have been little involved, shape urban green spaces, and how these spaces are perceived once they are established. Figure 2 shows a simplified representation of the interrelationships of influences that are deducted from an initial literature review.

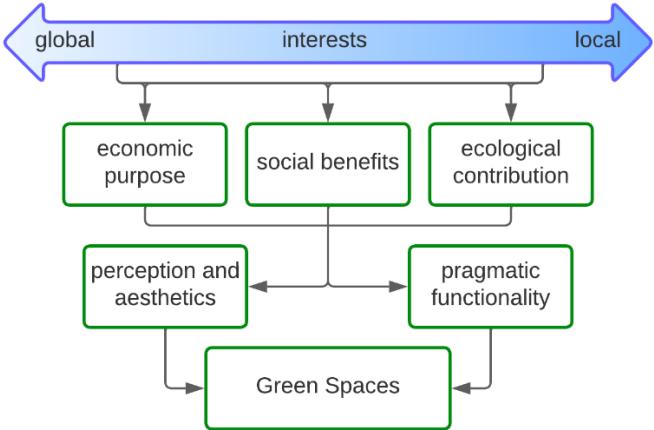


Figure 2: Constructed interest relations on urban green spaces

3 Methodology

During the initial literature review, the concept of urban political ecology, as used by BULKELEY & CASTÁN BROTO (2013) and GULSRUD & OOI (2015) and partially, combined with Eco-cities by NEO & POW (2015), proved to be a valuable theoretical and analytical approach to understand how urban environments are shaped by different actors and interests. These actors and interests should then be found at community, city, and transnational levels. As a student raised and educated in Europe, with no previous research training in the Southeast Asian region, high priority was given to the initial observation and exploration of the research field to identify in an exploratory way further places, contacts, and insights that contribute to this research project. However, during a six-week field trip in October and November 2022, the diversity and richness of urban greenery in Singapore revealed a very heterogeneous picture of landscapes that can be addressed either in an overall analysis or with specific dedication. Because this research project was designed in an exploratory approach that allows for ongoing learning and understanding to gain a broader education about Singapore's urban politics, economy, social interests, and environmental goals, the focus remained on a high proportion of interested observations. The explanations of BORTZ & DOERING (2006 pp. °237, pp. °308, pp. °336, pp. °380) represented the central guideline according to which the research proceeded. Information and expertise from NParks and other city agencies were also noted

and collected as reliable sources for the research. Observation for the research, therefore, focused on the previously stated research questions but also remained open to aspects of the research topic that had not yet been addressed.

During day trips, various results and impressions could be collected and transferred into scripts or documented with photos. In total, more than 61 parks were visited, including mainly larger parks and those located near the Park Connection Network (PCN), as this network was used for transit between parks. For this purpose, a total of more than 400 km was travelled on foot or by bicycle, partly through the PCN, but also through urban areas and larger parks and gardens. The following figure (Figure 3) provides an overview of NParks' parks, gardens, and reserves, as well as the PCN, and illustrates in light yellow, overlapping with the colours of the legend, the distances travelled or inaccessible/privatized areas.



Figure 3: Parks, Gardens, Reserves, and PCN (source: NParks), with own modifications in light yellow

In addition, informal conversations contributed significantly to understanding local development structures, philosophies, and general interests in social, political, and economic well-being, as well as coexistence and appreciation of the natural environment. Two conversations were found to be particularly valuable and were therefore recorded in a thought log following the conversations that could contain research questions. However, the field research, observations, and conversations revealed that the primary agency involved in the design and development of the areas studied was the National Parks Board (NParks), where several interviews were asked following the field trip. In addition, interview partners involved in civil society organizations were approached.

Given the Christmas holidays and Chinese New Year in December and January, only two interviews with contributions of three participants, all of them from NParks, could be conducted,

and as opposed to the intended semi-structured or open-ended interview forms, prior submission of questions or opportunities for written responses were requested.

On top of that, using secondary data sources, the annual reports of NParks from the year 2002/2003 to the year 2021/2022 were examined for data on the development of the number and size of parks, staff development, and financial statistics. Due to the use of the visualization program 'Tableau', missing data were replaced with data from the previous year to allow for continuous charts. Therefore, the visualized data are not considered to be sufficiently accurate but serve to provide an overview of trends. However, not all these categories were covered in the reports in all years, so staff figures for the more recent years, in particular, remain unknown.

4 Overall observations and experts' opinions

This chapter presents the insights gained through observation and expert interviews and further impressions from informal conversations with citizens and other experts. To provide more specific insight into urban green space, three well-known and central landscapes were scrutinized to explain the interests and influences to which they are exposed. The chapter, therefore, begins with a general overview of patterns and characteristics and then presents the Singapore Botanic Garden (SBG) as a prominent example of a landscape that has been influenced and shaped by various interests, as well as the Sungei Buloh Wetland Reserve (SBWR), which further illustrates the features of the various interests influencing the development of the area, and Pulau Ubin as a brief example of more unfamiliar landscape forms that are equally significant in Singapore.

4.1 general observations

Green spaces in Singapore need to be assessed against the individual background of each landscape (conversation NUS). Different areas, parks and gardens are dedicated to different purposes, yet serve a variety of needs and interests. Some of them, such as the Singapore Botanic Gardens (SBG) and the Gardens by the Bay, are often described as world-class as they "appeal to locals and tourists alike" (interview two NParks). The representation of what is considered natural depends on the expectations being addressed. Most of the urban environment is man-made nature and must therefore be considered as such. Remarkably, different sources also refer to Singapore as being "well known as a premier tropical City in a Garden" (observation SBG).

4.1.1 Annual Reports

NParks provides a reliable overview of the development of the nation's greening by publishing figures on parks, the area managed by parks and the total area maintained, as well as the financial and human resources devoted to their maintenance and management. The available reports, starting with the financial year 2002/2003 and ending with the last report in 2021/2022, were analysed and visualised using Tableau software, which is more of a web application for exploring data interactively, but still meets the interest of this study due to its clarity. Since parts of the reports were missing, it is important to mention that the data was taken from previous years when it was completely missing (the year 2008/2009). Therefore, the result of the visualisation should not be seen as completely accurate but should give an overview of trends and progress.

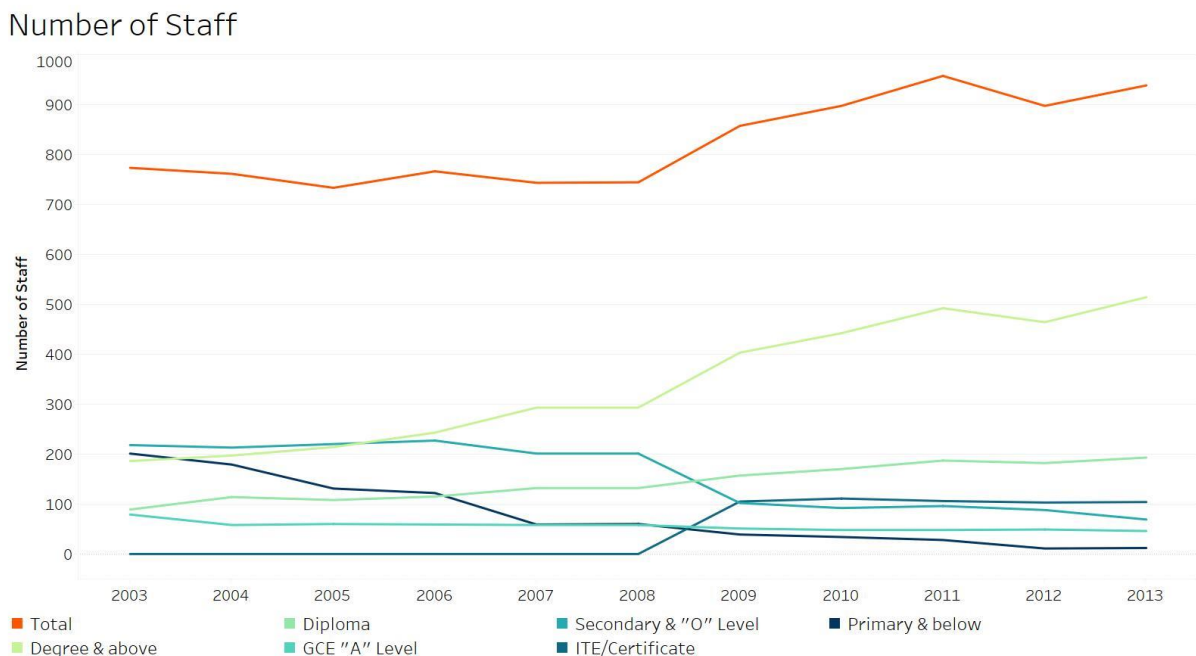


Figure 4: Development of Number of Staff at NParks 2003-2013 (data source: NParks Annual Reports, own presentation)

This illustration (Figure 4) shows the decrease of staff with the qualification 'Secondary & "O" Level' as well as staff with the qualification 'Primary & below'. At the same time, the qualification 'ITE/Certificate' was introduced, which indicates that the qualification levels of staff are changing or being replaced altogether, which could not be clarified in further research. The total number of staff increased in 2003-2013, no further data is available for the period after that. Accordingly, the largest increase in staff is due to staff with the qualification 'university degree and higher'. It is important to note that these data only represent staff employed by NParks. Observations during the field trips indicate that the majority of people employed for

the management and maintenance of parks and gardens are migrant workers employed by companies for which no data could be found or provided upon request.

The following graphs (Figure 5, Figure 6) trace the total assets in S\$ millions that NParks has accumulated over time and the underlying financial income and expenditure, which consist of various positions. Given the conflicting evidence of increasing expenditure and increasing total assets, this is another research point that could not be clarified in this study.

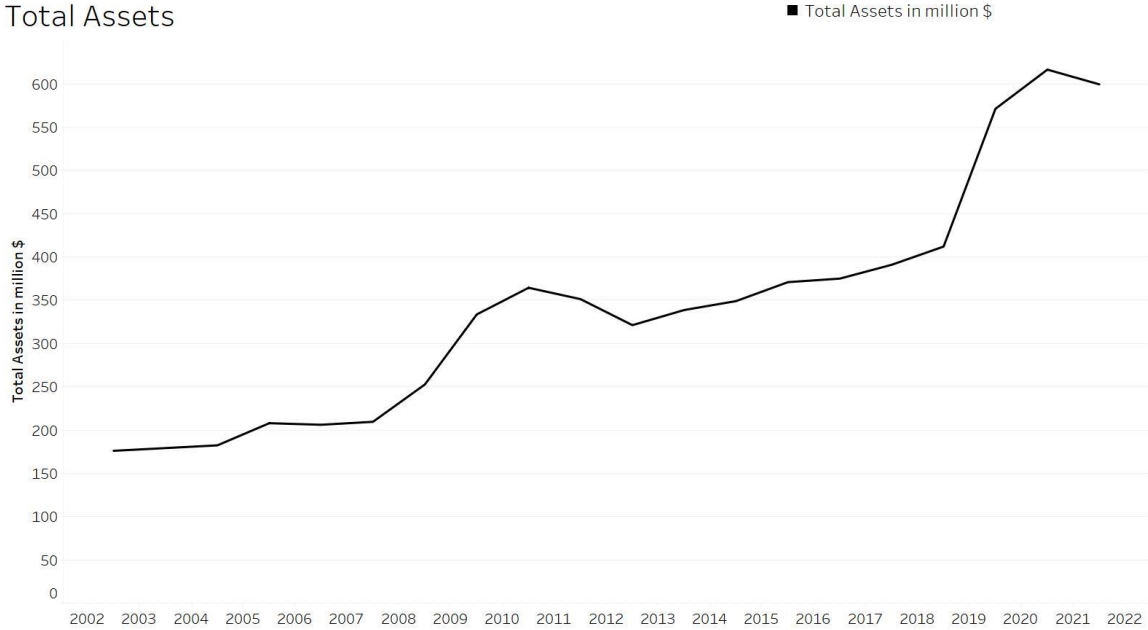


Figure 5: Total Assets NParks (data source: NParks Annual Reports, own presentation)

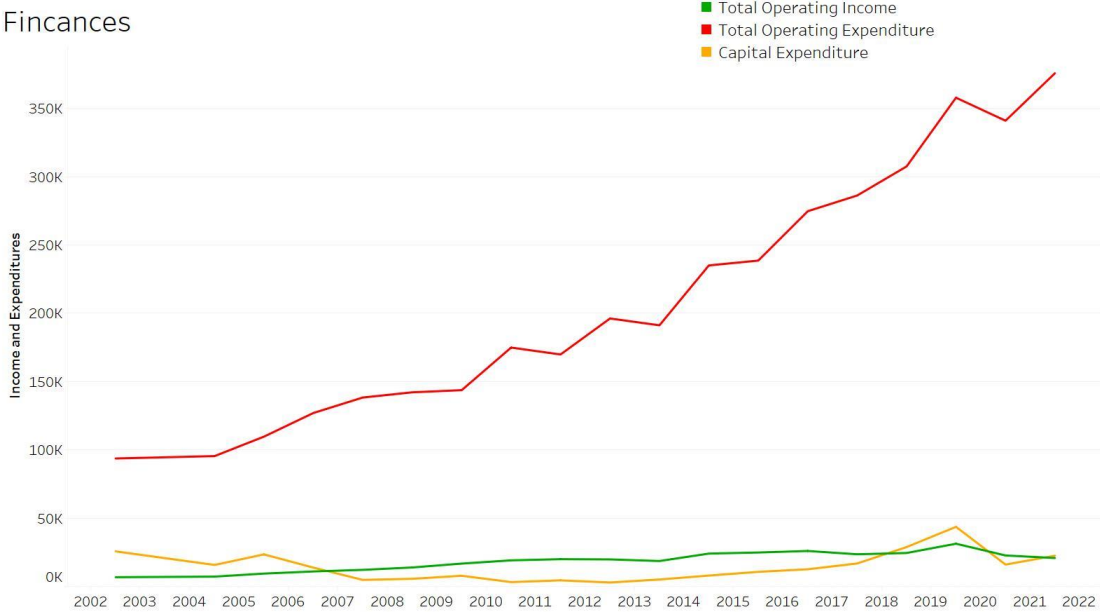


Figure 6: development of finances NParks (data source: NParks Annual Reports, own presentation)

The following four figures (Figures 7, 8, 9, 10) illustrate the landscapes managed and maintained by NParks and show the total area maintained by NParks, with a large increase in state-owned land taken over by the authorities from 2016 and an increase in the total area maintained (Figure 7). There has also been a slight increase in the number of parks managed over time (figure 6). Since there has been no data on Park Connectors since 2016, the total number of parks maintained has also continued to increase from a lower number in figure 8. The total mileage of Park Connectors is shown on the right axis and has steadily increased between 2010 and 2017 (Figure 8).

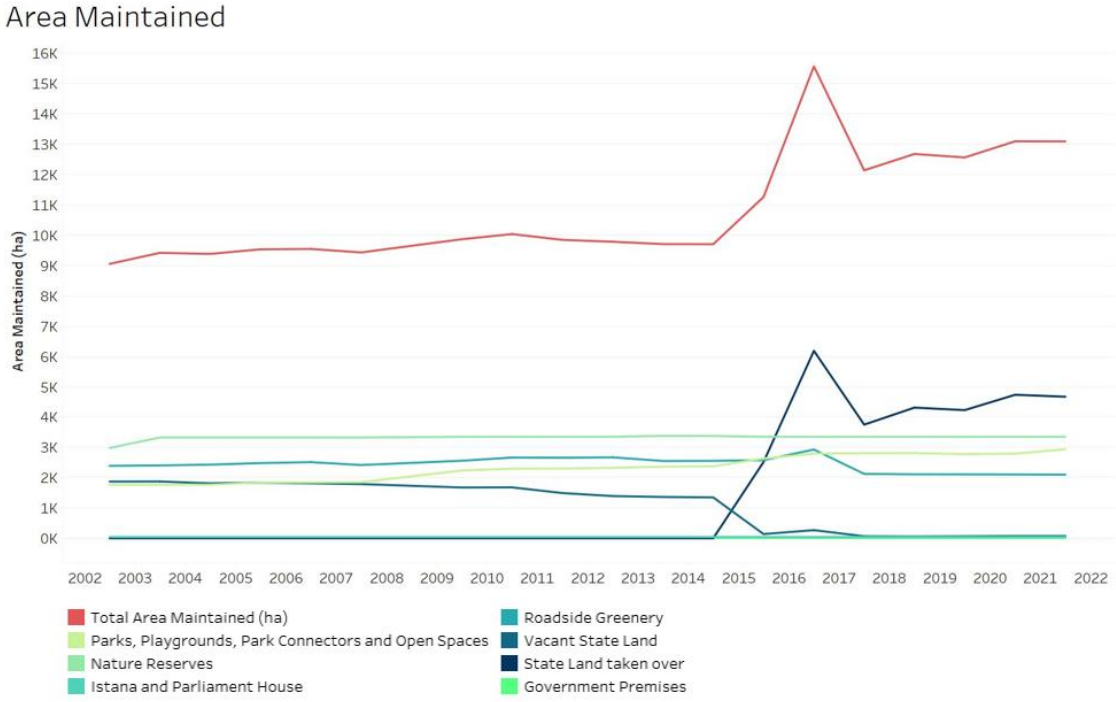


Figure 7: Area Maintained by NParks (data source: NParks Annual Reports, own presentation)

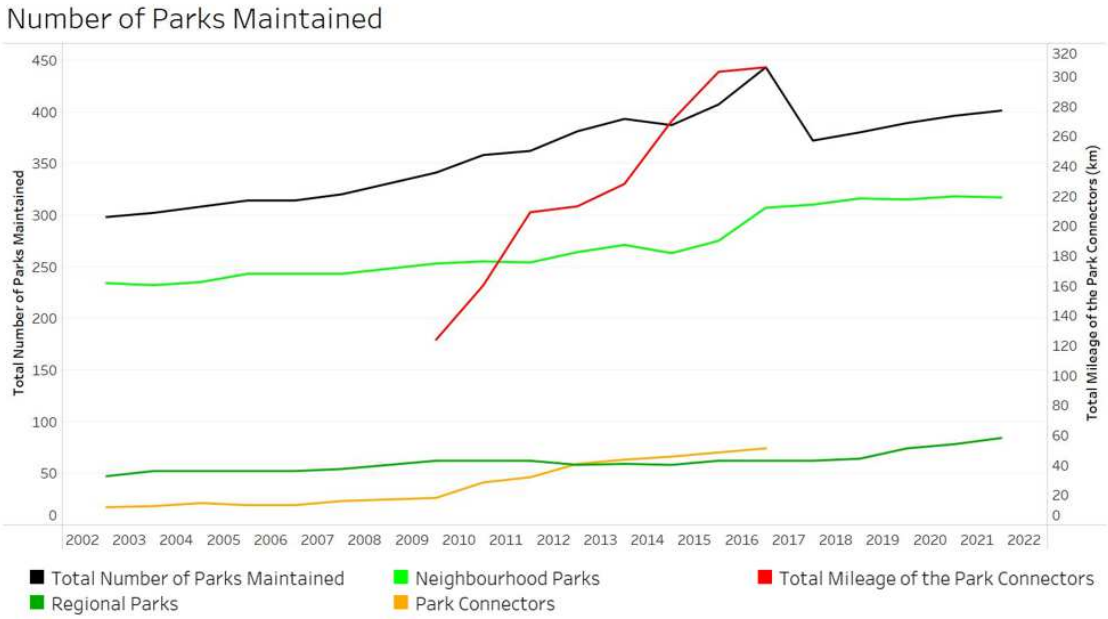


Figure 8: Number of Parks Maintained by NParks (data source: NParks Annual Reports, own presentation)

Park Area Managed

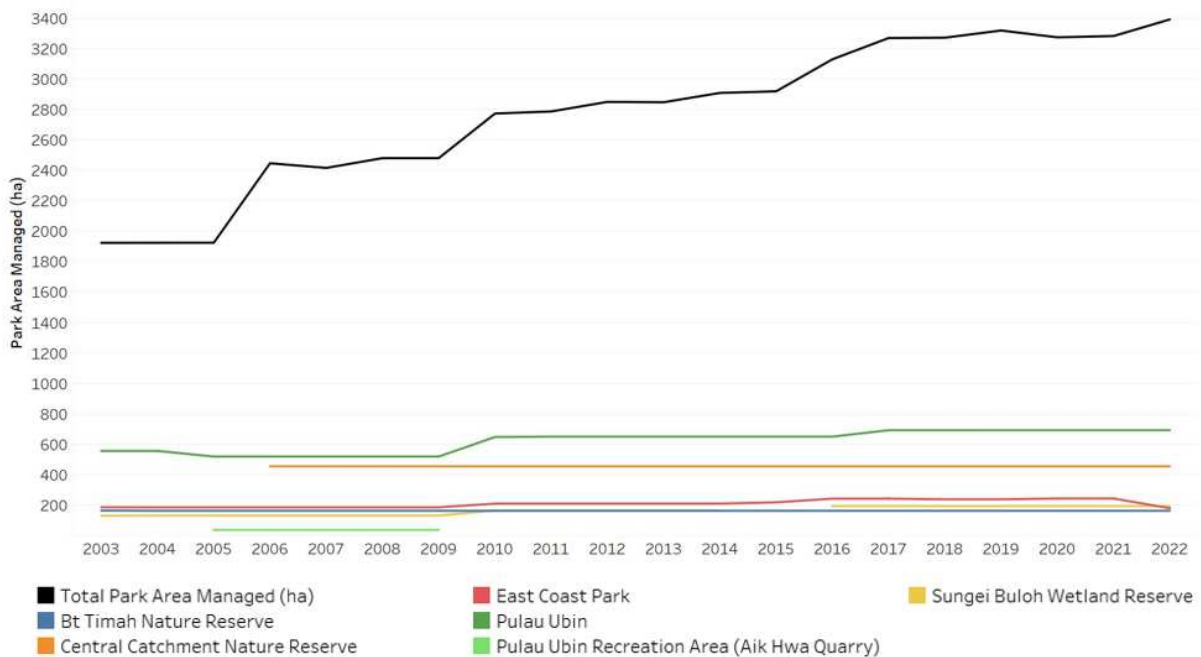


Figure 9: Park Area Managed by NParks for Top 5 Green Areas (data source: NParks Annual Reports, own presentation)

Park Area Managed (>100ha)

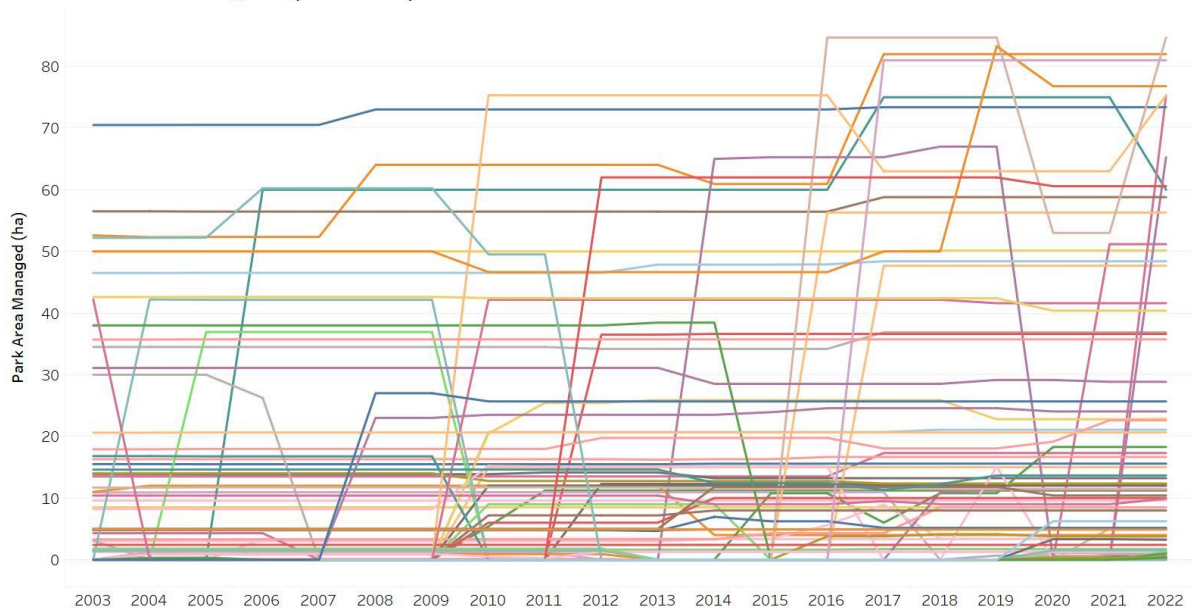


Figure 10: Park Area Managed for Green Areas smaller than 100ha (data source: NParks Annual Reports, own presentation)

For the case of this research, the Park Area managed was chosen to be visualised in two different ways (Figure 9, 10), showing the total park area managed along with the five (counting Pulau Ubin and Pulau Ubin Recreational Area, including Aik Hwa Quarry, as one) biggest Park

areas in the first visualisation (Figure 9), as they contribute largely to the overall area. Their areas have slightly increased, which is rather difficult to spot due to the high intervals of the axis, but as shown in the second figure (Figure 10) on the park area, the overall changes in the park area can be found in the remaining parks, all of which consist of less than 80ha. For simplicity, a legend has been omitted for figure 10. Yet, it illustrates the constant developments and changes of parks, being subject to frequent in- and decreases in their size.

4.1.2 Current development

According to various experts and sources, the Urban Redevelopment Authority (URA) is the main urban planning authority and therefore also responsible for the distribution of urban greenery. Based on the type of landscape protected or created, a further distinction is made between nature reserves, national parks, national gardens, neighbourhood parks and gardens. What exactly distinguishes these types of landscapes from each other could not be fully clarified, as the national gardens are so far only the Botanical Gardens as well as the Marina Bay Gardens, but the newly established Jurong Lake District is to become the third of its kind. The historical development of landscapes contributes significantly to the design and architecture of parks and gardens. Another strongly emphasised aspect is the state of land scarcity, which is not only a problem in finding space for ongoing construction and other land use interests but also confronted Singapore with the issue of survival in its early days as a young nation. It is pointed out that Singapore's land area would not even provide enough space for agriculture to feed a population of 2 million people. Therefore, to ensure the survival of its citizens, Singapore needed to work on a strategy "to really encourage investors from all over the world to come to Singapore, and invest in Singapore, built factories, built offices, so that we can have jobs and we can make a living" (interview one NParks). However, investment alone should not be attracted just for survival, but also for the benefit and well-being of Singaporeans, because unlike other surrounding countries, land and labour costs are higher, which should still make investors willing to invest in the city's environment, which ultimately contributes to the well-being of all residents (interview one NParks).

This strategy has evolved into the greening of an entire nation that continues to evolve.

Although the Singaporean government, and by extension the URA, sets the groundwork for future planning well in advance, design and planning approaches seem to be changing in line with urban narratives. Today, more respect is given to a more natural view in terms of depicting untamed, lush tropical greenery, while parks created a few decades ago still seem to have an austere and clean garden-like approach to representing the taming of nature (Figure 11, see also tree planting in Figure 13). Overall, the role of aesthetics also seems to have shifted in the wake of the "city in nature" narrative, with experts voicing their vision of a future Singapore that resembles a city in a living jungle, and therefore nature is increasingly being copied

(interview one NParks). In this context, a “science-based approach towards nature conversation has become more evident in the recent years”, as Singapore strongly promotes research in various fields and consistently incorporates the results into planning (interview two NParks).



Figure 11: park area at Hong Lim Park, Downtown Area, and natural riverbeds at Bishan-Ang Mo Kio Park West (own Picture)

This also shapes the understanding of aesthetics that develops with the understanding of the narrative of cities. In addition, experts state that aesthetics “may not always be achievable” as there are “hundreds of smaller parks in Singapore that are more functional” (interview two NParks). Singapore makes sure, the land is used for multiple purposes and admits it to inherit a multifunctional role for urban interests (interview one NParks), which was also observed during field trips (see Figure 12).



Figure 12: Fitness area, Playground, and Shelter at Katong Park (own picture)

The National Museum of Singapore (NMS) explains that more pragmatic choices were made, especially in the early years of greening, to help increase trees. The selection of trees for roadside planting was mainly for practical reasons, as “Angsana and rain trees were favoured because they grow quickly and their umbrella-shaped crowns provide much-needed shade in Singapore’s hot and humid climate”, while the native tembusu tree could not provide these benefits (observation NMS). However, even these areas have evolved in recent decades, and diversity in roadside planting is being pursued more ambitiously under the narrative of a ‘City in Nature’ as native shrubs, plants and trees enrich what used to be rather monotonously planted areas (conversation NUS).

Similar patterns are also observed and mentioned in housing projects, although they are less discussed in this study. However, it is noteworthy that the urban narrative of the ‘city in nature’ applies not only to green spaces but also to housing projects, both public HDBs and privately developed condo complexes, where the integration of lush greenery is becoming more present in recent years. According to experts, the overall amount of green space continues to increase and the creativity with which this is pursued has evolved (interview one NParks). In the Jurong Lake District, entire districts have been designed to combine living and natural water and green landscapes, which can also be observed in the newly established Punggol Waterway.

Not only did an expert from NParks state, “we copy a lot of things, we copy, and we are very famous for copying” (interview one NParks), but also the URA itself pointed out that Singapore copies urban development ideas from around the world. One such example, which can be traced back to the city of Hamburg in Germany, is a “green network of walkways and bike paths that connect its existing green spaces and provides safe, car-free commuter routes” (observation at URA City Gallery) which serves as an inspiration for the PCN in Singapore. In addition, an NParks expert pointed to the Spree Riverbank in Berlin, Germany, as one of the references for the earlier designs of riverbanks in Singapore. Since Singapore has a “try and error” strategy, it is willing to take the risk of failure, but as the expert says, “we learn from it, and we will advance it” (interview one NParks).

4.1.3 Social interests

Singapore is “widely recognised as one of the greenest cities in the world. Its proportion of green cover has grown in tandem with its economy and population, and today more than 40% of the island is covered in greenery. Singapore has long considered the provision of greenery to be integral to socio-economic and national infrastructure development and recognises the importance of civic ownership to maintain this” as stated in the SBG (observation SBG).

All experts interviewed or consulted for this study agree that the Singapore government aims to provide fair and equal access to parks and green spaces for all citizens, regardless of where they live. Parks offer a variety of possible activities that serve people from different

backgrounds. In addition, children are actively targeted with the establishment of 'nature play gardens', which aim to foster their connection to and curiosity about nature. While in some areas it is less advantageous to have large parks nearby, this is mainly related to the historical settlement patterns that enabled the establishment of these parks. Nevertheless, the PCN aims to ensure that citizens can access parks for recreation and leisure within a short distance. In addition, most areas in Singapore have parks and gardens nearby, which mainly serve as pragmatic exercise spaces for citizens, playgrounds for children and seating areas for outdoor socialising. These opportunities that parks provide for people to meet and form communities are also seen as part of creating local identities (interview two NParks).

The National Museum of Singapore (NMS) also highlights the importance of green spaces in Singapore's history. In terms of landscape, the first phase of Singapore's transformation into a 'Garden City' or 'City in a Garden' was carried out in the years between 1960 and 1980. It is explained that from the 1960s to the 1980s, much of Singapore's landscape was altered beyond recognition as the urban area almost doubled in size. To mitigate the impact of development, greening was deliberately incorporated into urban planning. In 1971, Tree Planting Day was introduced to encourage the public to participate in the greening of Singapore. By 1982, a tree was reportedly planted for every Singaporean born in the previous ten years, reinforcing Singapore's reputation as a 'Garden City'. These campaigns were accompanied by others, such as those to promote the cleaning of rivers. The National Museum of Singapore (NMS) explains: "Today, a clean and green environment is an intrinsic part of Singapore's identity as an efficient and orderly society. It is also a symbol of Singapore's transformation into an attractive global city" (observation NMS). Other exhibitions, such as the art installations 'Story of the Forest' and 'Singapore, Very Old Tree' which were ongoing at the time of the research, highlight the connection between Singapore's national identity, its development and greenery.

In terms of citizen participation, the SBG also states that "people are at the heart of Singapore's work in greening and conservation", citing not only community engagement but also 'active stewardship' by people living with nature in their urban setting. One expert (interview one NParks) states that he actively works in consultation with citizens regarding their contribution to future development. Further engagement to participate in projects, contribute ideas and suggestions and interact with regional groups can be observed in almost all ongoing developments. In doing so, most of these engagements are certainly committed to the inclusion of NParks. Encouragement from governments to engage through volunteer programmes or neighbourhood activities to contribute to greening the nation and protecting nature could be observed in various places.

4.1.4 Ecological Interests

Land reclamation and allocation, which began as early as the 1960s, are ongoing projects in various parts of Singapore that are portrayed as success stories for the literal growth of the small island nation. Various references mention that the land was first mangrove swamps or marshland, then developed and the land cover transformed into what is now Changi Airport, the forthcoming Tuas Mega Port, Jurong District, East Coast Park or Marine Parade. One expert (conversation NUS) also mentioned the resource-intensive process of land reclamation, which relies heavily on imported sand as a scarce resource to be considered from a sustainability perspective.

Sustainability can be observed as a rather rarely advertised topic, for example at HortPark in Singapore, where greenhouses are a testing ground for plants in the 'Cloud Forest' dome in the Gardens by the Bay. While signs there mention various aspects of habitat and biodiversity loss and the need for urgent protection of endangered ecosystems around the world, here at HortPark small signs inform about how the dome structures are cooled by using renewable energy. In addition, the aim of research on locally created soils is explained, as peat is to be replaced by biochar for environmental reasons, providing a more sustainable, local and cheaper raw material for crop cultivation. As the land reclamation process mentioned above also relies on a scarce resource, sand, Singapore is also investigating the production of sand itself using construction waste and ash from waste treatment plants, according to an expert.

However, for the experts, Singapore's greening is obvious as an ecological value: "We all know that greenery fundamentally helps the environment, so you plant trees, you will have more oxygen and carbon dioxide will be absorbed by these trees, this is very well known" (interview one NParks). When properly managed, the parks increase the biodiversity of wildlife, which is also evidenced by the biodiversity index that has been created. To enhance biodiversity, Singapore also aims to develop 'nature corridors' to allow wildlife to disperse (interview two NParks).

For the overall account of Singapore's attention to sustainability and the urgency of implementing green, as well as protecting the environment, it should be acknowledged that during the time of the research, the exhibition "A Climate Action Exhibition at CDL Green Gallery @ SBG Heritage Museum: Change the Present, save the ocean. Climate crisis is an ocean crisis" took place at the SBG Heritage Museum. There, extensive information is given on Singapore's campaigns and ambitions: The 'SG Green Plan 2030' was launched in 2021, and consists of various approaches to support a more sustainable future. 'City in Nature' is one of five key pillars in the 'SG Green Plan 2030', aiming to "achieve net zero by or around 2050" and directly commits to the UN 2030 Agenda for Sustainable Development and the Paris Agreement to "limiting global warming to well below 2°C and pursuing efforts to limit it to 1.5°C compared to pre-industrial levels" (observation SBG). In addition, an expert explains that

Singapore wants to contribute on a global scale, not with its physical impact as it is far too small for that, but “if we influence the global opinion, that could do something on a bigger scale so that our little tiny earth can survive, can sustain life” (interview one NParks).

The five other pillars consist of ‘Sustainable Living’, ‘Energy Reset’, ‘Green Economy’, and ‘Resilient Future’.

‘City in Nature’ aims for:

“Green, liveable and sustainable home for Singaporeans

- Plant 1 million more trees, and have every household within a 10-minute walk from a park by 2030 – more than 330,000 trees planted, and over 9 in 10 households are within a 10-minute walk from a park now
- Establish 500 km of park connectors by 2030 – there are currently more than 370km of park connectors
- Develop over 130 ha of new parks, and enhance around 170 ha of existing parks with more lush vegetation and natural landscapes by end 2026” (observation SBG)

The prevailing goal of incorporating more trees into urban areas, especially parks, can be observed in several settings. The planting of trees is intended to improve the quality of the environment (interview with an NParks) and, in recent years, to contribute to a more natural and tropical appearance of parks and gardens (Figure 13). These plans correlate with elements of other pillars, such as the ambition to “moderate the rise in urban heat [...] by increasing greenery” (observation SBG). There further exists a Marine Conservation Action Plan that aims to prevent coastal erosion by implementing “nature-based solutions to build the resilience of Singapore’s coasts” (observation SBG). The established Mangrove restoration program is “part of the OneMillionTrees movement” (observation SBG).

Despite contributing to climate goals, greenery serves as a source of shade for Singaporeans, a point regularly emphasised as Singapore's climate forces urban planners to develop oases of shade and cooler air temperatures (interview one NParks, conversation NUS).



Figure 13: tree planting at West Coast Park and Sembawang Park (own picture)

4.1.5 Economic Interests

Regarding the economic benefits of green spaces, experts from NParks state that “providing spaces for exercise and recreation and thus stress relief [...is] improving the health of the population [and] will in turn increase productivity and reduce healthcare reliance and cost” (interview two NParks). Furthermore, they state that greening has an impact on property prices and surrounding commercial areas, which could be understood as a positive aspect of value retention. However, based on other observations during the research trip, it can be questioned whether the rising rents in the world's most expensive city contribute to social and economic well-being when not only foreign workers but also Singapore residents either relocate to nearby Malaysia or settle for the hostel environment as a permanent living space.

Technology plays an important role especially in the maintenance of parks, gardens and other green spaces, as it seems that every tree is monitored. Singapore has become very sensitive to falling tree branches since a fatal accident a few years ago (conversation SBG) and offers many different apps for park visitors as well as maintenance teams. According to NParks experts, “Internet-of-Things [...] systems are increasingly being used. For example, water, tree lean, weather, and visitor count sensors allow us to get real-time information on malfunctioning taps, and trees which need more frequent monitoring, plan for severe weather events and monitor park usage. Such information allows us to be more efficient in responding to and planning of the park maintenance regimes” (interview two NParks). An NParks expert still describes the role of technology as more of a ‘tool’ to help with planning, design and development, while Singapore ultimately wants “to create something sustainable and a very natural link” (interview one NParks). In addition, there are also more traditional ways of maintaining parks, as it is not for nothing that chickens are seen in various green places around the city, as their scratching loosens the soil and thus contributes positively to natural ecosystems (conversation SBG).

4.2 Singapore Botanic Gardens as a symbol for economic greenery

The Singapore Botanic Gardens (SBG) offers rich information about its history as well as the region's relationship with plants, botany, and greenery in general. It refers to Singapore's past as a pure forest area, cleared for agricultural production in colonial times, and sheds light on the role and especially the importance of tropical rainforests in Southeast Asia and elsewhere today.

The dedication of an exhibition on ethnobotany further highlights the importance of appreciating not only the history of nature and humanity through the presentation of indigenous people's culture but also how such natural areas can be protected and preserved, especially through the informed stewardship of indigenous peoples based on their knowledge. Ethnobotany is defined here as “the study of the relationship between people and plants, and

how plants have shaped human culture in turn. The field spans cultural, domestic, religious and medicinal aspects, and much more” and its emergence dates back to the colonial period, when “collect[ing] knowledge about how various indigenous cultures used plants” became of interest (observation SBG). The knowledge collected to date is described as “typically obtained [...] by acquiring land and plants from indigenous people violently and without compensation” (observation SBG).

The value of these natural places thus lies mainly in the ecosystem services they provide, i.e. mitigating soil erosion and acting as carbon sinks, but also in the fact that these plants provide opportunities for “potentially important genetic research” (observation SBG). As rainforests in Southeast Asia have shrunk drastically due to deforestation, mainly for large-scale agricultural production of cash crops, with palm oil cultivation being the most important, but also due to small-scale subsistence agriculture, the protection of the remaining areas with the help of local communities is highlighted as extremely important.

In addition, botanical gardens are now seen as important institutions for the conservation of endangered species and as seed banks. However, the history of the SBG goes back to a purpose other than biodiversity conservation: the first superintendent, James Murton, changed the purpose of the garden from recreation to scientific experimentation in 1859 by establishing a plant exchange system, an herbarium and a library. The history of botanic gardens is generally influenced by the British colonial tradition of establishing gardens in the tropics, and the SBG was part of a colonial garden system for trading seeds to grow cash crops (conversation SBG). To illustrate the role of the SBG within the economy of the plant trade in the colonial system, it is also worth noting that the first two superintendents were trained in the United Kingdom and sent from there to run the SBG. The SBG was therefore quickly set up as a test plantation for various crops, which the British collected and traded around the world to increase production and boost economic profits by finding the best locations to grow the plants. The SBG's former economic garden quickly assumed a central role in the economy of Southeast Asia. The SBG dedicates information on the connection between ‘Colonial Economics and Botanical Gardens’. In “the nineteenth century, there was a network of botanical gardens across British colonies, to carry out botanical exchange and research for the testing, production and processing of economically valuable crops” is explained in the SBG. “One such crop was natural rubber, the global demand for which was rapidly expanding at the turn of the twentieth century” (observation SBG). The then director of the Botanical Gardens, Henry Nicholas Ridley, contributed to rubber harvesting techniques and encouraged plantation owners to grow rubber, even earning him nicknames such as ‘Mad Ridley’ or ‘Rubber Ridley’. In the early 20th century, the rubber industry settled in Singapore after Tan Chay Yan established large rubber plantations in nearby Malacca for commercial interests. Other plantations were established in various parts of Singapore during this period by Tan Kah Kee

and Lim Boon Keng, among others. Through the research carried out by Henry Ridley, the SBG managed to generate a regular income for its experimental work, thus making itself independent of the Kew Gardens in England, which formed the core of the colonial botanical garden system. Nevertheless, it was a decades-long process before the SBG also became independent of the Kew Gardens in scientific terms and despite the interruptions caused by the First World War.

The economic dimension of the Botanic Garden is also evident in the former economic garden, which was inaccessible to the public at the time and consisted of the following parts: “41 hectares of land for the testing of plants of potential economic value, such as Pará Rubber (*Hevea brasiliensis*), African oil palm (*Elaeis guineensis*), pineapple (*Ananas comosus*), cacao (*Theobroma cacao* – chocolate) and coffee (*Coffea liberica*), amongst others” (observation SBG).

Some of these plants are of great importance to the Southeast Asian economy, e.g. rubber and oil palms. However, the former Economic Garden has been converted to now house the NUS and some historic plantings have now returned as part of the Botanic Garden. The resulting science of economic botany is further defined as “the study of the relationship between people and plants, particularly for economic purposes. It is concerned with crops that can be utilised by people, from their sale as goods to their use as feed for livestock” (observation SBG). It goes on to say that “Singapore has a long history with economic botany that began during her colonial past, when Sir Stamford Raffles sought to establish Singapore as a place to grow plants with high economic value for trade purposes, mainly concentrating on spices. Singapore’s Botanic Gardens also originally served as a test bed for many of the crops to be grown in plantations across the region” as Singapore became “an important port city within the British Empire”, where “economic botany [...was] important for trade” (observation SBG). Another notice states that “Singapore’s potential to trade plant commodities was recognised by the British as a valuable resource for the city, [...]. Many foreign crops were brought into the Gardens for testing and trialling in the local climate before being distributed to the local population. [...] This history of crop trials, and Singapore Botanic Garden’s role in economic botany in the region, were highlighted in the successful bid for UNESCO World Heritage Site status” (observation SBG). Today, the SBG is one of the remaining historic gardens and landscaped gardens in Singapore, representing the colonial history of crop trade and economic botany.

It was not until the middle of the 20th century that SBG consolidated its position in the international orchid market, although it had been active in this field for a long time before that. In addition, the SBG took on another role in the young established nation: “Building Our Community”, is written on one of the signs in the garden, explaining how the SBG, as a place of community and identity, became a place to promote racial cohesion and the development

of a distinct national culture when, even before independence, “the then Ministry of Culture staged regular open-air cultural events/shows known as the Aneka Ragam Ra’ayat (People’s Variety Show). A total of 200 shows were staged between 1959 and 1964. The first of these shows was held at the Gardens on 2 August 1959 on a specially constructed stage. Then Prime Minister Lee Kuan Yew officially opened the show. Addressing a large crowd, he said, *‘Here, under open skies, Malays, Chinese, Indians will, I hope, discover the materials for a national art and national culture’* (observation SBG). The SBG continues to host concerts, movies and other entertainment shows and should provide more than ever a hostile environment for the people of Singapore. It can be concluded that the SBG plays a “significant role in [...] growth as a young nation” and serves as “common ground for people”, that promotes “harmony and encouraging unity among the people of Singapore” in the “need to develop a national culture” (observation SBG).

Yet SBG's role is not limited to its strong influence on the economic history of the region and the creation of a shared culture and identity for the nation, but it also contributes significantly to the appearance of Singapore's green spaces: By introducing the green vision of tree cities, SBG has been “instrumental in the greening and transformation of Singapore into a City in Garden. [...] On 16 June 1963, Mr Lee planted a Empat tree at Farrer Circus. This marked the start of the greening campaign that has continued for more than five decades. [...] the Gardens provided the expertise, skills and resources needed to implement the Garden City vision. [...] To meet the growing demand for technical expertise in horticulture, the School of Ornamental Horticulture was established and housed in Burkill Hall (1972). Here, the Gardens’ staff trained officers from other government departments as well as university students. In 2007, the school’s former role morphed into the Centre for Urban Greenery and Ecology (CUGE), which still provides training and certification for Singapore’s landscape industry workforce. Today, as Singapore evolves into a City in a Garden, the Gardens continues to support Singapore’s greening efforts through its plant research, education and conservation works” (observation SBG). Here, in the heart of the SBG, the NParks headquarters is located and offers employees a unique working environment.

In the first years after its foundation, not much of the SBG's natural environment remained. The Botanical Garden was established in 1859 by taking over the 22.4-hectare site, including 6 hectares of primary rainforest. Within a few years, the land was levelled, terraces laid out, roads paved, the Swan Lake dug, and flower beds laid out. Parts of the rainforest were also cleared for the construction of the Botanical Garden. When then Prime Minister Lee Kuan Yew launched the Garden City Campaign in 1963, he stated that “all Singaporeans should have access to greenery and believed that a clean and green environment would make Singapore more liveable, and lift the human spirit. The Garden City was one arm of his strategy to make Singapore a distinctive and attractive city-state for tourists and investors” (observation SBG).

In this sense, “He ensured that it [the Gardens] was protected and well-resourced, even as Singapore developed into a first world metropolis” (observation SBG).

Thus, today the remaining part of the rainforest is protected and constantly recreated, as it would no longer be sustainable on its own due to natural ventilation and the associated loss of moisture (conversation SBG). To constantly increase the diversity of the rainforest and help it evolve, plants from the Southeast Asian region are carefully introduced into the forest, as it is not certain which species can be considered native to Singapore. While there is historical evidence of the NMS, Singapore's landscape has since been severely impacted by the displacement of various species in favour of a few crops imported from around the world. As a result, ‘protectors of the primaevial forest’ are turning mainly to trees and shrubs found in Malaysian and Indonesian rainforests, and then observing their adaptability to Singapore's small rainforest (conversation SBG). In addition, species thought to be extinct or threatened with extinction have been rediscovered and successfully reintroduced in parts of the garden's rainforest. Protection of the 6-acre patch of forest is also ensured by surrounding the fragile ecosystem with a buffer area to prevent winds from drying out the forest, and by changing the visitor path from concrete to wooden blanks so that it does not heat the area (conversation SBG).

4.3 The Sungei Buloh Wetland Reserve's victory by birds

The story of the development of the Sungei Buloh Wetland Reserve (SBWR) began in 1986, shortly before plans to convert the area into an agrotech park were implemented, when “a group of avid bird watchers discovered that Sungei Buloh is a much-needed refuge for migratory shorebirds”, which then “started a strong community effort towards its conservation” (observation SBWR). As early as 1890, during colonial rule in Singapore, various areas were protected as forest reserves, including the SBWR area, which managed to maintain its position as one of the few protected areas until 1973. Then, with the ongoing industrialisation of the area, mangroves were cleared for “prawn, fish and horticultural farms and light industries” (observation SBWR). With the involvement of bird watchers who proposed to the government to conserve the wetlands, the “rich cultural and natural history and their potential value in education” (observation SBWR) were considered to convince the government. Quoting a member of the Malayan Nature Society, a signboard states that the main objective was to “*show that it was a marvellous educational facility which could be a tourist facility*” (observation SBWR), referring to the potential value of the area as a protected area.

With a positive outcome, the wetland was then opened in 1993 as the first wetland park in Singapore. A quote from former Prime Minister Goh Chok Tong underlines the educational interest: “*nature areas should be put to complementary use so that Singaporeans can enjoy our natural heritage and learn to appreciate nature*” (observation SBWR). In the years that

followed, the park boasted various successes in protecting and caring for endangered species such as otters, migratory birds and orchids. In 2002, the park was enlarged from the former 87 ha to 130 ha and was given the new status of a reserve, leading to its new name, the Sungei Buloh Wetland Reserve. With its new status as a reserve, the SBWR was able to expand its networking in the region by becoming the first ASEAN Heritage Park in Singapore in 2003 and collaborating with other countries in establishing a partnership to protect areas for migratory birds along the East Asian-Australasian Flyway. The list of protected species continued with horseshoe crabs, northern greenshank, rare mangroves and hornbills.

With the preparation of a new master plan in 2008, the area was considered for “sustainable recreation and education programmes with minimal impact on [...] conservation efforts. The Master Plan involved three strategic thrusts”, which can be summarized as securing the reserve as a living wetland; to “increase education, awareness and capacity building of the Reserve as a regional centre for wetland management”, and to “create a destination with a difference to sustain delicate human-nature interactions” (observation SBWR).

These interactions are highlighted in the activities offered at the SBWR. There are workshops and self-guided walks, painting sessions, programmes for children and other art and craft activities. In addition, volunteer programmes support conservation and nature interaction activities at the SBWR.

From an ecological point of view, the main emphasis is on the fact that it is an important and rare resting place for migratory birds, but throughout the reserve, various signs also point out the value of the mangroves and the ‘Mangrove Economics’: “Mangroves have always been economically important to man and have provided us with food and all manner of products for thousands of years” and it continues, “Mangroves can be considered to be one of the most productive ecosystems as they perform a variety of useful ecological, bio-physical and socio-economic functions”. One of these functions, which is particularly important for the marine environment, is the ability of the roots to bind sediments, thereby stabilising the coastline and preventing erosion. In addition, commercial products such as perfume and medicine are made from the plants of the mangrove forests. The economic benefits of mangrove forests are highlighted in various ways, especially in terms of coastal protection and production opportunities based on their natural resources (observation SBWR).

4.4 Pulau Ubin’s presence in society despite past prosperity

One of the more rural and therefore 'natural' areas in Singapore, the small island of Pulau Ubin off the northeast coast of the main island, provides further examples of the complexity of sustainable green space interests in Singapore.

Its natural resources were particularly important after independence, when “the island was of great economic value to Singapore as its granite was widely used in the construction of early

public housing and roads on the mainland” (observation Pulau Ubin). The most famous, Pekan Quarry, has now been flooded and converted into a freshwater wetland, with additional artificial floating mats to create habitats for various species. In addition to the restoration of freshwater wetlands, mangroves and coastal strips are also being rehabilitated and afforestation measures implemented (Figure 14). These measures serve to protect against erosion and revitalise formerly commercially used landscapes, to increase biodiversity and to protect or introduce endangered species. The rehabilitation areas are mainly areas such as quarries, wetlands and shorelines that were previously damaged by aquaculture activities.



Figure 14: Mangroves and Wetland Area at Pulau Ubin (own picture)

At Chek Jawa, the economic value of natural resources is highlighted to justify the need for conservation, such “Marine spots [...] provide a haven and nursery for many species, some of which contribute to the food chain, increasing the population of fish for human consumption” or “Newly-found chemicals produced by some species, like the sponges, are proving to be invaluable in the search for new medicines and drugs”, and of course the beauty of nature itself: “There are many other reasons for protecting Chek Jawa. For most visitors, stepping out on dry land in the middle of the open sea, with the beauty of a thriving, teeming world beneath and uncluttered skies above, such an experience speaks volumes of its value” (observation Pulau Ubin).

With only one small village, a more rural appearance and a few uninhabited tracks where visitors can explore the island by mountain bike, discover the Chek Jawa wetland bypassing the Tudor-style visitor centre, or simply enjoy the island's peaceful and tranquil environment accessible only by boat, Pulau Ubin is a rather remote place in Singapore. Formed from a collection of islands connected by “buildings of bunds for prawn farming”, Pulau Ubin contains the last kampong that retains the “beauty and simplicity of a bygone era” (observation Pulau Ubin). Today, most of the island's residents make a living renting mountain bikes, which are used by tourists for day trips around the island. For both mainlanders and some tourists, the

island provides a “respite for many Singaporeans looking to get away from the hustle and bustle of urban life” in a “familiar and rustic getaway, where we can reminisce the past and celebrate the present, where our children can learn about and enjoy thriving biodiversity, where we can come together to enhance its idyllic charm through sustainable means and practices” (observation Pulau Ubin). On Pulau Ubin in particular, certain sites have been transformed for educational purposes, most notably the Ubin Living Lab, which provides a platform for learning and research for visitors, students and anyone interested in Pulau Ubin's biodiversity, heritage and culture. NParks encourages student groups to engage and interact with the local environment by offering various projects and learning opportunities while contributing to the development of the island. As in many other parks, gardens and reserves, citizens on Pulau Ubin are encouraged to participate as volunteers in the protection and maintenance of the island.

However, social life in Pulau Ubin also flourishes, not only through current and former residents but also through non-residents and regular visitors. Annual festivals strengthen the bond between the island, its residents and all people who are in some way connected to the kampong lifestyle or Pulau Ubin. The National Heritage Board discovered this after a year-long study in 2016 that ended with the production of a 25-minute documentary film.

Given the population decline, it says here that the ‘The Ubin Project’ was launched in 2014, which aims to involve a wide range of Singaporeans to contribute their ideas and suggestions for the development and conservation of Pulau Ubin. However, it is unclear who originally launched the project, as it goes on to say that “To help achieve this [either the involvement of Singaporeans within the development of Pulau Ubin, or, the sustainable (re-)development of the island], the Friends of Ubin Network (FUN) was formed in 2014” and “With support from the National Parks Board (NParks), this ground-up initiative sees various stakeholders organising activities to share their favourite aspect of the island with the public” (observation Pulau Ubin). In addition, FUN is involved in educating and informing the public, for example by promoting how to interact with nature on Pulau Ubin responsibly and sustainably through videos at various locations (Changi Point Ferry Terminal, NParks website).

“Another idea supported by FUN was to have a single government agency managing Pulau Ubin”, which led to the designation of NParks as the “central managing agency for Pulau Ubin” in 2016 (observation Pulau Ubin). The close relationship between NParks and local volunteer groups working for the environment or carrying out socio-cultural activities is particularly strong in this environment. More information on FUN, for example, can be found on the NParks website. However, it remains to be explored how these actors are connected.

5 Discussion

The overall design of the research, which relies almost exclusively on the opinions and resources provided by the authorities, limits the possibility of including different perspectives on current and past developments of green spaces in Singapore. Nonetheless, the expert interviews as well as the public comments at each site added valuable content to the previous findings from the literature. While much has been published about 'experimentation' in Singapore and social participation in community projects, or how certain environments influence citizens' behaviour, there have been few critical voices. The value of Singapore's greenery in contributing to the densely populated urban environment is closely followed in ongoing research by some resident institutions, including and especially involving a highly qualified scientific team at NParks. This also symbolises an important point gained from the research: Singapore's city government is taking a more scientific approach to evaluating the best options and opportunities that serve the overall benefit of the small island nation. This is evident in ecological aspects, where great efforts are being made not only in the areas of botany and wildlife but also in the general approach of educating citizens to enable better coexistence of human and non-human animals in Singapore's urban environment. NG (2018 p.°320) summarises planning approaches guided by strong political visions as follows:

“The government has an inherent affinity to knowledge and research findings from rigorous scientific studies. And they are not afraid of making mistakes, learning from failures, and experimenting again. It seems that government officials are trained to always adopt a long-term perspective and work collaboratively to identify multifaceted impacts with emerging trends and possible policy options”.

5.1 social aspects of greenery implementation

In terms of social interests, literature sources such as BRAND (2013 p.°236) and NG (2018 p.°320) indicate that the government conducts studies to understand social behaviour and needs (see also KOH et al. 2022), similar to the research findings in this study.

Additional committees and other systems are formed in “appreciation of people’s perceived needs, concerns and preferences”, BRAND (2013 p.°236) analyses, but “they remain a form of consultation, rather than transformative participation” and therefore being less effective for knowledge acquisition than participatory methods with higher degrees of inclusiveness. However, HENDERSON (2013 p.°221) points to increasing efforts to involve citizens in planning processes, observing the solicitation of suggestions on social media and the implementation of more diverse forms of participation. According to ROWE & HEE (2019 p.°53), these are still offered on a rather small scale.

As active engagement with citizens was observed in different places and on different occasions during this study, participation seems to have become more important to the Singapore

government. Nevertheless, as also referenced in the literature (ROWE & HEE 2019 p.°53), a more 'guided participation' approach introduced and monitored by the government may be more likely to prevent some people from actively participating and contributing to campaigns. This circumstance should be considered further.

Questions accompanying this analysis consider the cultivation of "awareness and activism over the protection of nature and the environment" in society (NEO & POW 2015 p.°406) which is in the case of Singapore visible throughout the urban area.

Referring to the weak and strong forms of ecological modernisation as introduced by NEO & POW (2015 p.°406) which consider technological and economic approaches instead of open, democratic, diverse and ecological approaches (see also CAPROTTI 2014 p.°1297), Singapore can be more difficult to categorise under these forms as the government intervenes heavily in the shaping of the urban environment while at the same time bringing citizens' values and ambitions into the perception and shaping of the environment. However, GULSRUD & OOI (2014 p.°82) contextualise the education of citizens within the restructuring of the urban environment by drawing attention to a changing focus of educating people to participate in global capitalist structures, expressed not only in urban greenery but also in the health and lifestyle of residents. HENDERSON (2013 p.°221) links the implementation of park areas to the "taming and manipulation of nature", which represent well-ordered environments and therefore express a certain type of politics, which she describes as a model of "order and the exercise of authority [that] was a dominant motif, reflected in the park landscape and the treatment of the natural environment" (HENDERSON 2013 p.°222). In the case of Singapore, the authorities are focused on engaging citizens in participation and practice in urban green spaces (Figure 15). While various forms of engagement are provided, they are ultimately linked to government agencies.



Figure 15: diverse ways to promote civic engagement in urban greenery (own pictures)

Community gardens, on which this research project did not specifically focus, have gained rather high attention in past years, as they are considered a direct melting pot of governance structures and civic society participation (see for example GULSRUD & OOI 2014 p.°86, MONTEFRIO 2021, TAN & NEO 2009). Furthermore, it has also been stated as a clear intention by the Singaporean government to educate and adapt the behaviour of its citizens (GULSRUD & OOI 2014 p.°77). This is especially important with growing wildlife and interactions related to it, for example, KOH et al. (2022 p.°14) show in their study on one specific park in Singapore, where they analyse 'poor engagement' in connecting biodiversity and education with non-material eco-system services could hamper the ongoing rewilding to serve the overall concept for a 'City in Nature'.

5.1.1 Socio-economic indications

Looking at Singapore in the case of eco-cities, as discussed and questioned by NEO & POW (2015 p.°408) on their impact on the rising cost of living, one could even ask how rising rents in Singapore, as observed during the research study, and confirmed by numerous informal conversations with residents, can also be attributed to Singapore's tourist appeal, place branding and ultimately greening. Furthermore, CAPROTTI (2014 p.°1287) mentions the intensification of inequalities through the implementation of eco-urbanism, which serves as "a foil for economic strategies" and refers to "decarbonised iterations of capitalism as the only hope for our collective urban future", built by the hands of cheap migrant labour.

Although this research did not explicitly aim to find data on migrant workers for urban greening, the question of financial and human resources arose during the field observations, because despite some elderly people taking their daily walks and some joggers and cyclists doing sports, the parks were mainly occupied by workers involved in the maintenance and replanting of the grounds. In the few informal conversations, no information about staff and their considerations could be obtained, except for the observation that specific design plans were used, provided by landscape architects.

The use of resources, whether financial or material (for land reclamation or provision of soils, as in the case of peat) or of human beings, occupies a central position in the creation of the 'city in nature'. Tracking these resource flows was considered to support the study but was not its main objective. However, few indications could be obtained from secondary data, especially on the financial background and the number of employees. Here, subsequent research could provide more precise findings.

5.1.2 Socio-nature interaction

In a wider sense, RANDRUP et al. (2020 pp.°920) discuss nature-based thinking as an improved or contrasting concept of nature-based solutions, which are, in this understanding, a western

concept mainly focusing on the purpose and benefit - most often in a materialistic way – that are underlying and are offered by the integration of nature in human environments. In return, nature-based thinking requires to “reconnect urban populations with nature directly, physically as well as spiritual, emotional etc.” (RANDRUP et al. 2020 p.°922). According to ROWE & HEE (2019 p.°54), a comparable approach would also benefit Singapore, as “the acceptance of a ‘City in Nature’, or a literal state close to it by Singaporeans needs to be cultivated and developed”.

BEATLEY (2016 p.°243) stresses the need to develop “civil society organizations and processes that allow for direct biophilic efforts and initiatives, the basis for truly collaborative efforts”.

The connection between society and wildlife, especially in Singapore, has only frequently been researched, as a study conducted by YEO & NEO (2010 p.°6), concluded on human-monkey encounters that “urbanization involves a denaturalization of the environment, producing deleterious environmental impacts that affect the existence of wildlife” and “contemporary urban theory is often anthropocentric, ignoring the subjectivity and agency of nonhuman animals”.

5.2. Ecology

Benefits for ecology are clearly on hand, due to some of the experts, as every tree found in an urban environment lessens the harms of nature destruction through urbanisation.

In inner urban areas greenery reduces heat stress, filters molecules harmful to the human respiratory system, and represents a valuable tool to adapt to changing urban climate conditions within the coming decades (GUY et al. 2015, NEWMAN 2014, WANG et al. 2018, YU & HIEN 2006 p.°105). These indications can be assigned to the nature-based solution approach that various studies follow according to RANDRUP et al. (2020).

More critically engaged scholars, such as GULSRUD & OOI (2014 p.°77) highlight that despite Singapore's reputation as a green oasis, the actual green space in parks and other open spaces available for the recreation of citizens is lower than in other global cities, both in Asia and on other continents, and TAN et al. (2013 p.°24) admit that planning targets have not been met for several years and that “green space provision indicates that it is not significantly differentiated from other high-density cities, indicating that the physical distribution of vegetation in the urban fabric is more important than the absolute quantum of vegetation”. Similarly, GULSRUD & OOI (2014 p.°89) mark for Singapore that it “raises questions regarding the meaning of urban sustainability and what being a green city actually entails”.

The intertwining of green and blue spheres, as ROWE & HEE (2019 p.°4) mark in their work on Singapore, shows how the greening of the city and implementation of nature is mainly connected to the improvement of waterways and concludingly attached to improvements of efficiency on water resource management, in which Singapore has become self-sufficient. TAN

et al. (2013 p.°31) highlight the need to contribute to more ecological pathways beyond obvious greening, in paying attention to how urban ecosystems benefit from green spaces, including “soil and water-bodies, interact to influence the overall flows of energy, water nutrients, etc., and will affect the health and functioning of cities and their inhabitants”. Koh (2021 p.°71) also emphasises the “self-sufficiency in water” that has been reached through efforts connecting natural greenery and water spheres.

A specific pragmatism in planning is therefore often applied in Singapore: parks and especially the PCN serve as multifunctional areas, as not only stated by an expert (interview one NParks) but also highlighted in the literature. TAN (2006 p.°48) for example explains how drainage buffers were specifically targeted in early plans to be turned into PCN areas to “make the “park connector” proposal palatable to pragmatic decision makers”. At the same time, especially the PCN serves as a modality to enhance biodiversity within the city, as the structure connects not only humans to nature but also enables wildlife to traverse between different refuges (TAN 2006 p.°48). Yet, in the economic growth of Singapore, its very own hinterlands in the form of Offshore Islands have experienced overall and huge transformations to provide diverse services, in which ‘more natural’ environments were sacrificed for the economic growth and prosperity of the nation (CONNOLLY & MUZAINI 2021 p.°16). Areas on Singapore's north coast, such as Pulau Ubin and Sungei Buloh Wetland Reserve studied for this research, may have defended their environment only because they have faced less financial pressure in recent decades.

In a study conducted by BEATLEY (2016 p.°58), the “opportunity to restore and repair nature” through greening facades has been mentioned as a central aim in the construction of some of Singapore’s recent landmarks. These arguments also refer to the approach of understanding nature as a benefit or solution for humans, especially in a highly artificial environment as urban areas are, but not for the sake of nature itself. In return, the island-state set international standards by establishing the Singapore Biodiversity Index for cities (NEWMAN 2014 p.°64) and solely by the achievement of leading it, it speaks for at least an advancement in urban nature connections. Additionally, it is mentioned in interviews and literature, that greenery in Singapore benefits from the tropical climate, although there is “much conscious intention” (BEATLEY 2016 p.°52).

GOH (2013 pp.°565) has summed up the total dilemma in analysing urban environments with the UPE view for cities and states like Singapore: with nature being inherently intertwined with urban environments, with the urban being itself a part of nature, state capitalism or the developmental/post-developmental/entrepreneurial state conducts the role of guiding natural developments in urban environments. Separate debates are occurring to discuss adequate terms to define state agency’s role in development, capital accumulation and international economic networking (GOH 2013 p.°566, MIAO & PHELPS 2019 p.°318).

What is referred to as a 'garden-theme-park' (GULSRUD & OOI 2014 p.°84), as the Gardens by the Bay is a main attraction for international tourism and receiving a lot of international attention (BEATLEY 2016 p.°63), is still contributing to Singapore's leading role in tropical botany, "generating awareness of conservation and climate change by bringing to this international tourism hub" diverse species and further just situated right "at the heart of the new Singapore" (KOH 2021 pp.°67). Further contributing to the role of tropical botany is also the botanical garden itself (ROWE & HEE 2019 p.°83).

Despite the image created by the implementation of lush greenery, GOH (2013 p.°571) highlights the missing consideration of further measurements to improve 'true sustainability' such as the inclusion of carbon footprints into urban models.

5.3 Economy

The discourse of resource scarcity has often been introduced in the literature consulted but has been underestimated in the initial research in its role in the mentality of Singapore, which, according to some experts and literature, found itself in a rather unfriendly environment after independence and feared for its survival as a nation. The ensuing national effort, driven by well-informed, internationally trained professionals and a strong 'political will' to serve the citizens in the best way possible, has led Singapore down a path of a distinctive state model in its development.

The focus on attracting business, investors, and international professionals, especially in the early years, has contributed to Singapore's ambitions, while in recent years, environmental considerations, but also more representative aspects of urban branding, have gained more attention. Similarly, GULSRUD & OOI (2014 p.°79) discover that greenery in Singapore does not only serve the purpose of nation-building and community building but does represent a tool for economic development and allocation of different land usage.

5.3.1 Historical economy

As derived from history, Singapore emerged as a landmark in botany, marking horticultural and tropical wildlife maps already back in the colonial era when its botanical garden was established in 1859 as a testing field for tropical cash crops (ROWE & HEE 2019 pp.°83). The natural landscapes of Singapore were therefore possessed in favour of trade and local agricultural production long before its independence, leaving little to no primaevial forests and wildlife to the emerging state (ROWE & HEE 2019 p.°52, TAN et al. 2013 p.°24). Urban green spaces were implemented as political symbols of dominating nature, reflected in colonially styled English parks and gardens. Nowadays ambitions to redevelop Singapore into a 'City in Nature', increasing tropical lush greenery instead of clean park landscapes derived from colonial history can therefore even be seen as an empowerment of Singapore's local identity

in a tropical and equatorial urban development, as pervasive urban greening adapted by the narrative of 'City in Nature' contradicts or at least revises the colonial approach of the 'Garden City', as stated by ROWE & HEE (2019 p.°45). Santangelo (2019 p.°17) describes "the construction of landscapes being in Singapore a political act before anything else, the redesigning of the island shows its passage from a colonial past [...] to its unique 'supertropical' character today".

Singapore today is way more than an urban planning paradigm and a financial hub: "It boasts a plethora of entertainment, sports and other venues. It is one of the world's downtowns with respect to shopping and life-style activities. In fact, Singapore receives over fifteen million visitors per year, a number that has risen steadily" (ROWE & HEE 2019 p.°6). Informal conversations conducted during this research project also pointed to an urban attraction of Singapore, derived from its strategic location which made it accessible to discover the south-east Asian or Australian region for travellers, a downtown landmark to visit or spent some shopping days, especially in combination with leisure activities at Universal Studios Sentosa or nearby Malaysian Disneyland, or, for sure, as an important international financial hub, where conferences, exhibitions and bright job opportunities await and working hustle dominates the urban environment.

As strongly indicated in empirical research and according to the consulted literature, Singapore instrumentalised urban greenery to attract foreign investment, capital, and human resources alike, wherefore the reputation and ongoing improvement of its greenery are of central importance.

5.3.2 International reputation in greenness

This strategy of greening Singapore, showing the world it is willing and eager to conquer international markets, has turned out to be a far-sighted and sustainable vision, that still, and especially today is more relevant than ever.

One of the benefits the urban core is drawing from green spaces is the international recognition, that has been achieved not only in urban planning in general but also and specifically in green urbanism or biophilic design (CHYE 2018, McDONALD et al. 2018, MIAO & PHELPS 2019, MONTEFRIO et al. 2021). Some of these green spaces are actively designed for 'worlding' (SANTANGELO 2019 p.°18), which can be also seen in the many references of literature pointing to the Marina Bay area as the 'world class garden' (BEATLEY 2016 p.°63). Interestingly, less research has engaged with the SBG as a world-class garden, at least from a geographic perspective and its implications for the region.

GULSRUD & OOI (2014 p.°78) attribute motives of green city visions along with general place brands towards the ongoing greening of Singapore and state, it "became an act of local identity-making in the name of economic competitiveness and environmental responsibility"

(GULSRUD & OOI 2014 p.°83) and “greening [...] was not about nature conservation or promoting biodiversity but the commodification of biophysical landscapes for recreational opportunity and, ultimately, garden-theme-park-based tourism” (GULSRUD & OOI 2014 p.°84). HODSON & MARVIN (2007 p.°305) explain in their study on ‘strategic glurbanization’ in the case of London how in general “entrepreneurial cities engage in self-marketing, constantly constructing and reconstructing images to ‘sell’ themselves as the means of attracting capital, people and ideas in the ‘space of flows’ [...] in constructing a distinctive image of representation of the city as an ‘attractive’ place”. SANTANGELO (2019 p.°19) claims in the case of Singapore “it was, of course, an economic strategy; greening provided a way of beautifying the city, of attracting investors and tourists, of communicating that the ‘Third World City’ was changing into something more attractive. To this extent, a green narrative has been maintained over the years, updating the original idea of a lush, equatorial city”. KOH (2021 pp.°66) refers to this critique by attesting ‘nature-loving purists’ the lost sight of possibilities in a highly urbanised city like Singapore, as he stresses that the island “has achieved [...] to make the best of very limited resources” and the “co-existence with nature amidst quality high-density living requires the clever use of ‘artifice’”. Therefore, the changed narrative of a ‘City in Nature’, including new possibilities of greenery on high-rise buildings is the ultimate (re-)development to a more natural urban environment, that is after all aimed and the result of a “political will to commit and invest significant resources to priority areas, such as [...] tackling climate change” (KOH 2021 p.°72).

This gained reputation has also led to another form of marketing from Singapore, meaning the active exports of planning strategies or supporting master planning, at least partially supported by state-owned consulting agencies, which POW (2018 p.°1210) describes as “blurring the public and private divide”, for urban areas in Asia, South America, and Africa (HARRISON & GROESE 2022 p.°5, MIAO & PHELPS 2019 p.°325, POW 2018 p.°1210). According to MIAO & PHELPS (2019 p.°328), China represents the largest client of Singapore’s planning advice, but observations of urban planning exports are expanding globally. One of the experts interviewed for this study was also involved in the planning and design of a Chinese eco-city, which he says demonstrates the strong impact of Singapore’s green urban development on other nations. As GOH (2013 p.°563) introduces, “The Singaporean state has as well actively exported itself – extended its expertise, labour and capital, and reputation – across territories”.

5.4 Research design and prospects

As indicated in the chapter’s introduction, the research design limited the potential outcomes of this research. Experts consulted were in most cases directly linked to the state authority responsible for the maintenance and management of green areas, employees on NParks. Further, observations retained in parks, gardens, and other green spaces were also provided

by NParks, as they equip the area with signs and information to educate the visitors. Therefore, the overall gained insights must be critically reflected in front of this background.

Although a lot of aspects influencing and shaping urban green spaces in Singapore could be referred to in literature, the significance of several aspects seemed underestimated. Therefore, the explorative design of the study has contributed to gain a more detailed and nuanced understanding of the research field in terms of its scientific background as well as the geographical area itself.

When engaging critically with urban greenery, various concepts can be implemented, such as the biophilic urbanism approach addressing the ‘experiments’ found in urban environments, but also more ambitious thinking of nature as an urban authority itself rather than serving human inhabitants in cities. The application of Urban Political Ecology in this research has contributed to a more reflective understanding of the artificial surroundings. Yet, it can be perceived as contradicting other critical approaches, that thrive to strengthen the non-human serving and created spaces in these areas. Singapore, despite being densely populated, offers a variety of examples, spanning from prestigious greening on luxury hotels, ‘theme-park’-tourist attractions, to rather remote areas where in a city so small and with high land scarcity, wilderness can be found, or at least, is re-established to the best of the nation’s knowledge.

The insights gained from these areas contributed to the perception of interests shaping the urban green space in Singapore. Reviewing the intended construction of interests shaping urban green spaces as illustrated in figure 2, the additional dimension of time has been underestimated, as Singapore’s history, also in the issue of green spaces, is closely related to colonial economic botany and its influences on recent times. Reviewing literature, the illustration (Figure 16) of ROWE & HEE (2019 p.°117) expresses as one in few the role of Singapore’s history in urban greening.



Figure 16: Proportion of Green over the change of time and narrative (source: ROWE & HEE 2019)

Addressing the interests displayed in figure 2, the research can ultimately summarise, that in the pursuit of national survival and growth, international acceptance and competition within investments, workforce, and reputation, Singapore is first and primarily a striving city-nation, where pre-colonial rainforests are difficult to reintroduce in the sense as 'nature-loving purists' (KOH 2021 p. °66) might expect. Yet, diverse research has approved Singapore's ambitions in becoming a 'City in a Garden', with lush greenery, at least as perceived on an international and national level. The step towards becoming a 'City in Nature' consequently continued, relying on global best practices examples and scientific findings.

At the same time, Singapore serves as an example of successful implementation of 'Nature' in urban areas and will therefore continue to obtain attention far beyond its physical borders.

6 Conclusion

Goh (2013 p.°566) states, "Singapore's development has been dominated by discourses of *scarcity* and *survival*", which is as well addressed on various occasions during this research project. Experts as well as civic participants refer to the tininess of Singapore and its lack of natural resources in explaining the need to claim economic strength (SANTANGELO 2019 p.°16). As Ng (2018 p.°322) asks "how can the little 'red dot' play a bigger role in terms of its cosmopolitan responsibility in pursuing sustainable development and the well-being for those non-citizens within and beyond its boundary", it can be traced back to different spheres: the physical size of Singapore based on its land area is often referred to as a little or tiny red dot, but its economic weight, its urban planning setting standards are recognizable far beyond the island-state borders and even south-east Asia. Singapore's meta-physical green sphere shapes urban masterplans in China as well as on other continents, reaching for inspiration and attraction around the globe.

References to the size of Singapore got important repeatedly, and certainly play a bigger role than initially expected. TAN (2006 p.°47) summarises the core of the struggle of the small nation in stating Singapore "is not just a thriving city but also an independent island nation that needs to set aside land for airports, seaports, reservoirs, power stations and military training areas in addition to residential, commercial and industrial uses".

One of Singapore's secrets could also be the attention spent on new ideas: NEO & POW (2015 p.°404) trace the history of ideas on eco-cities back to the mid-1970s and although Singapore might doesn't fit adequately in this concept, first ambitions to implement lush greenery in the urban environment has already back then shaped the island-states future, with ever developing and improving concepts and increasing density of green, Singapore has evolved to an image of a green city, just in the pace of the development of theoretical work.

Retrieving from this, Singapore's state model enabled strong policy to conduct ambitious urban greening which is beyond initial expectations guided and influenced by global examples, dedicated research, and courageous implementations. Within a few decades, the nation transformed its physical landscape dramatically, escaping the risk of poverty due to resource scarcity and rising to an international metropolis. Yet, what has been Singapore's strength, the uncompromising political intention is often criticised for its exclusive approach to citizen participation. Economic interests in plants and botany, which have been pursued in Singapore since its establishment as a colonial port city, still shape the urban environment. Yet, the nation could enhance its narrative and continues to adapt to future challenges, under the critical eyes of their research.

This study has shed light on narratives and discussions about global green urbanism, to which Singapore is actively contributing as a role model. It highlights different viewpoints that call for greater implementation of nature for its own sake, and those that see the urban environment itself as natural. Singapore, however, has become a "green" city embedded in a system of economic growth and resource accumulation, which is also served by the greenery used. The study has uncovered strengths and weaknesses based on its prosperous growth, the vast number of resources that have been allocated over the decades, the growth in land area and the attraction to workers lured by lush greenery, and those behind the daily maintenance and upkeep of green spaces.

Through the limited perspective of the NParks material, important narratives for green space protection and conservation nevertheless become apparent, following the notion that green spaces represent "nature-based solutions" and provide "ecosystem services." More specific research interests and approaches, divorced from government narratives, could provide further insights into how solutions are negotiated between interests and how they can continue to inspire global urban development narratives.

Contributing Interview Partners: Yeo Meng Tong, Emelyne Looi & Goh Kun Han (all National Parks Board, Singapore)

Additional informal conversations held with a lecturer at National University of Singapore and Singapore Botanic Gardens Guide

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