Leapfrogging toward sustainability – dynamics from a developing city perspective

Vanessa Copa Tórrez

BSc, MSc

Thesis submitted for the degree of Doctor of Philosophy

School of Social Sciences

Monash University

February 2021

Copyright notice

Abstract

Cities in developing contexts are growing rapidly, placing a variety of increasing pressures on governments and institutions to provide for, and keep up with, the social, economic, and environmental needs of a growing population. Most of this growth is experienced through unplanned urbanization that intensifies and expands informal settlements, increasing poverty gaps and outstrips the capacity of most developing cities to provide adequate services for their citizens. A fundamental change is required in the provision of urban services to these areas in order to improve the residents' livelihood and respond to looming resource scarcity and environmental problems. Increasing attention is being given to a vision of blue-green cities to support improved urban environmental conditions, human well-being, and increase the resilience of urban spaces. Rapid progress towards this vision of a blue-green city is critical if the urgent challenges facing developing cities are to be addressed. In order to progress rapidly towards this vision, leapfrogging has been proposed in the literature as an approach to understand and accelerate the pace of change and identify opportunities for bypassing established technologies and practices to adopt newer alternatives. Despite the allure of leapfrogging as a means of rapid development, leapfrogging processes to support technological advances alone—as it has been conceptualised to date—will be insufficient to address the broader systemic urban challenges described above. Indeed, there are many unanswered, and even unexplored, questions about whether and how leapfrogging can support rapid sustainability transformations of a city. To address these conceptual gaps, sustainability transitions scholarship offers a promising suite of theories and frameworks to examine the dynamics by which fundamental change occurs within socio-technical systems as they move towards sustainability. However, these have largely been developed through theoretical and empirical studies within developed country contexts and so may not be directly transferrable to developing cities.

To address these gaps, this PhD thesis develops new empirical and theoretical insight into the dynamics of leapfrogging to support the rapid development of sustainable socio-technical systems in developing cities. This aim was addressed by employing an embedded single-case study approach examining a transformation in the blue-green services in the city of Surabaya, Indonesia. Surabaya is a developing city that has been recognised nationally and internationally for undergoing significant change towards improved environmental transformative outcomes. Through a historical analysis of key urban development programs and semi-structured interviews with a diverse range of actors across government, research, community, NGO and the private sector, the thesis traces the shifts in blue-green servicing across Surabaya's neighbourhood development and the broader policy landscape over 70 years. In doing so, this thesis identifies the strategies that allowed Surabaya to effectively deliver sustainability leapfrogging within neighbourhood blue-green services management.

The results identified sixteen enabling factors that helped to create the socio-institutional conditions supportive of leapfrogging. Whilst the historical analysis revealed that these conditions come from a long history of transformative change, the results showed that key acceleration factors were critical in providing the structure and have been the catalyst for the leapfrogging dynamic. The findings also provide insight into the different local contexts that exist within a developing city (e.g. rich areas, slum areas), providing an

opportunity for inner-city learning and identification of current starting points to formulate more targeted strategies for each area within a city. Finally, the results of this research have led to the theoretical development of a conceptualisation of leapfrogging as accelerated socio-technical transformation processes, providing a foundation for operationalising the insights gained from this research to drive rapid transitions in developing cities elsewhere.

As one of the first detailed studies of leapfrogging in developing cities against a broader sustainability context, this research advances transition scholarship and the nascent field of leapfrogging. This research also offers the basis for devising practical guidance to support the strategic actions of practitioners and decision-makers for enabling rapid shifts in developing cities.

Declaration

This thesis is an original work of my research and contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

Signature: . . . . . .

Print Name: Vanessa Copa Tórrez . . . . . .

Date: February 25, 2021 . . . . . .

Acknowledgements

This PhD journey started with a childhood dream, one that I was privileged to accomplish at this stage of my life. A PhD journey that was not enough on its own but had to be part of a bigger ride called 'life'. A path that during these last two years has challenged me the most, sometimes far beyond what I thought I could endure. I'm grateful to God for giving me strength and restoring faith, faith in myself.

I'm deeply thankful for my husband Josh, you have not only shown me love and (re-defined) patience each day but made this journey possible and endurable. The work within this thesis would not have been achievable without your endless support, love, and wisdom. You and our little bundle of joy are my strength, my shining lights, the motivation I need to push through, my all. Amor, te amo, these words contain all my life. Uma, hija mía, me siento afortunada y bendecida de ser tú mamá. This is for you, like everything else. Alexander, eres el milagro que anhelaba. Los amo tesoros de mi vida.

Without my family, and their never-ending love, encouragement and support I would be nowhere. Dispersos, pero siempre unidos; adorado papá José, gracias por tus enseñanzas, haberme inculcado y guiado en el arte de la educación, y alentarme a alcanzar grandes sueños desde niña; amada mamá Patty, gracias por siempre creer en mí, por impulsarme e iluminarme, y ser el ejemplo más puro de amor, comprensión y fortaleza; y a mi entrañable hermana Carla, gracias por inspirarme, guiarme y enseñarme el valor de lo incondicional, y por mi precioso milagro. Todo lo que soy o alguna vez espero ser, se los debo a ustedes, los amo. To my extended family, Alex, Wikke, Aussie-fam, Berlin & my girls, thank you for the laughs, comprehension and overall support.

I would also like to express my appreciation to my main supervisor, Associate Professor Briony Rogers, thank you for guiding and encouraging me to show my inherent value into my work, and for understanding that with vulnerability comes strength. I'm also thankful that my research was guided by co-supervisors Associate Professor Annette Bos and Professor Rebekah Brown. Thank you to this supervisory team for sharing their experience and knowledge throughout the vicissitudes of my candidature. A team of women whose capacity to balance motherhood and influence sustainable development research, is inspiring.

This research was supported by the Australian Indonesian Centre. Sincerest thanks are also due to all research participants for their devoted time, insightful interviews, and generosity to share their culture with me. I am so grateful for those individuals I was able to partner with during my stay in Surabaya, in particular to Diana thank you for navigating language and culture with me; and Bu Pur thank you for showing me the heart of the kampungs.

To any fellow PhD candidates reading this, "I realized, through it all, that…In the midst of winter, I found there was, within me, an invincible summer" (Camus, 1953).

Table of Contents

List of figures

List of tables

Acronyms and abbreviations

AF	Acceleration Factors
BAPPEKO	Development Planning Agency (*Badan Perencanaan Pembangunan)*
C-KIP	Comprehensive Kampung Improvement Program
CSR	Corporate Social Responsibility
DKP	Cleaning and Landscaping Agency *(Dinas Kebersihan dan Pertamanan)*
FF	Foundational Factors
GDP	Gross Domestic Product
JICA	Japanese International Cooperation Agency
ITS	*Institut Teknologi Sepuluh Nopember*
KIP	Kampung Improvement Program
KITA	Kitakyushu International Techno-cooperative Association
KOTAKU	No Slum City program (*Kota Tanpa Kumuh)*
MLP	Multi-level Perspective
NGO	Non-Governmental Organisations
PDAM	Regional Drinking Water Company
PKK	Building Family Welfare Movement *(Pemberdayaan Kesejahteraan Keluarga*)
PWSS	Surabaya Strenkali People's Movement (*Paguyuban Warga Strenkali Surabaya)*
RT/RW	Neighbourhood associations (R*ukun Tetangga* – RT)/(R*ukun Warga* – RW)
RSDK	Social Rehabilitation of Slum Area (R*ehabilitasi Sosial Daerah Kumuh*)
SDG	Sustainable Development Goals
SGC	Surabaya Green and Clean
SKE	Sustainable Kampung Environments
UKM	Small and Medium Enterprises (*Usaha Kecil Menengah)*
UN	United Nations

Chapter 1

Introduction

1.1 Sustainability in developing cities

Developing cities[1] are experiencing rapid urbanisation due to their high economic growth. While this has been beneficial in extending access to basic services (Cohen, 2006), this urban development has not necessarily run parallel to sustainable development (Kiamba, 2012; van Welie *et al.*, 2018). More than half of the world's population lives in urban centres, and it is expected that by 2050 eighty three per cent will live in urban regions in developing countries (United Nations, 2019c). As such, many urban areas are facing enormous challenges. Urban issues include growing numbers of residents living in slums[2], limited access to services and basic facilities (e.g. water, electricity, sanitation, education and health), environmental degradation, weak urban governance, poor urban planning and high levels of urban poverty (United Nations, 2013; UN-HABITAT, 2016b). These challenges are also likely to be exacerbated by the impacts of climate change, with many developing countries predicted to be disproportionally burdened (United Nations, 2019a).

Visions of sustainable urban development aim to address these challenges for today, while considering the needs of future generations (United Nations, 2015). Whilst there is no single definition of sustainability that can account for its many applications and subjects (Johnston *et al.*, 2007; Emas, 2015), understandings of sustainability and sustainable development often draw on the now canonical definition outlined by the World Commission on Environment and Development. This defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, 1987). For the purpose of this research, this definition is being followed, as it provides an implicit relationship between societal systems (e.g. human needs and economy) and non-human systems (e.g. ecology of external environments) in the pursuit of an improved quality of life (Mebratu, 1998; De Haan *et al.*, 2014). Similarly, sustainability and sustainable development are used throughout this thesis, with sustainability referring to the overarching long-term goal and sustainable development representing the processes and pathways to achieving this (UNESCO, 2020).

The evolving concept of urban sustainability seeks to develop strategies for environmental protection, economic prosperity, inclusivity, and community well-being, while increasing cities' liveability under the ambit of urban development (Romero-Lankao *et al.*, 2016). One avenue for supporting the creation of sustainable cities is through an increased engagement with the preservation, design, and management of urban blue-green infrastructure (Ghofrani *et al.*, 2017; O'Donnell *et al.*, 2017; Tan and Jim, 2017). Blue-green infrastructure is

[1] Statistically developing country/city refers to a country/city's rating on the Human Development Index that is purported to express both social and economic development (UNDP, 2014b). The designation of these labels is intended for comprehension convenience and do not express judgement relating to a specific country/city's stage reached in the development process. Developing country/city is also referred in the literature as global south (Swilling *et al.*, 2016; Schot and Steinmueller, 2018) or less developed country/city (Rosemarin, 2005; van Benthem, 2015).

[2] United Nations suggests the generic definition of a slum as "a contiguous settlement where the inhabitants are characterized as having inadequate housing and basic services. A slum is often not recognized and addressed by the public authorities as an integral or equal part of the city" (2013, p. 10).

"an interconnected network of natural and designed landscape components, including water bodies and green and open spaces, which provide multiple functions"[3] (Ghofrani *et al.*, 2017, p. 15). These spaces have been recognised as capable of providing valuable ecological and socio-cultural services to improve urban environmental conditions, support human well-being, and increase the resilience of urban spaces (Newton and Rogers, 2020). In the face of the pressing urban challenges highlights above, Ghofrani, Sposito and Faggian (2017) argue that the use of blue-green infrastructure is one of the most promising actions for rapidly reconfiguring urban environments to respond to changing human and environmental circumstances. Similarly, many scholars argue that for sustainable development to occur, an understanding and initiation of radical and systemic societal shifts is needed (Romero-Lankao *et al.*, 2016; Frantzeskaki, Castán Broto, *et al.*, 2017; Köhler *et al.*, 2019; Nielsen and Farrelly, 2019). However, despite the promises within scholarship, rapid change within urban environments has been slow. Projections indicate that unless radical, systemic, societal changes occur, slum populations will double by 2050 (UN-HABITAT, 2016a). Despite the global recognition of these problems, extreme poverty, human and environmental health are still deteriorating at an alarming rate within many developing countries (United Nations, 2019b).

Moving towards sustainability is not an easy task due to the so-called wicked or persistent problems deeply rooted in the prevailing development of our societal structures (e.g. institutions, infrastructure, culture) (Rotmans, 2005; Weaver and Rotmans, 2006). As pointed out by Holden and Linnerud (2007, p. 177), "not every aspiration for a better life is compatible with the goal of sustainable development". This means that for most developing cities, "sustainable development first and foremost means providing increased access to basic human needs, even though this results in larger per capita ecological footprints" (p. 183).

The reality of realising sustainability in developing city contexts is made more difficult due to the challenging conditions that are often present, such as limited financial and human resources, weak institutional structures, less efficient bureaucracies, and poor implementation and enforcement of regulation (Lachman, 2012; Hansen *et al.*, 2018; Ramos-Mejía *et al.*, 2018). Furthermore, basic services sectors have inconsistent levels of quality and highly uneven distribution of infrastructure (Fernández-Maldonado, 2008; van Welie *et al.*, 2018). Combined, this leads to poor environmental performance and lack of provisioning for basic human needs[4]. The challenge facing practitioners, policy-makers and scholars alike is responding to the urgency to accelerate the pace of change whilst ensuring a sustainable future for all (Temper *et al.*, 2018; United Nations, 2019a).

[3] For further understanding of using blue-green infrastructure, the reader is referred to see the work of (Kazmierczak and Carter, 2010; Ghofrani *et al.*, 2017; O'Donnell *et al.*, 2017; Tan and Jim, 2017).

[4] According to the Brundtland report (United Nations, 1987) basic human needs are employment, food, energy, housing, water supply, sanitation and health care. Basic human needs is a complex concept as it can vary significantly by region. For further understanding of the theory of (basic) human needs, the reader is referred to see the work of Doyal and Gough (1991).

1.2 Accelerating sustainability in developing cities

There is an active debate among policy-makers and socio-economic development experts about how to facilitate rapid industrial development while at the same time promoting a sustainable economic growth[5] (World Economic Forum and ADB, 2017; UNCTAD, 2018a). The possibility of 'leapfrogging' (skipping steps or stages) frequently features as a strategy in the policy-development documents, as a cost-effective means of accelerating the pace of sustainable development in developing contexts (Blimpo *et al.*, 2017; de Coninck *et al.*, 2018; UNCTAD, 2018a; World Bank, 2018; ADB, 2020). The notion of leapfrogging refers to the potential for developing cities to bypass pollution-intensive stages and jump over some stages of development, straight to advanced clean technologies (World Bank, 2003; Binz *et al.*, 2012; IPCC, 2012; Poustie *et al.*, 2016; Goldemberg, 2020). This is argued as infrastructure is not well established in developing cities, path-dependencies that are linked to existing socio-technical and institutional conditions tend to be much weaker (Binz and Truffer, 2009; Brown *et al.*, 2016; Wong, 2016), and therefore provide a window of opportunity to explore new pathways for sustainable development (Angel and Rock, 2009; Berkhout *et al.*, 2009; Binz *et al.*, 2012).

National development strategies in developing cities tend to focus on scaling up infrastructure investment (Murphy, 2001; Kooy, 2014). This often follows standards from developed countries, arguably unsuited to the conditions and socio-political contexts of developing contexts (Brown, 2012). However, despite the vast alternatives of sustainable approaches to urban development and infrastructure delivery (Wong and Brown, 2009; Joss *et al.*, 2013; Keeley *et al.*, 2013; Romero-Lankao *et al.*, 2016), infrastructure proposals in developing countries continue to keep adopting and replicating conventional development pathways that are often carbon-intensive, centralised, and dependant on technocratic solutions (Ehrhardt *et al.*, 2010; Cleary, 2011; UNDP, 2012; Poustie *et al.*, 2014). This phenomenon is known as 'technological lock-in' (Arthur, 1989) and 'path-dependency' (Paul, 1975). Both terms are derived from economics scholarship, describing the persistent adoption of a particular technology due to a sequence of economic changes that influence the path of its development. According to Arthur (1989), the lock-in of this technology prevents the take-up of 'new', potentially superior alternatives. This has also been applied to institutional frameworks, raising the possibility of lock-in of current socio-technical systems and represents a challenge for implementing transitions to more sustainable systems (Foxon, 2014). Therefore, in the context of sustainable development, both developed and developing cities need to be cautious not just to follow established development pathways with their associated technological and institutional lock-in, but to also learn from situations where such pathways and their lock-ins have been avoided. Doing so represents an opportunity to implement potentially more sustainable approaches directly. However, to date, these lessons have primarily occurred in transformative technological developments such as the rapid uptake of mobile phone technology without a previous

[5] Sustainable economic growth means increases in GDP (gross domestic product) are maintained over time without damaging the environment (Kumar Duraoappah, 2015).

investment in landline infrastructure (James, 2009; Puspitasari and Ishii, 2016) and the rapid adoption of low-carbon energy technologies (e.g. wind energy, carbon-neutral fuel in automobiles) (Tukker, 2005; Unruh and Carrillo-Hermosilla, 2006; IPCC, 2012; Goldemberg, 2020).

Despite the liberal use of the term 'leapfrogging' within numerous government and international development policy and strategy documents (Reut Institute, 2009; IPCC, 2012; World Bank, 2016c, 2018; AIC, 2018; Federal Democratic Republic of Ethiopia, 2019; ADB, 2020; Government of India, 2020), the existing body of scholarship remains largely focused on technological advancements. Given the level of socio-technical complexity involved in cities and systemic change for sustainability (Grin *et al.*, 2010; Loorbach, 2010; Wolfram and Frantzeskaki, 2016), this technological focus remains too narrow to study the dynamics of fundamental change at a socio-technical level (Binz *et al.*, 2012; Schroeder and Anantharaman, 2017; Yap and Truffer, 2018). Furthermore, existing concepts for prospective evaluation of leapfrogging remain limited to vague conceptualisations (Binz *et al.*, 2012), simplistic assumptions (Perkins, 2003) and practice-based literature (Poustie *et al.*, 2016). Against this background, there is a need to explore a better understanding of the concept of leapfrogging to support sustainability within developing cities, the enabling conditions that influence leapfrogging processes, and how its dynamics could better steer sustainable pathways beyond technology (Poustie *et al.*, 2016; Evans *et al.*, 2018; Yap and Truffer, 2018). Moving beyond a technological focus for leapfrogging is critical if it is to be used as a strategy to guide and support sustainability meaningfully across its many dimensions.

In contrast to the technological focus of leapfrogging, sustainability transitions studies is a growing field of scholarship focused on understanding and informing the radical transformations of socio-technical systems for sustainable development. Sustainability transitions recognises that environmental problems (e.g. climate change) cannot be addressed by improvements in one dimension (e.g. technological fixes), but require radical shifts across multiple dimensions (e.g. technological, institutional, political, economic, and socio-cultural), elements (e.g. markets, user practices, industry structures, cultural meanings) and multi-actor (e.g. academia, politics, industry, civil society) processes (Markard *et al.*, 2012; Köhler *et al.*, 2019). The field of sustainability transitions has produced conceptual and analytical tools that have proven fruitful for understanding and navigating transformations to more sustainable modes of production and consumption and has been applied to different urban sectors, such as water transitions (De Haan *et al.*, 2015; Fuenfschilling and Truffer, 2016) and energy transitions (e.g. Raven, 2007; Wieczorek *et al.*, 2015; Schot *et al.*, 2016). However, the theoretical understanding of transitions literature has been mainly derived from historical case studies in developed country-contexts (Geels, 2002, 2006; De Haan *et al.*, 2015; Frantzeskaki *et al.*, 2016). This lack of 'geographic sensitivity' in addressing sustainability transitions has been criticised in transitions research (Coenen *et al.*, 2012; Raven *et al.*, 2012; Truffer *et al.*, 2015; Ramos-Mejía *et al.*, 2018). In this vein, scholars have suggested that understandings of transition dynamics can be advanced by exploring processes in different urban spaces such as developing contexts (Berkhout *et al.*, 2009; Hansen *et al.*, 2018; Wieczorek, 2018). Consequently, understanding the conditions in which a "sustainability transition" towards alternative and more sustainable pathways could be possible in developing contexts remains limited.

Bridging leapfrogging and sustainability transitions scholarship provides an opportunity to develop empirically founded insights to support accelerated sustainable development in developing contexts that not only aim to avoid 'dirty' development stages by learning from the mistakes of developed countries (Perkins, 2003; Ho, 2005; Tukker, 2005; Hakala and Bjelic, 2016a; Poustie *et al.*, 2016), but also create "new paths to higher standards of living which bypass the mistakes that other communities have made" (Jefferies and Duffy, 2011, p. 29). Furthermore, combining these areas of scholarship helps to strengthen the conceptual foundations of leapfrogging and expand the geographical focus of sustainability transitions to developing contexts. In creating an evidence-base to guide leapfrogging strategies in some of the world's poorest communities, this research aims to contribute to significant improvements to the sustainability of areas in developing contexts.

1.3 This thesis

Against the context of the challenges facing developing cities, this research is motivated by the idea that developing cities can avoid many of the carbon-intensive, centralised, and technocratic systems and infrastructure historically used by developed countries to fulfil basic service needs and instead move directly towards more sustainable systems.

As such, the hypothesis underpinning this research is that *accelerating the pace of change towards more sustainable systems is possible in developing cities and understanding the social, technical, and institutional factors that enable such change can provide important insights to support rapid development to sustainable socio-technical systems in other developing cities.* It is through the scholarships of leapfrogging and sustainability transitions that this research aims to explore this hypothesis. This thesis argues that whilst the concept of leapfrogging is alluring as a strategy to support rapid, sustainable development in developing cities, current examples and applications of it fail to engage with the inherent complexity involved in transitioning the socio-technical systems that make up urban environments. Bridging leapfrogging scholarship with transitions scholarship to examine the transformation of blue-green services in a developing city extends understanding of both leapfrogging dynamics and the contextual considerations for understanding sustainability transitions. Uniting the practical lessons learnt from a successful leapfrogging case with the conceptual framing of leapfrogging within sustainability transitions provides a foundation to support the strategic focusing of development resources to enabling rapid change in other developing cities.

1.3.1 Research aim and objectives

Based on the significant needs outlined above, the overall aim of this PhD research is to ***develop new empirical and theoretical insight into the dynamics of leapfrogging to support the rapid development of sustainable socio-technical systems in developing cities.***

In order to achieve this overarching research aim, the following four objectives are investigated through a qualitative, embedded single case-study approach (Yin, 2018) of the city of Surabaya, Indonesia:

Objective 1: Conceptualise the relationship between leapfrogging and sustainability transitions

Objective 2: Develop and analyse an in-depth empirical case study of the socio-institutional dynamics and actor strategies of Surabaya's blue-green sustainability transition

Objective 3: Identify and characterise the enabling factors and actor strategies that have driven Surabaya's sustainability transition and examine how they influenced parts of Surabaya to accelerate change through leapfrogging

Objective 4: Develop a preliminary framework to operationalise leapfrogging in developing cities by identifying the scope of strategic actions that best fit the local context

These objectives are explored in the context of the successful implementation of sustainable blue-green initiatives in Surabaya. The selection of Surabaya as a successful case study to explore was done using the awards and recognition of the city's environmental approach as a proxy for their success, both within academic literature and organisational reports. Surabaya has been recognised as one of the most environmentally sustainable cities in Southeast Asia due to innovative practices employed towards improving the urban living environment (UN-HABITAT, 2008; Aleluia and Ferrão, 2016; ASEAN Secretariat, 2017; Global Forum on Human Settlements, 2017). Whilst city awards and international recognition can be marred by politics and may overstate the apparent success of the awardee, evidence of the innovative and unique approach to rapidly transforming *kampung* areas (low-to middle- income subdistricts) into sustainable environments (UN-HABITAT, 2008; Joss *et al.*, 2011; Urban Redevelopment Authority, 2018; World Cities Summit, 2018) makes Surabaya a valuable case for in-depth study. Further discussion of the research context and design is contained within Chapter 3.

1.3.2 Structure of the thesis

This thesis is composed of eight chapters. Table 1.1 summarises the thesis content, indicating how each research objective is linked and addressed in the different chapters. *Chapter One* positions the research within current real-world problems, outlining the background, the overall aim and objectives. *Chapter Two* provides the theoretical underpinnings of the research and identifies scholarly research gaps within leapfrogging scholarship and transition studies. *Chapter Three* discusses the overall strategy of the research project and methodological techniques used to address each research objective and the research philosophy. Results and discussions are presented across the following four chapters. *Chapter Four* analysis the broader historical development of Surabaya's blue-green initiatives from 1945 to 2017, which set the foundation for its sustainability transformation. *Chapter Five* examines the mechanisms underlying the success of the Surabaya green and clean program and identifies nine acceleration factors that catalysed the leapfrogging process during Surabaya's transition. *Chapter Six* examines and unpacks the dynamics of a leapfrogging process, including strategies underlying sixteen enabling factors (seven foundational and nine acceleration). *Chapter Seven* explores the relationship between the enabling context and the actors behind the strategies. *Chapter Eight* synthesises the findings by combining empirical and scholarly insights from leapfrogging studies, socio-technical transitions, and other bodies of literature in developing frameworks for both, the conceptualisation

and operationalisation of leapfrogging. A summary of the key contributions derived from this research and recommendations for future research are discussed in *Chapter Nine*.

Table 1.1 Relationships between chapters and research objectives

Research objectives / Chapters	**Objective 1** Conceptualise the relationship between leapfrogging and sustainability transitions	**Objective 2** Develop and analyse an in-depth empirical case study of the socio-institutional dynamics and actor strategies of Surabaya's blue-green sustainability transition	**Objective 3** Identify and characterise the enabling factors and actor strategies that have driven Surabaya's sustainability transition and examine how they influenced parts of Surabaya to accelerate change through leapfrogging	**Objective 4** Develop a preliminary framework to operationalise leapfrogging in developing cities by identifying the scope of strategic actions that best fit the local context
Chapter 2 Literature review	- Synthesises conceptual understanding of leapfrogging and sustainability transitions - Current theoretical characterisation of technological leapfrogging			
Chapter 4 The co-evolution of blue-green initiatives in Surabaya's transition		- In-depth exploration of Surabaya's blue-green neighbourhood	- Identifies a set of socio-institutional factors which shaped the networks and institutional settings needed to enable leapfrogging to occur	- Explores the effects generated by the socio-institutional context
Chapter 5 Leapfrogging within kampungs, a sustainability process		- In-depth exploration of a city-wide initiative to stimulate grassroots environmental stewardship in the Surabaya case	- Identifies acceleration factors that catalysed the leapfrogging process in Surabaya's transition	- Identifies gap of ignoring social dynamics in leapfrogging
Chapter 6 Socio-technical leapfrogging dynamics by Surabaya's kampungs			- Identifies enabling factors and correspondent strategies that support the leapfrogging process	
Chapter 7 Shaping an actor-driven enabling context				- Derives theoretical insights from the Surabaya case on the role of actors in implementing strategies that support the leapfrogging process
Chapter 8 Conceptua-lising and theorising leapfrogging	- Theoretical development of leapfrogging - Conceptually expands sustainability transitions understanding within a developing context	- Designs a framework to inform neighbourhood blue-green service management in developing cities		- Develops a framework for strategically applying the enabling factors to support leapfrogging accelerated transitions

Chapter 2

Literature Review

2.1 Introduction

As outlined in Chapter 1, this research aims to explore the hypothesis that accelerating the pace of change towards more sustainable systems is possible in developing cities. In exploring this hypothesis, this research draws on both leapfrogging and transitions scholarship as two areas that provide a conceptual and strategic framing for rapid urban change.

The chapter begins with a section that critically reviews leapfrogging scholarship. Given that leapfrogging remains scholarly embryonic but potentially promising (Binz *et al.*, 2012; Casiano Flores *et al.*, 2019), a detailed literature review was done to better understand the potential foundations for the development of alternative pathways towards sustainability. A scoping study methodology was used to examine both the current conceptual foundations (and limitations) of current scholarship, as well as identify the existing evidence of enabling factors for leapfrogging. This draws attention to the technological focus of leapfrogging scholarship and argues that to support a systems-perspective of sustainable development further conceptualisation of leapfrogging is needed with greater consideration of socio-institutional factors and the actors behind them. In order to address these gaps, this is followed by a separate review of how processes of systemic change are conceptualised within the established scholarship of transitions literature (Köhler *et al.*, 2019). Several conceptual frameworks are introduced before focusing on the acceleration of transition processes and the role of actors and agency within transitions. These provide a framing for understanding the socio-institutional factors enabling change, however as a body of scholarship primarily established through empirical work in developed contexts; there are questions around its applicability within developing contexts. The chapter concludes by arguing the merits of drawing leapfrogging and sustainability transitions together as a means of engaging leapfrogging with socio-institutional processes of change and providing insights into the acceleration of sustainability transitions within developing contexts.

2.2 Exploring the potential of leapfrogging as a development strategy

In both scholarship and development policy, the leapfrogging hypothesis proposes that developing countries may be able to bypass older versions of technology and avoid developed countries' path to industrialisation, with a typical legacy of environmental degradation. This possibility frequently features in numerous policy-development documents as a strategy to accelerate technological development in developing country contexts (Blimpo *et al.*, 2017; AIC, 2018; de Coninck *et al.*, 2018; UNCTAD, 2018a; World Bank, 2018; Federal Democratic Republic of Ethiopia, 2019; ADB, 2020; Government of India, 2020). The analysis of leapfrogging is most commonly conducted from a technological or economic perspective and has attracted increasing attention in scholarly fields of sustainable development debates (Gallagher, 2006; Watson and Sauter, 2011; Goldemberg, 2020). Leapfrogging is often framed as the most optimal development pathway for developing countries to skip over old 'dirty' technologies to new 'clean' technologies (Perkins, 2003; Goldemberg, 2011; Poustie *et al.*, 2016). While the concept of leapfrogging appears promising for developing country contexts, the conceptualisations and understanding of leapfrogging dynamics remain limited (Binz *et*

al., 2012; Poustie *et al.*, 2016; Yu and Gibbs, 2018). As such, some scholars have addressed the notion of leapfrogging as vague (Binz *et al.*, 2012; Casiano Flores *et al.*, 2019) or as a misconception due to the abstraction of the leapfrogging hypothesis and evidence (Murphy, 2001; van Benthem, 2015), increasingly viewed as a buzzword (Remigios and Reckson, 2018), and rather a hard-slog, not a leap-frog (Hobday, 1994; Rock *et al.*, 2009). The following sections aim to present a critical review of the potential of leapfrogging to accelerate pace of change towards more sustainable systems in developing cities.

2.2.1 Leapfrogging review methodology

Leapfrogging conceptualisation is somewhat fragmented, and there is not yet a published examination of shared attributes of leapfrogging dynamics across sectors as a means to advance the scholarship. A scoping study was selected as the most appropriate method to guide the conduct of the literature review, as it could provide comprehensive coverage of the relevant literature relating to a particular topic (Davis *et al.*, 2009). The purpose of this detailed review is to understand the existing construct of this scholarship and identify existing avenues for considering leapfrogging as a developmental strategy.

Scoping studies are often used to map key concepts (Arksey and O'Malley, 2005) and identify the extent and type of evidence available (Grant *et al.*, 2009), particularly in areas of research that are yet to be comprehensively reviewed (Mays *et al.*, 2001). The steps adopted in this research are based on the five stages of the scoping study framework proposed by Arksey and O'Malley (2005): (1) define the research question, (2) identify (potentially) relevant studies, (3) select studies for analysis, (4) chart the data, and (5) collate, summarise and report the results.

The review examines existing leapfrogging literature to develop a foundation for how leapfrogging is currently conceptualised and systematically analyse empirical evidence to identify key factors that have been instrumental in enabling a leapfrogging pathway in published cases. The literature search was guided by the following research questions: *How is leapfrogging currently conceptualised? Does leapfrogging provide an explanatory construct to understand transformative change? If so, how is this represented? Is the leapfrogging potential realistic? If so, where has leapfrogging occurred? What are the common conditions that enable successful leapfrogging?*

Boundaries for article selection for the literature review were the year of publication, language, type of document, and search database. The search covered a period time from 1980, which was the earliest available period with articles that explicitly included the word leapfrogging, through to 2019. The search was conducted in English, as the main language used in leapfrogging-related publications. Publication type was limited to peer-reviewed journal articles, books and book chapters. Searches were made of two electronic databases: Scopus, which covers a wider journal range than others such as Web of Science (Markard *et al.*, 2012; Falagas *et al.*, 2017), and Google Scholar, which theoretically lists all online-available publications (Falagas *et al.*, 2017).

Following Arksey and O'Malley's (2005) scoping study framework, the search terms were defined to enable a broad capture of potentially relevant articles using the terms *leapfrogging, leapfrog*, and *catch-up*. The initial search identified 134 publications. Subject areas outside the contextual focus (e.g. mathematics, chemistry, biology, planetary science, and physics) were excluded to reduce the list to 98. In a final step, the abstracts

were assessed for relevance to the research questions and reduced this list to 83. Finally, five reports were added that displayed the practical application of leapfrogging. As a result, the total number of articles selected for review was 88.

2.2.1.1 Profile of leapfrogging literature

The literature search highlighted that significantly fewer articles have been published on leapfrogging than other concepts that examine long-term transformation processes. For instance, in a 2012 review of literature on the broad notion of 'sustainability transitions', Markard *et al.* (2012) identified 540 journal articles and found that the field has grown considerably since the first papers were published in the late 1990s, both in terms of the number of articles and the number of citations (235 in 2006 to 1815 in 2011). Hence, despite the promise of leapfrogging research in supporting the economic advancement of developing countries, there has been limited theoretical development and empirical research (Watson and Sauter, 2011; Poustie *et al.*, 2016) and has not yet developed a coherent conceptual basis for prospective analysis that goes beyond a theoretical technological background (Binz *et al.*, 2012).

The first leapfrogging papers were published in the mid-1980s, and since then the annual number of publications has increased slightly, particularly in the last decade; however, the total number remains low (Figure 2.1). The majority of articles were published from 2011 to 2014, and the majority examined case studies of leapfrogging. As of the end of 2019, leapfrogging articles had received approximately 1600 citations, which is less than the number of citations in the sustainability transitions field in just one year (Markard *et al.* 2012), accentuating the low dynamic of the field. The journals publishing the reviewed articles cover a variety of themes, including economics, technological change, social change and sustainability.

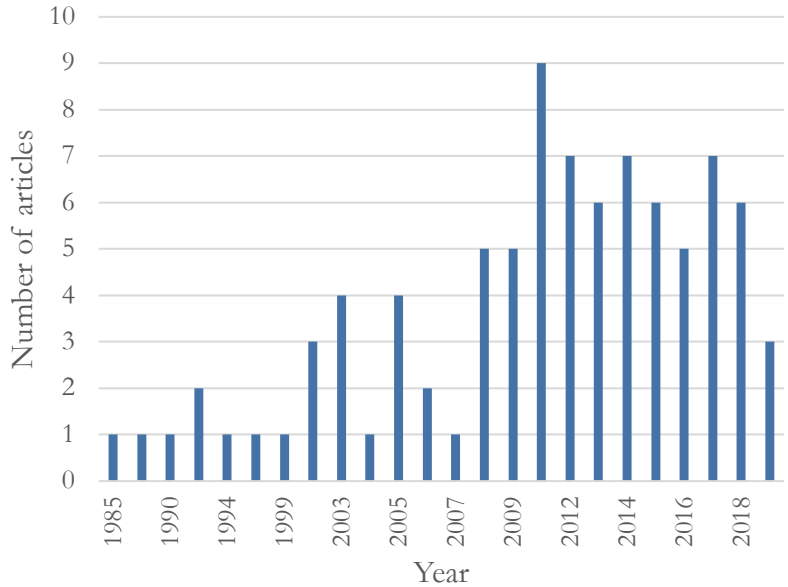

Figure 2.1 Total number of journal articles per year

The articles examine both the theoretical and practical challenges of leapfrogging, and the opportunities and implications of leapfrogging to support primarily technological development (Perkins, 2003; Rock *et al.*, 2009). The limited research in this area focuses mainly on the leapfrogging of specific technologies of cases in developing countries (or less developed countries) of Asia and Africa (e.g. India, Indonesia, China, South Africa, and West Africa). Specific case study examples include a range of topics, such as IT manufacturing and processes (Waswa and Juma, 2012; Lee *et al.*, 2014; Etoundi *et al.*, 2016; Tan *et al.*, 2018), the internet (Hackbarth and Kettinger, 2004; James, 2008; Chen *et al.*, 2009); renewable energy (Schäfer *et al.*, 2014; Schroeder and Chapman, 2014; Hakala and Bjelic, 2016b), low-carbon technology (Unruh and Carrillo-Hermosilla, 2006; Lema *et al.*, 2015; Kainuma *et al.*, 2017), wind energy (Lewis 2007), solar panels (Fu and Zhang, 2011; Zhang, 2014; Yu and Gibbs, 2018); economic reform (Karp and Lee, 2001; Gottinger, 2005), greening industry (Ho, 2005; Caruso *et al.*, 2015), sustainable consumption and production (Tukker, 2005; Visvanathan, 2012); fuel efficiency (Kojima, 2003; Gallagher, 2006), electric vehicles (Wang and Kimble, 2011; Kimble and Wang, 2012); mobile phones (Chen and Li-hua, 2011; Huang, 2011; Puspitasari and Ishii, 2016), communication technology (Steinmueller, 2001; Ojo, 2014; Fleary and Chunming, 2017); wastewater treatment (Binz *et al.*, 2012; Yap and Truffer, 2018), sanitation (Abeysuriya *et al.*, 2007), and river basin management (Shah *et al.*, 2000). Figure 2.2 shows the number of articles for each common major industry sector and highlights the dominant geographic regions of the case studies.

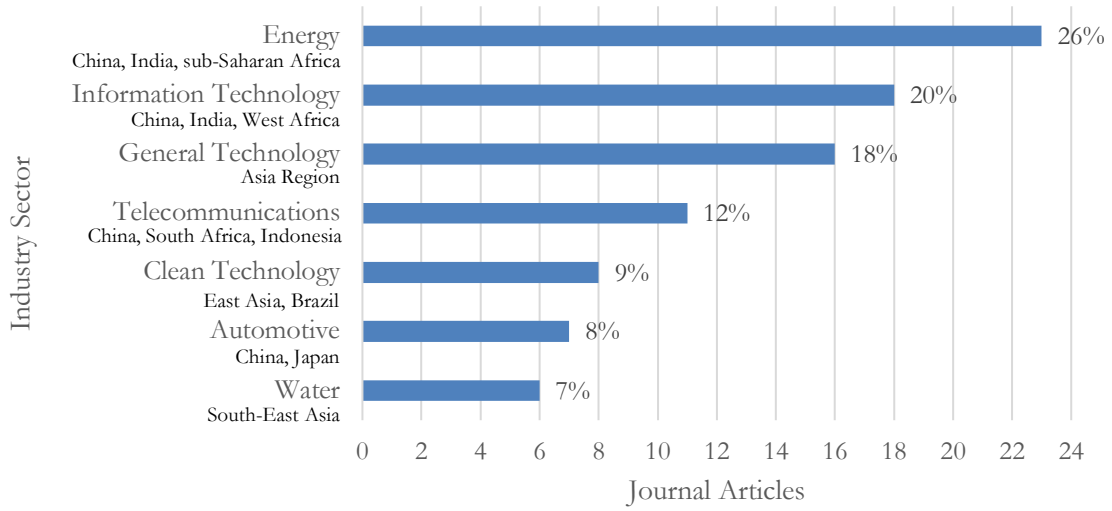

Figure 2.2 Total number of journal articles per sectorial category

2.2.2 Conceptualisations of leapfrogging

Whilst it is increasingly being viewed as a strategy to support sustainable development, the concept of leapfrogging emerged with the rapid global diffusion of technologies following the Industrial Revolution, as cities looked to integrate new, modern approaches into sectoral servicing. The first definitions of leapfrogging can be found in technology diffusion literature, particularly in international diffusion and (Perkins, 2003; Kuffer *et al.*, 2018) leadership (Sharif, 1989). This early literature identified the possibility of latecomers

(developing countries) to 'jump' older technologies and catch up with frontrunners (developed countries) (Hobday, 1994; Watson and Sauter, 2011).

Soete (1985) was one of the early authors to introduce the potential of leapfrogging. With a focus on microelectronic technology, his definition of 'technological leapfrogging' began the leapfrogging narrative:

> "The opportunities offered by the international diffusion of technology to jump particular technological paradigms and import the more, if not the most, sophisticated technologies that will neither displace the capital invested nor the skilled labour of the previous technological paradigm, constitute one of the most crucial advantages of newly industrializing countries in their bid for rapid industrialization" (Soete, 1985, p. 416)

The concept of technological leapfrogging created an attractive notion in the field of economic growth, innovation studies and sustainable development. In the context of socio-economic development, leapfrogging has been defined as a strategy that entails the acceleration in the pace of change in the economy's products and services of a country – that is, leapfrogging as a strategy to help grow economies faster (Reut Institute, 2009, p. 15). While there is considerable scepticism, most economists read the evidence as suggesting that leapfrogging is possible (Gottinger, 2005; Hausmann *et al.*, 2007; Wang *et al.*, 2010; Cherif and Hasanov, 2019), mainly if it is focused on technological substitution as a driver for economic growth (Kojima, 2003; Cherif and Hasanov, 2019; Mealy and Hepburn, 2020). However, the complexity that entails transforming large parts of a country's economy, the lack of conceptual clarity (e.g. quantification of the degree of leapfrogging), and the conditions leapfrogging requires to transform (e.g. transformative capacity) (Reut Institute, 2009; Levin and Thomas, 2016), make leapfrogging an uncertain strategy (Wang *et al.*, 2010).

Derived from this techno-economic perspective, leapfrogging found a home in innovation systems studies to explore the potential for firms (e.g. companies) to influence the innovation and diffusion of leapfrog technologies (Perkins, 2003; Yap and Truffer, 2018). Innovation systems studies often conceptualises the technological process as a contrast between latecomers and forerunners firms. Latecomer firms are generally located in developing countries, characterised by being technologically weak and isolated from the leading international market and research and development (R&D). Forerunners are typically leading firms in developed countries with a large R&D department that contributing to innovations and technology (Hobday, 1995a). The argument of latecomers quickly adopting new technologies of developed countries and rapidly catching up with forerunners (Mody and Sherman, 1990; Sharif, 1992; Hobday, 1995b) goes back to technology and economics history literature (Gerschenkron, 1962; Rosenberg, 1976; Perez and Soete, 1988).

The leapfrogging hypothesis suggests that a route to economic and technological development can have particular trajectories or paths that define their development (Lee and Lim, 2001; Wang and Kimble, 2011). As shown in Figure 2.3, the first pattern (a) shows the normal path a forerunner may go through in the development of a technology (a technology trajectory), characterised by the accumulation of knowledge and investment into its development. The second pattern (b), framed as a 'catch-up' pathway, means that the latecomer follows the same trajectory to technological development but in a shorter period, usually resulting

form of technology transfer by the forerunner. Finally, the third pattern (c), also called a stage-skipping leapfrog, involves the latecomer initially following the same path but leapfrogging over a 'normal' stage of development to a more advanced stage, implying a developmental discontinuity with the potential of competitive advantage, and thus, accelerating the pace of development. Whilst these patterns of technological development are helpful to illustrate the difference in developmental trajectories, some caution is required in its interpretation, as technological change is often framed as the result of a cumulative and incremental process rather than a linear and predictive path (Steinmueller, 2001).

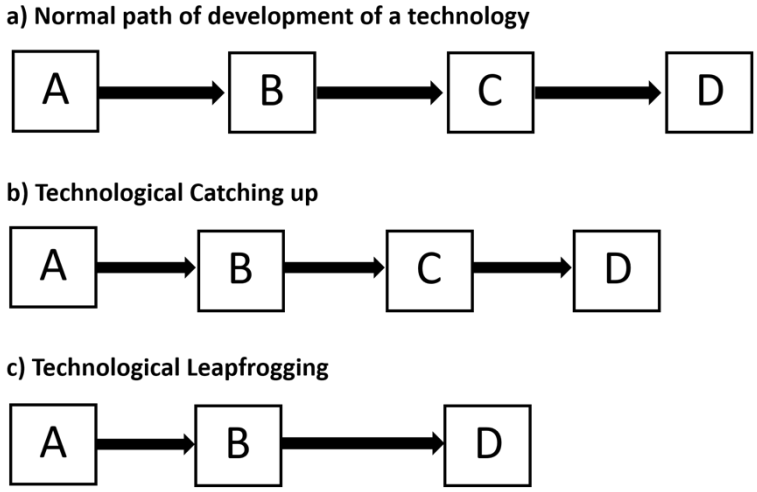

Figure 2.3 Patterns of technological development (Lee and Lim, 2001; Wang and Kimble, 2011)

Accelerating the pace of change (i.e. time taken to move from A to D) is an essential component of a leapfrogging progression and has been found to support more rapid diffusion rates of new technology or practice in developing countries in contrast to diffusion rates in developed countries (James, 2013; Blimpo *et al.*, 2017). Consequently, latecomers not only catch up to technological levels reached by forerunners, but this process takes place rapidly and is recognised as a "matter of speed" (Liu *et al.*, 2019, p. 449). The leapfrogging process has been found to take place in a period between five and ten years. For example, China's rapid switch from fossil fuels to renewable technology in ten years (Gallagher, 2006; Fu and Zhang, 2011); Africa's rapid adoption of mobile telephony in five years (James, 2009); Kuwait's quick transition from camels to modern motor vehicles in a five year period (Batinge *et al.*, 2017); and India and China's rapid development of wind energy systems (Lewis, 2007). Nevertheless, a number of authors contested that leapfrogging is the result of a cumulative, gradual process that takes place over decades rather than a radical jump (Hobday, 1994; Kojima, 2003; Rock *et al.*, 2009).

More recently, leapfrogging has been proposed as a cost-effective means of accelerating the pace of sustainable development, perceived as an opportunity for developing countries to bypass (jump or skip) the intermediate states[6] (or stage) of technology in a development process (UNCTAD, 2018b). In this context,

[6] State can be a condition or way of being that exists in a particular time. Following this definition, a state in leapfrogging can be a technology, generations of technology, a system of production, or a development step.

IPCC (2012) defines leapfrogging as "the ability of developing countries to bypass intermediate technologies and jump straight to advanced clean technologies" (p.961). This strategy entails developing countries jumping straight to low-carbon stages (World Bank, 2003, 2008) and avoiding the resource-intensive consequences of conventional development forged by developed countries (Goldemberg, 1998). This is thought to be possible as infrastructure within developing countries has heavily invested into single-purpose systems, and institutions are not well established, if they exist at all (Davison *et al.*, 2000; Binz *et al.*, 2012). As such, it is argued that these less 'locked-in' socio-technical systems are less likely to impede a shift to sustainable systems, or at the very least be more malleable to the adaptations or wholesale changes required (Davison *et al.*, 2000; Tukker, 2005; Wieczorek, 2018). Tukker (2005) asserts that in developing contexts, there are "much more degrees of freedom to leapfrog directly to sustainable [systems], without making the mistake of investing in 'dinosaur' [conventional] infrastructures" (p. 79). He defines leapfrogging as "a situation in which developing countries learn from the mistakes of developed countries and implement directly sustainable systems of production and consumption" (Tukker, 2005, p. 66). Other definitions; however, highlight that leapfrogging is relevant for any community wanting to learn from the mistakes of another community in order to improve their system. For instance, Jefferies and Duffy (2011) conceptualise leapfrogging as the idea that there are new paths to higher standards of living which bypass the mistakes that other communities made (pg. 29). This conceptualisation opens the possibility to apply leapfrogging beyond a large scale as a country or city, but as a strategy on smaller scales, like a community.

It is this potential to support rapid, sustainable development in developing countries that are likely behind the continued use of leapfrogging as a strategy within policy development documents. However, several authors have argued that further investigation into the mechanisms enabling leapfrogging is needed (Perkins, 2003; Binz *et al.*, 2012; Poustie *et al.*, 2016; Yap and Truffer, 2018; Casiano Flores *et al.*, 2019).

2.2.3 Examining successful cases of leapfrogging within the literature

The following sections aim to review successful cases of leapfrogging from the literature in response to the literature review research questions: *Where has leapfrogging occurred?* W*hat are the common conditions that enable successful leapfrogging?*

The initial findings of the review of successful cases of leapfrogging show that the majority of studied empirical examples continue to be predominately focused on technological examples. Similarly, in examining the successful cases of leapfrogging, it was apparent that the case studies shared common industry sectors. Seven categories were determined for classifying the articles: 1) *Energy* – technology and practice that produces or supplies energy; 2) *Information Technology* (IT) – technology and practice that involves the development, maintenance, and use of computer systems, software, and networks for the processing and distribution of data; 3) *General Technology* – articles that do not specify a particular sectorial technology or practice; 4) *Telecommunications* – technology and practices that make communication possible on a global scale, whether

the telephone or broadband connectivity; 5) *Clean Technology* – a wide range of technology that reduces negative environmental impact through significant resource efficiency and sustainable practices*; 6) Automotive* – technology and practice encompassing the design, development, manufacturing, marketing, and selling of motor vehicles; and 7) *Water* – technology and practice that provides drinking water and wastewater services.

The following sub-sections use these sectors to identify the perceived drivers, challenges and strategies that enabled leapfrogging pathways within the empirical examples.

2.2.4.1 Energy

Within the energy sector, reducing greenhouse gas emissions has been on the global agenda for more than 20 years. In response, limiting carbon-intensive energy development has been the major driver in the published cases of energy leapfrogging (Goldemberg, 1998; Unruh and Carrillo-Hermosilla, 2006; Schroeder and Chapman, 2014; Kainuma *et al.*, 2017), as well as seeking opportunities to reduce costs (Sauter and Watson, 2008; Zhang, 2014). However, incorporating efficient technology into the development process has presented some challenges to be overcome in leapfrogging.

The policies for limiting carbon emissions of the importing host government played a crucial role in the process of technology transfer (Unruh and Carrillo-Hermosilla, 2006; Lema *et al.*, 2015). Weak policies and regulations were directly influenced by a lack of awareness of the benefits of renewable energy and energy-efficient technology (Goldemberg, 1998) and the potential market size and return on investment, particularly for the private sector (Zhang, 2014). Across the cases reviewed, the most energy infrastructure in developing countries was funded by the government. Therefore, government budgetary constraints on financing for energy projects presented another challenge (Goldemberg, 1998), and the involvement of multilateral organisations in these situations made a difference (Zhang, 2014).

Another identified challenge to successful technology transfer was the ability of private companies to acquire, transform and apply new knowledge (Lewis, 2007; Sauter and Watson, 2008). Strategies for overcoming this challenge were an investment in infrastructure, research and development, and the promotion of absorptive capabilities (to learn and implement external technologies and apply them internally) by local firms (Lewis, 2007; Fu and Zhang, 2011), and multilateral organisations (Zhang, 2014). Government support also influenced the success of energy leapfrogging. For example, in India, changes in policy have created and incentivised market opportunities for the local manufacturers (Lewis, 2007; Schroeder and Anantharaman, 2017). Similarly, in China, uniformity of environmental regulations among different cities has facilitated a faster catch-up of cities with non-environmental endorsement (e.g. cities that heavily rely on mining) to cities with high environmental energy efficiency policies (Huang *et al.*, 2018; Yu and Gibbs, 2018). Finally, thorough understanding and consideration of local context were fundamental for successful leapfrogging to ensure adaptation and application of imported technology to suit the local conditions (Lewis, 2007; Fu and Zhang, 2011; Zhang, 2014).

2.2.4.2 Information Technology

Opportunities for the IT sector to leapfrog were driven mainly by the economic prospects of higher product demand. Shifts in hardware technology initiated an increase in demand for customised software (Chiang, 2008; Lee *et al.*, 2014) and computer components (Lee and Lim, 2001), which led to economic growth in the sector. This growth benefited the industry through higher production and benefited the community through increased job opportunities. For instance, India gained the lead in the IT labour market due to cost efficiencies and an abundant workforce, resulting in higher revenues for the sector (Lee *et al.*, 2014). However, this industry growth was not easy to achieve, with identified challenges including policy restrictions (Lee *et al.*, 2014); lack of necessary knowledge and skills to provide efficient global service (Rousseva, 2008; Lee *et al.*, 2014); absence of already established infrastructure (Waswa and Juma, 2012); limited investment from the national government (Waswa and Juma, 2012; James, 2013); and poor leadership in the public and private sector (Waswa and Juma, 2012; Lee *et al.*, 2014).

Case studies of leapfrogging in the IT sector highlight a range of strategies that facilitated the path to overcoming these challenges. Government support to the sector played an important part, including policy changes (Lee *et al.*, 2014), incentives to foreign investors (Chen *et al.*, 2009), and tariff and tax exemption (Chun and Hyun, 2001). The private sector also played a key role by increasing their research and development into new technologies (Lee *et al.*, 2014; Tan *et al.*, 2018) and investing in domestic organisational and technological innovation (Lee *et al.*, 2014; Etoundi *et al.*, 2016), which accelerated the development of technological capabilities needed to leapfrog (James, 2013; Lee *et al.*, 2014; Etoundi *et al.*, 2016).

2.2.4.3 General technology

Modern development economics emphasises the role of technology as the primary factor behind most nations' economic growth (Soete, 1985; Karp and Lee, 2001). Whether through technological innovation, diffusion or adoption, effective technology transformation generally means economic growth (Soete, 1985; Sharif, 1989; Karp and Lee, 2001). As technology is considered the heart of economic growth, it is logical to expect market expansion and technological competitiveness. This competitiveness was considered a driver in general technological leapfrogging in the case studies reviewed because it increased the quality of the technology (Sharif, 1989), promoted innovation (Sharif, 1992) and created alternative market opportunities (Angel and Rock, 2009). However, technological leapfrogging faced a number of barriers in the case studies, such as low technological capabilities (Soete, 1985; Sharif, 1992; Rock *et al.*, 2009); lack of financial resources to invest in research and development, innovation and basic infrastructure (Karp and Lee, 2001; Gottinger, 2005; Angel and Rock, 2009; Rock *et al.*, 2009); lack of strategies to retain experienced human resources (Meyer, 2018), and low cooperation and coordination between key actors across different government levels, the private sector and internationally (Sharif, 1992; Rock *et al.*, 2009; Meyer, 2018).

In the successful cases of general technological leapfrogging, a fundamental strategy was to seek investment from beyond the government, such as the private sector and foreign capital (Sharif, 1989; Lee *et al.*, 2009; Rock *et al.*, 2009). This strategy also promoted technology transfer and technology cooperation among

countries (Sharif, 1992; Angel and Rock, 2009; Lee *et al.*, 2009). However, government intervention was also vital to enable significant private sector investment and international trade and investment (Angel and Rock, 2009; Rock *et al.*, 2009).

2.2.4.4 Telecommunications

The telecommunications industry, in particular mobile phones, is a common example in the leapfrogging literature (James, 2009; Huang, 2011; Puspitasari and Ishii, 2016). The diffusion of mobile phone technology was mainly driven by high consumer demand (Puspitasari and Ishii, 2016; Evans *et al.*, 2018) from users who rapidly switched from landlines and those who did not previously have access to landlines. The switch offered more convenience, and a more affordable service than landlines, as fixed-line networks require heavy infrastructure investment for the telecommunications industry (James, 2009; Huang, 2011). As a result of the growth of the fast telecommunications observed in the case studies, competition in the sector started rising (James, 2009), forcing the industry to keep up with the high demand and meet the standards of international competition (Chen et al., 2011). Another challenge was overcoming the lack of necessary infrastructure for mobile technology. Fortunately for the mobile phone industry, the development of the infrastructure was well-funded by the private sector and, unlike some other technologies (e.g. railroads), governments did not tend to limit this process (James, 2009), which provided an incentive for private companies to cover this market.

2.2.4.5 Clean technology

The main driver of leapfrogging to cleaner technologies in the case studies was environmental protection (Perkins, 2003; Ho, 2005), including a commitment to reducing environmental degradation (Perkins and Neumayer, 2009). In practice, reducing the environmental impact of industries involved overcoming many barriers. In the reviewed case studies, many stakeholders, particularly multinationals, were reluctant to shift to clean technologies (Gallagher, 2006; Watson and Sauter, 2011); governments were slow to implement 'clean' policy and regulations (Gallagher, 2006; Angel and Rock, 2009; Visvanathan, 2012), and there was a small market (provider-offer and user-demand) for clean technologies (Ho, 2005; Tukker, 2005; Perkins and Neumayer, 2009). Other challenges were low commercial availability of clean technology and their higher costs compared to other alternatives (Ho, 2005). The central strategy in successful cases is clear: the government needed to change policies and regulations to help foster awareness in the general community (Ho, 2005; Perkins and Neumayer, 2009) and incentivise a market demand for cleaner technologies (Tukker, 2005; Visvanathan, 2012).

2.2.4.6 Automotive

The automotive sector went through an intensive expansion in the 1980s. This motivated governments to support the industry growth through incentives, such as tax exemption and reduction (Nawrot, 2014). Whilst this development has resulted in economic growth, particularly for some Asian countries, it has also contributed to adverse environmental impacts, such as air pollution (Gallagher, 2006; Kimble and Wang, 2012). Hence, another driver for the automotive sector to leapfrog in the reviewed case studies was reducing

pollution caused by automobiles (Wang and Kimble, 2011) and, in particular, poor fuel quality (Gallagher, 2006).

The technological leapfrogging in the automotive sector was limited by inconsistent policies and regulations (Wang and Kimble, 2011; Nawrot, 2014) and weak technological capabilities (Lee and Lim, 2001; Gallagher, 2006; Kimble and Wang, 2012). Policy and regulatory barriers were overcome with strong support from governments, such as establishing new regulations to develop electric vehicles (Wang and Kimble, 2011) and stimulus to the market (Nawrot, 2014). The private sector was essential to improve the technological capabilities in the automotive industry, through heavy investment in research and development (Lee and Lim, 2001; Watson and Sauter, 2011) and collaboration with foreign companies (Lee and Lim, 2001).

2.2.4.7 Water

Whilst wastewater recycling technology is the only published leapfrogging case study in the water sector to date; the analysis also included articles that refer to the concept of leapfrogging as a broad potential strategy for water development. The water system in most developing cities is insufficient to comprehensively meet their entire population's basic needs, such as having safe and secure access to water supply and sanitation. In this context, Abeysuriya et al. (2007) and Poustie et al. (2016) argue that current water management approaches can leapfrog to more sustainable ones as long as it considers the 'contextual fit' or reality of the country for leapfrogging. Shah et al. (2005) contend that if innovative water technology is to be transferred from developed to developing countries, it needs to be adapted to the local context. This means understanding the socio-economic 'reality' of the country, often characterised by low public awareness about water issues and limited financial resources for investment in improving the water system. A lack of coordination between different governmental levels and key actors (e.g. the private sector) on water issues is a challenge frequently identified in the literature (Shah *et al.*, 2000; Abeysuriya *et al.*, 2007; Poustie *et al.*, 2016). The strategies in successful water leapfrogging cases included government interventions, such as changing policy and regulations (Binz *et al.*, 2012), strengthening incentives for the private and public sector (Abeysuriya *et al.*, 2007; Binz *et al.*, 2012), empowering frontrunners (Poustie *et al.*, 2016), facilitating technology transfer (including technological and absorptive capabilities) and providing foreign financial assistance (Shah *et al.*, 2000; Abeysuriya *et al.*, 2007; Binz *et al.*, 2012).

2.2.4.8 Summary of the drivers, challenges and strategies influencing leapfrogging success

The perceived drivers, challenges and strategies that helped or hindered a leapfrogging pathway across the empirical cases in each of the above seven categories (energy, IT, general technology, telecommunications, clean technology, automotive, and water) are summarised below in Table 2.1. This review highlights that although there were various drivers and challenges present across the cases, there are several consistencies within the strategies used to overcome these challenges that can be analysed to develop a preliminary understanding of the enabling conditions for leapfrogging.

Table 2.1 Drivers, challenges and strategies influencing leapfrogging success identified in published case studies, organised by sectorial category

Sector	Driver of Leapfrogging	Challenges Encountered	Strategy to Overcome Challenges
Energy	- Reduce high costs - Reduce greenhouse gas emissions	- Lack of an initial threshold of absorptive capacity - Weak host government development policies - Low finance resources - Lack of awareness of the benefits	- Absorptive capacity - Technological capabilities - Uniformity in environmental regulations - Private financing - Incentive of the domestic market - Thoroughly understand and consider local context
Information Technology	- High product demand - Economic growth	- Policy restrictions - Lack of skills - Lack of scalable infrastructure - Limited capital - Poor leadership	- Government intervention - Research and development investment by the private sector - Domestic innovation - Technological capabilities
General Technology	- Economic growth - Competitive industries	- Weak technological capabilities - Basic infrastructure - Low cooperation and coordination between key actors - Low finance and human resources	- Technology transfer and financial assistance from developed economies - Government intervention - Promoting cooperative partnerships - Targeting other sectors for investment
Telecommu-nications	- Competitive industry - High consumer demand	- Meet the standards of international competition - Lack of scalable infrastructure	- Market incentives - Affordable technology - Private financing
Clean Technology	- Environmental protection	- Unwillingness for cleaner technologies - Low market incentive to leapfrog to cleaner technologies - Low availability of clean technology	- Policy change to help foster awareness and market demand for cleaner technologies
Automotive	- Industry growth - Environmental protection	- Inconsistent policies and regulations - Weak technological capabilities	- Strong governmental support - Research and development investment by the private sector - Collaboration with foreign companies
Water	- Sustainable water future	- Innovative technologies need to be adapted to the local contexts - Low coordination between different governmental levels - Low finance resources - Low public awareness	- Technological and organisational absorptive capacity - Government incentives - Foreign financial assistance - Empower frontrunners

2.2.4 Enabling conditions for technological leapfrogging

The results of the synthesis across the sectorial categories provide insights to highlight specific constituent factors to support leapfrogging. Across the sectors, seven overarching factors were identified that enabled a successful leapfrogging pathway: supportive policies, clear goals and targets, financial resources, technological capabilities, incentives, market opportunities, and tailored to the local context (Table 2.2). Whilst these are

taken from predominately technological cases, they represent a preliminary foundation for understanding the enabling conditions to support leapfrogging towards sustainable socio-technical systems.

Each of the enabling factors is unpacked below in further detail.

Table 2.2 Key factors to enable a technological leapfrogging pathway

Enabling Factors	Description
1) Supportive policies	Policies and regulations that ensure environmental protection whilst also supporting local economic development.
2) Clear goals and targets	A set of goals and targets that influence the direction of the leapfrogging.
3) Financial resources	Different funding injection points, directed to assist the leapfrogging process.
4) Technological capabilities	New knowledge and skills that will foster innovation and support the leapfrogging process, accompanied by absorptive capacity.
5) Incentives	Creation of opportunities to help the implementation of economic and social mechanisms that will support the leapfrogging process.
6) Market opportunities	A market competition that provides economic and research opportunities that support the leapfrogging process.
7) Tailored to local context	Appropriate technologies and knowledge fit the local conditions.

1) Supportive policies: Pursuing leapfrogging pathways can challenge the capacity of existing public policy and regulations to deliver aspired outcomes. As Ho (2005) suggests, this may require a reconfiguration of the legislative framework to ensure it provides adequate environmental protection (Perkins, 2003; Rock *et al.*, 2009), as well as active sustainability policies (Tukker, 2005). Other enabling policy measures include supporting local economic development (Lewis, 2007) and facilitating international networks (Binz *et al.*, 2012). Experience in the IT, automotive and energy sectors shows that quite diverse policy interventions have resulted in successful leapfrogging cases. For instance, policy restrictions (e.g. limiting carbon emissions) and changing policy strategy (e.g. import substitution to export-oriented).

Whilst government policy and a strong legislative framework are essential for regulating and driving private sector activities to become more sustainable; private sector organisations should also develop their sustainability policies to support leapfrogging. These may include, for example, cleaner production processes, investment in research and development for cleaner technologies (Lee and Lim, 2001), and the deployment of less polluting technologies (Sauter and Watson, 2008). However, as Perkins (2003) suggested, the shift towards clean production in the private sector may occur with the support of government incentives or if cleaner production results in lower costs and higher benefits.

2) Clear goals and targets: The practice of leapfrogging has been criticised in the literature for lacking specific targets and objectives beyond the general strategic goal of bypassing dirty technologies for cleaner technologies (Goldemberg, 1998; Perkins, 2003). The failure to set specific targets (e.g. reducing specific pollutants) could obscure the necessary conditions for leapfrogging and provoke a misunderstanding of the concept, resulting in it being devalued as a policy goal (Perkins, 2003). Therefore, defining short and long-term goals and targets could assist policy-makers in the development of the policies and regulations (Ho,

2005), influence the direction of research (Binz *et al.*, 2012) and guide different stakeholders in effectively managing their capabilities and resources (Tan *et al.*, 2018)

3) Financial resources: Limited financial resources represented a significant constraint to leapfrogging in the cases reviewed. These case studies suggest a number of potential strategies to overcome financial limitations, including market development policies and financial incentives (Foxon and Pearson, 2008), the use of acquisitions by local companies to speed up investment (Lachman, 2011), and in some scenarios the need for tariff and subsidy adjustment (Lachman, 2011; Zhang, 2014). Specifically, the reviewed case studies provide extensive examples (Lee and Lim, 2001; Lewis, 2007; Angel and Rock, 2009; James, 2009; Lee *et al.*, 2014) of how private sector investment can facilitate leapfrogging. For example, private sector investment in research and development has enabled less industrialised countries to catch-up to advanced industrialised countries by investing in up-to-date technologies (Sauter and Watson, 2008; Yu and Gibbs, 2018) and to position the new technology into a more sustainable one (Lee and Lim, 2001). These examples confirm the private sector's significant role in the leapfrogging process and the potential momentum it can create with the right incentives.

Early leapfrogging conceptions assumed that developing countries lack financial capital; this was confirmed in the case studies analysed, which found that limited financial resources were typically a challenge for leapfrogging success. Therefore, financial assistance from developed economies can improve local capabilities and the cost and performance of competing technologies (Sharif, 1992; Binz *et al.*, 2012). In these circumstances, it is important to ensure that this financial assistance is awarded through established avenues of international cooperation (Perkins, 2003) and, if possible, with the purpose to achieve sustainable development.

4) Technological capabilities: The technological capabilities and absorptive capacity of actors were of key importance in the leapfrogging process in the reviewed cases. In most cases, this meant that the technology was upgraded (Watson and Sauter, 2011) or adapted to the local conditions for its success (Binz *et al.*, 2012). Whilst technological capabilities require knowledge, skills and experience; it was mainly the lack of capability to expand production capacity, increase the scale of production or increase specialisation that represented barriers for countries that wanted to leapfrog. In the successful case studies reviewed, knowledge was mainly acquired through research and development (Waswa and Juma, 2012), learning-by-doing (Watson and Sauter, 2011) and through the exchange of information (Foxon and Pearson, 2008). However, building technological capabilities is not enough if the country lacks absorptive capacity (Steinmueller, 2001). The concept of absorptive capacity has been widely used at the firm level and is described as "an ability to recognize the value of new information, assimilate it, and apply it" (Cohen and Levinthal, 2017, p. 128). Hence, enhancing the ability of government policy-makers and practitioners to recognize innovative technology, adapt and apply it to their contextual situation is critical.

New knowledge or skills acquisition required to support across the three actors. The government supports the development of new partnerships and research and development initiatives, whilst the private sector promotes access to external knowledge and investment in research and development (e.g. Lee et al., 2001;

Watson et al., 2011). The participation of international aid organisations in transferring technologies and knowledge to developing countries was successful through focusing on migration of experts, joint ventures with locals, technology licensing, and strong partnerships with foreign universities through joint research projects (Murphy, 2001; Binz *et al.*, 2012; Poustie *et al.*, 2016). These enablers are likely to result in more efficient knowledge formation under international cooperation and coordination umbrella.

5) Incentives: Government provision of incentives to not only adopt clean technologies (Perkins, 2003; Binz *et al.*, 2012) but also take up a sustainable development approach (Kainuma *et al.*, 2017) is a crucial strategic intervention for achieving sustainability leapfrogging. There are many different types of incentives identified in the leapfrogging literature, such as financial incentives (e.g. subsidies, taxes) to encourage private sector research and development (Sharif, 1992), establishing educational programs (Sharif, 1992; Lee *et al.*, 2014; Sarabhai and Vyas, 2017) or international education opportunities; promoting competitive domestic market opportunities (Perkins, 2003) and providing incentives to foreign investors (Lee *et al.*, 2014).

6) Market opportunities: The private sector's interest in entering a market normally occurs when there is a potential opportunity for profit (Abeysuriya *et al.*, 2007). Lessons learned from the technological sector showed that market competition created an opportunity to leapfrog not only to the newest technology but also to improve other conditions. For instance, dominant firms often try to keep at the forefront by investing in research and development (Watson and Sauter, 2011), contributing to improving capabilities, such as knowledge and skills. In the same way, for local firms to stay competitive, they too will have to gain access to external knowledge and invest in research and development (Lee and Lim, 2001).

7) Tailored to local context: International assistance that is tailored to local circumstances also needs to be considered. A common criticism of international assistance is a potentially poor "contextual fit", e.g. the uncritical imposition of developed-country solutions into developing-country challenges may prove to be dysfunctional or counter-productive (Shah *et al.*, 2000; Jomo, 2001) or leapfrog through technology transfer might fail due to lack of local market judgement (Dai and Xue, 2015). As Goldemberg (1998) suggests, it is critical for leapfrogging that appropriate technologies fit the local conditions. Therefore, leapfrogging strategies need to consider the local context of the leapfrogging country (Davison *et al.*, 2000; Murphy, 2001), including capabilities, social, economic, ecological and cultural circumstances.

2.2.5 The promise of leapfrogging

Leapfrogging as a strategy to accelerate development is broadly supported within the literature, being used across different fields of scholarships and in various policy-development documents. Yet, despite the opportunities that leapfrogging represents, scholars suggest that there is weak theoretical background for leapfrogging and the field lacks a clear conceptualisation and a systematic empirical base, especially when applied to complex challenges such as sustainable development (Murphy, 2001; Sauter and Watson, 2008; Wang *et al.*, 2010; Wang and Kimble, 2011; Binz *et al.*, 2012; van Benthem, 2015).

Leapfrogging has also been critiqued as to whether it is realistic and/or an achievable goal or simply an alternative pathway for development (Murphy, 2001; Weng, 2010). Hobday's (1994) analysis of Singapore's

electronic industry suggests that technology development was a gradual accumulation over time, rather than a process of leapfrogging or bypassing technologies. Rock et al. (2009) and Angel & Rock (2009) claim that the complexity of this process will be more a "hard slog" than a leapfrog because of the existing barriers to the introduction of sustainable technologies. Barriers identified include un-strategic and inconsistent policies (Gallagher, 2006); financing challenges (Unruh and Carrillo-Hermosilla, 2006; Lachman 2011); lack of incentives from the government (Abeysuriya et al. 2007; Lachman 2011); weak technological capabilities (Perkins, 2003; Gallagher, 2006; Binz *et al.* 2012); problems of compatibility (Kemp 1994) and; an apparent unwillingness of multinational and multilateral organisations to transfer cleaner or more efficient technologies beyond those simply required by the standards (Gallagher, 2006; Unruh and Carrillo-Hermosilla, 2006).

Critiques surrounding the 'implementation context' have also contested the potential of leapfrogging. Shah *et al.* (2000) suggest that problems in developed countries are not the priority in developing countries, thus by learning from past mistakes, developing countries can face a problem of "contextual fit", where the learnt experience from one context may prove dysfunctional or counter-productive in another. Research done by (Remigios and Reckson, 2018) further highlights the challenge of contextual fit, particularly when recommending strategies such as leapfrogging to poor rural areas. Examining energy leapfrogging at the household level in Chiwundura, Zimbabwe, their research found the following limitations: depressed incomes; availability, knowledge and information of modern energy services; unavailability of skilled workforce; and cultural practices. Similarly, Murphy's (2001) contends that energy planners often focus on the technical and economic viability of the new technology while ignoring or oversimplifying the local social, cultural, and political relationships and realities of the region/area. He argues that whilst the leapfrogging metaphor is portrayed as a quick and easy way around the complications that come with the incremental implementation of technology; it is challenged by the social and cultural realities of technology – the socio-technical system.

However, despite the conceptual shortcomings of leapfrogging, evidence of (technological) leapfrogging has been observed in developing countries (van Benthem, 2015; Yap and Truffer, 2018; Goldemberg, 2020). The review of successful leapfrogging examples suggests several shared enabling factors that contributed to the success of leapfrogging. Combined, these seven enabling factors represent a foundation for understanding the necessary conditions for enabling leapfrogging in other contexts, albeit primarily within technological domains. Similarly, although technological development is often considered both an individual act and a collective one, as its innovation and diffusion emerge within a system (Jacobsson and Bergek, 2004), no explicit consideration of socio-institutional factors influencing the leapfrogging was observed in the reporting of the successful examples. Examining the relationship between the enabling factors and the limited mentions of actors within the case studies reveals three actor groups supporting the leapfrogging process: government, private sector and international aid organisations. The government played a central role in promoting strategic partnerships between key stakeholders (Ho, 2005), the private sector was important for extending networks to international domains (Sharif, 1989; Lee *et al.*, 2009; Rock *et al.*, 2009), and international partnerships fostered leapfrogging strategies by supplying the necessary financial and technical capabilities under local

conditions. This social context enabled efficient planning and implementation of policies and targets, and ultimately drives forward the leapfrogging process (Perkins, 2003; Poustie *et al.*, 2016). However, although government, private sector and international aid organisations are important actors, given the lack of consideration for socio-institutional factors within the case studies (and leapfrogging more broadly), there are likely to be other actors involved and relevant for the leapfrogging process when framed within a socio-technical system (e.g. community, research institutes, societal groups).

Whilst the concept of leapfrogging has been around for a number of years, and is increasingly used to inform development actions, as a field of research, it is underdeveloped. The existing research is largely technologically focused, and there is a near-complete lack of understanding or exploration of actors and agency within leapfrogging paths and how these fit within a socio-technical perspective of societal change. To support the development of insights into the dynamics of leapfrogging within sustainability transitions, three broad knowledge gaps were identified.

Firstly, *a clear conceptualisation of leapfrogging is needed that focuses the concept under a sustainability lens and engages with the systemic changes required* (Moore *et al.*, 2017; Ben-Eli, 2018). There is renewed optimism amongst scholars about the potential for technological leapfrogging to be used as a strategy for developing countries to leapfrog over the successive generations of technology and immediately adopt the newest and cleanest version. While this argument provides an opportunity to explore new paths for developing cities towards a sustainability pathway, it maintains a focus on technological advancement and does not explicitly incorporate a systems perspective of sustainability as central to the concept.

Secondly, *leapfrogging literature to date has not captured the explicit role of actors, their interplay and their contribution to facilitating leapfrogging* (Binz *et al.*, 2012; Yap and Truffer, 2018). As shown above, leapfrogging cannot be realised without a dynamic and systemic interaction of different elements and actors. Whilst technological leapfrogging has been helpful in sketching the bigger picture for understanding rapidly advancement or acceleration of a technology; research fails to address the socio-technical dynamics or provide a more actor-oriented analysis. A few studies have begun to draw on transitions literature to study leapfrogging in the industry (Tukker, 2005; Binz *et al.*, 2012; Yap and Truffer, 2018) and cleaner productions (Almeida *et al.*, 2017). However, they do so in a relatively superficial manner that fails to develop the conceptual foundations of leapfrogging adequately. The embedding of society in the leapfrogging process opens up a host of vitally important questions, such as: a) What kinds of actor are involved in and/or influence a leapfrogging pathway?; b) How can/do actors and institutions facilitate the leapfrogging process?; b) What is the role of agency and associated institutional context in leapfrogging?; c) What strategies do actors adopt to support leapfrogging?; d) What resources do actors mobilise and deploy to achieve a leapfrogging goal?; e) How do interactions among various social groupings enable a leapfrogging pathway?.

Finally, whilst leapfrogging is characterised by an acceleration of the pace of change in the adoption of technology (Reut Institute, 2009), *there is limited knowledge on how leapfrogging dynamics can be harnessed as a strategy for accelerating, amplifying and scaling change processes within a socio-technical system.* Considering leapfrogging as an approach that has the potential to accelerate sustainable development in large-scale complex systems (e.g.

cities) raises the following questions: a) how can leapfrogging dynamics accelerate a sustainable pathway beyond the technological sector and at a city-scale?; b) under what conditions does such acceleration takes place?; c) what are the mechanism, strategies and actors that can enable such an acceleration?.

To support the development of a socio-technical understanding of leapfrogging dynamics, the following sections examine the foundations of transitions scholarship, its role in sustainable development, how the acceleration of change processes is conceptualised, and the potential shortcomings of transitions theory within developing contexts.

2.3 Engaging with systemic change through transitions theory

Transitions scholarship represents a valuable avenue for integrating and building the leapfrogging concept as it has largely explored transformative change across socio-technical systems in response to the need for expediting sustainability (Grin *et al.*, 2010). Sustainability transitions recognises that environmental problems, such as climate change, cannot be addressed by improvements in one dimension (e.g. technological fixes), but require radical shifts across multiple dimensions (e.g. technological, institutional, political, economic, and socio-cultural), elements (e.g. markets, user practices, industry structures, cultural meanings) and multi-actor (e.g. academia, politics, industry, civil society) processes (Markard *et al.*, 2012; Köhler *et al.*, 2019).

Transitions is part of an extensive field of scholarship focused on understanding large-scale changes within systems, with an emphasis on better understanding the relationship between society and technology and how this influences the dynamics of change. For example, the fields of social innovation (Swyngedouw, 2005; van der Have and Rubalcaba, 2016); reflexive governance (Voß and Kemp, 2006; Hendriks and Grin, 2007); actor-network theory (Quitzau *et al.*, 2013; Rohracher, 2015); and social practice theory (Shove *et al.*, 2012) have all been used to explore systemic changes within society. Transition theory is well suited to expand leapfrogging theory as it shares an examination of similar empirical phenomena, in the exploration of technological change and transformation processes. They also draw on common theoretical roots in evolutionary economic theorising (Markard and Truffer, 2008) and innovation studies (Smith *et al.*, 2010; Jacobsson and Bergek, 2011).

A transition can be defined as "a long-term continuous process of societal change during which the structure of society, or a sub-system of society, fundamentally changes" (Rotmans *et al.*, 2001, p. 16). It is important to highlight that a transition refers to a specific kind of change: a change that is fundamental, radical, profound or transformative, as opposed to an evolutionary, incremental or gradual change (Rotmans, 2005; De Haan, 2010; Frantzeskaki and Loorbach, 2010). In other words, transitions refer to a change of the dominant culture (e.g. norms, values, paradigms), structure (e.g. physical, economical, institutional) and practice (behaviour, habits, routines of actors) of a societal system (van der Brugge, 2009; Van Raak, 2016). There are well-established characteristics of a transition in the literature:

- A transition is a long-term process, spanning one or more generations (25 – 100 years). It is characterised by a non-linear behaviour, containing periods of slow and fast developments (Rotmans *et al.*, 2001; Rotmans, 2005; Geels and Schot, 2010; Grubler *et al.*, 2016; Sovacool, 2016).

- A transition is a set of connected changes which encompasses an array of dynamics across numerous domains, such as technological, economic, ecological, socio-cultural and institutional developments that link up and reinforce each other (Geels, 2004; van der Brugge, 2009).

- A transition occurs through an interplay of dynamics at different scale levels (micro, meso and macro) moving in the same trajectory (Figure 2.3) (Rotmans *et al.*, 2001; Geels, 2002), involving a broad range of actors from a diversity of sectors and backgrounds (De Haan, 2010; Grin *et al.*, 2010) and a range of possible development paths (Rotmans, Kemp and Asselt, 2001; De Haan, 2010).

Transitions are processes that unfold over time with multiple driving factors and impacts (Loorbach *et al.*, 2008). How transitions unfold has been a primary research question at the core of transitions studies. Two key concepts are widely acknowledged as the foundation for understanding transitions: the multi-level concept and the multi-phase concept (van der Brugge *et al.*, 2005; Grin *et al.*, 2010; Loorbach *et al.*, 2017).

In order to support the exploration of leapfrogging dynamics within sustainability transitions in developing cities, the following sub-sections begin by examining the multi-level and multi-phase concepts in more detail. A specific focus is then placed on the use of transition theory to support sustainability (i.e. sustainability transitions) before exploring sustainability transitions within developing contexts. Finally, given the focus of rapid development within leapfrogging scholarship, the review of transitions literature concludes with a brief examination of existing understandings of accelerating transitions.

2.3.1 The multi-level concept

The multi-level concept also referred to as multi-level perspective (MLP), describes a transition in terms of different dynamics processes within and between three analytical levels in a nested hierarchy: macro-level (landscape), meso-level (regime), and micro-level (niches) (Rip and Kemp, 1998; Geels, 2002; Smith *et al.*, 2010) (Figure 2.4). A highly structural context for both the regimes and niches is provided by the macro-level (Smith *et al.*, 2010). At this level, the landscape is determined by macro-changes of external factors (e.g. cultural changes, demographic change, and the natural environment) (Rotmans *et al.*, 2001; Geels, 2002; Smith *et al.*, 2010), which influence both regimes and niches (Markard and Truffer, 2008). Landscape pressure takes place more slowly than in regimes, but can prompt shifts within a regime and/or create opportunities for niches to emerge (Geels, 2002). At the meso-level, regimes relate to "dominant practices, rules and shared assumptions" (Rotmans *et al.*, 2001, p. 19), which comprises both technical and non-technical components (e.g. policy, technology, culture, science, infrastructure, user practices) (Geels, 2002). Socio-technical configurations within the regimes provide the stable and dominant direction of realising a particular societal function (e.g. water provision) (Smith *et al.*, 2010). In addition, Markard et al. state that "the core idea behind the regime is that it imposes a logic and direction for incremental socio-technical change along established

pathways of development" (2012, p.957). The micro-level comprises niches for innovative development. The niches are 'protected spaces' where innovation (new technology) and/or deviations (new socio-technical practices) from the norm can emerge and develop while being protected from the pressures of normal regimes (Rotmans *et al.*, 2001; Smith *et al.*, 2010). Niches have been described as incubation spaces that allow the development or trial of new practices or innovations before broader exposure at the regime level (Schot and Geels, 2008). Therefore, niches are a source for transformative ideas and capabilities (Smith *et al.*, 2010) that wait until they are strong enough to impact the regime (Geels, 2005b).

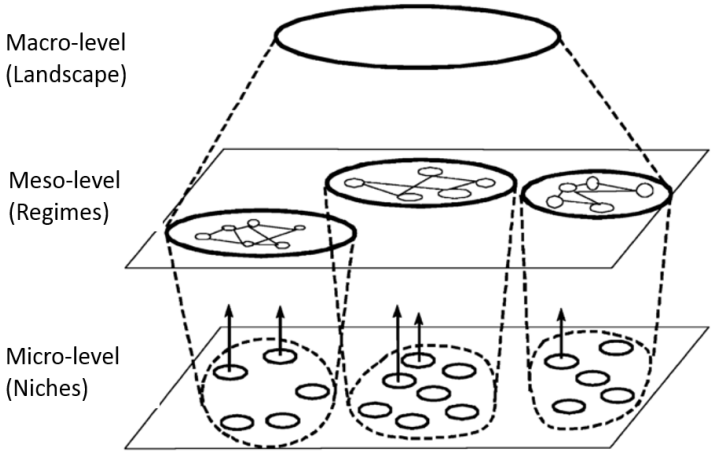

Figure 2.4 The multi-level perspective (Geels, 2002, p. 1261) **-** Developments at the macro-level correspond to slow broad societal trends. Dynamics at the meso-level are determined by the regime. The regime is the dominant pattern of institutions, rules and structures in the social system. At the micro-level, individual actors, local practices, or innovations are distinguished.

Studies into socio-technical transitions are heavily influenced by the MLP, as it provides a relatively straightforward way of ordering, organising and simplifying the analysis of complex, large-scale transformations by which change occur in socio-technical systems[7] (Geels, 2002; Smith *et al.*, 2010). It explores the reconfiguration processes between technology development and broader adjustment processes in science, industry, markets, policy, and culture across different levels (macro, meso and micro) (Geels and Schot, 2007). The MLP has been applied, mainly in a developed context, to assess emerging technologies against the background of incumbent socio-technical structures. Examples include transitions in water supply and personal hygiene in the Netherlands (Geels, 2005a) and water servicing in Australia (Brown and Clarke, 2007), the transition from horse-drawn carriages to automobiles in the USA (Geels, 2005b), the transition from cesspools to sewer systems in the Netherlands (Geels, 2006), and the transition of the Dutch energy system (Loorbach *et al.*, 2008). However, despite the lack of application within developing contexts, the MLP can support the development of a conceptualisation of leapfrogging that engages with the multi-level change processes occurring within systemic changes and provides a conceptual language to explore this.

[7] Socio-technical systems are a type of complex adaptive systems that predominantly analyses the system transformation that results from the co-evolution between technology and society throughout history and how they interact to fulfil societal needs (Geels, 2004).

2.3.2 The multi-phase concept

The multi-phase concept illustrates that transitions pathways are non-linear with different phases, shifting from one dynamic equilibrium to another, alternating between periods of steady (slow) incremental change to quick transitional change (Rotmans *et al.*, 2001; Kemp and Rotmans, 2005; Loorbach and Rotmans, 2006). According to Rotmans *et al.,* within a transition, there is "multiple causality and co-evolution caused by independent developments" (p.16, 2001). This means that in principle, it is possible to have different pathways to reach the same equilibrium level. These paths can differ in regard to three system dimensions: the speed of change; the size of change; and the time period of change (Figure 2.5) (Rotmans *et al.*, 2001). These three dimensions determine the nature of the transition, in other words, the final equilibrium and the pathway to it (Grin *et al.*, 2010). The authors are careful to highlight that the speed of change in transition processes is relative, as periods of slow and fast development occur within a transition. Given the gradual nature of a transition, it cannot occur quickly, nor have great jumps within (Rotmans *et al.*, 2001; Kemp and Rotmans, 2005).

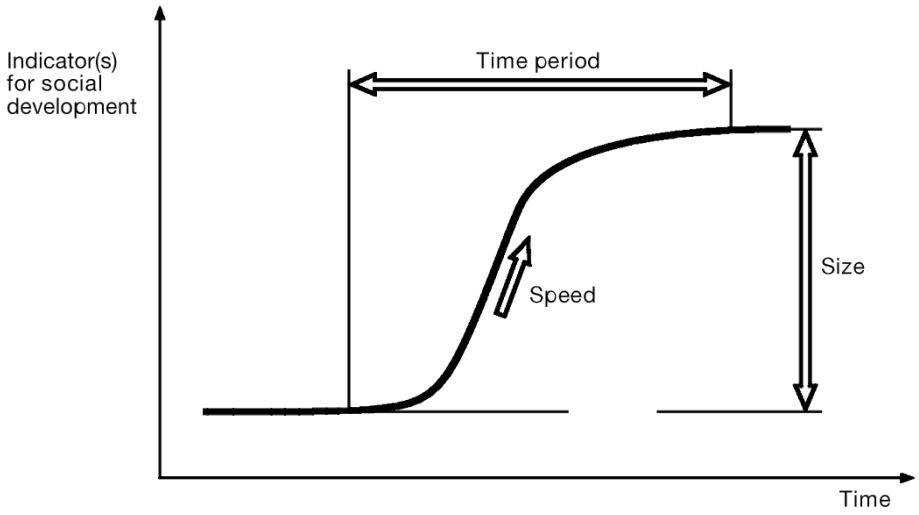

Figure 2.5 The three system dimensions of transitions (Rotmans *et al.*, 2001, p. 18)

Given that transitions are long-term processes, Rotmans' *et al.* (2001) multi-phase concept distinguishes four phases to facilitate tractable research: pre-development; take-off; acceleration and stabilisation (Figure 2.6). These phases are underpinned by complex interactions between different actors (e.g. networks, institutions, individual behaviour) at varying scales (e.g. economic, ecological, socio-cultural) (Brown *et al.*, 2013), that ultimately will create different transitions pathways (Geels and Schot, 2007; van der Brugge and Rotmans, 2007). In the following, each transition phase is briefly described:

Phase 1 - Pre-development: The system dynamics do not visibly change, but contestations at a macro-level (landscape) begin to emerge (Rotmans *et al.*, 2001). In these early stages, changes in the socio-environmental conditions pose a growing tension to the regime (van der Brugge and Rotmans, 2007), demanding efforts from actors to experiment (Kemp and Rotmans, 2005; Kivimaa *et al.*, 2019), define issues and make connections with other individuals (Hartz-Karp and Gorissen, 2017; Brown *et al.*, 2018). A growing awareness

of new directions and societal goals during this phase begins to increase the vulnerability of the regime (Van Lente *et al.*, 2011) and provides space for niches to emerge.

Phase 2 - Take-off: This phase is reached when innovations at the micro-level are reinforced by changes at the macro-level (van der Brugge *et al.*, 2005). As the new mindset and system innovation processes start to perturb the status quo, generating large scale changes, and allowing the niche to be formed (van der Brugge and Rotmans, 2007; Brown *et al.*, 2013). The system innovation changes are visible and begin to destabilise the system; this shift initiates the system transformation, building up the niche (Rotmans *et al.*, 2001). In take-off, there is a build-up of innovation actor-network who project a shared understanding of the relevant problems and how to solve them, and develop and access resources (e.g. financial and/or knowledge) (van der Brugge and Rotmans, 2007; Van Lente *et al.*, 2011). This positive reaction amplifies the response of the system creating momentum, which may lead to behavioural change (Rotmans, 2005; van der Brugge, 2009). During this phase, the system chooses either to continue towards the desired pathway to achieve sustainability or may lead to less desired pathways (Figure 2.6), making this phase one of the most crucial (van der Brugge, 2009).

Phase 3 - Acceleration: This phase is also known as the breakthrough phase; the system transforms structurally (Rotmans *et al.*, 2001; Kemp and Rotmans, 2005). These changes become visible as a result of an accumulation of innovations in socio-cultural, economic, ecological and institutional domains (Rotmans *et al.*, 2001) reacting and mutually reinforcing, facilitated by processes of collective learning mainstream and diffusion, and embedding of new thinking and practices (Rotmans *et al.*, 2001; van der Brugge and Rotmans, 2007). During this phase, the old regime transforms in response to pressures from the micro and macro-level (van der Brugge *et al.*, 2005); consequently, the niche expands and a niche-regime translation occurs (Brown *et al.*, 2013), leading to accelerating change. Nevertheless, according to Van der Brugge (2009), whilst the name suggests that the change process will be faster, cultural, institutional or infrastructural shifts may take years or decades.

Phase 4 - Stabilisation: The speed of large scale transformation decreases as the new regime settles down (Rotmans *et al.*, 2001; van der Brugge *et al.*, 2005). Regime dynamics across socio-institutional and technology-environment reach a new dynamic equilibrium (Rotmans *et al.*, 2001; Kemp and Rotmans, 2005), which could accommodate the next transition cycle (van der Brugge *et al.*, 2005; Hartz-Karp and Gorissen, 2017). During the stabilisation transformation, processes turn into optimisation of internal processes to enhance the efficiency of the new system (van der Brugge and van Raak, 2007).

The multi-phase concept has been extensively used in transitions literature to better understand the direction, pace and magnitude of a transition. The employment of the concept includes describing historical case studies in developed contexts (Hoogma *et al.*, 2002; Geels, 2005a; Kemp and Loorbach, 2007; van der Brugge and van Raak, 2007; van der Brugge, 2009; Van Lente *et al.*, 2011; Brown *et al.*, 2013; Kivimaa *et al.*, 2019); and to illustrate the pattern of change in transitions (Kemp and Loorbach, 2006; Safarzyńska *et al.*, 2012; Schot *et al.*, 2016; Köhler *et al.*, 2019). In particular, the pre-development and take-off phases have been studied in depth (Köhler *et al.*, 2019), whilst the acceleration and stabilisation phase remains under-conceptualised

(Frantzeskaki, Borgström, *et al.*, 2017; Kabisch *et al.*, 2017; Gorissen *et al.*, 2018) (explored further in Section 2.3.3). The conceptual analysis of the transition phases has also been modified according to the needs of the case study (i.e. some phases might need to be further divided into sub-phases or merged into fewer phases). As Van der Brugge (2009, p. 25) suggested, the rationale behind the four phases is "not to forecast the course of the transition through time, but to help us to recognise where we are in the process". For example, Brown *et al.* (2013) apply the multi-phase concept to navigate Melbourne's stormwater transition from the mid-1960s to 2001. In doing so, their research recognises two additional sub-phases within both the pre-development (landscape shift and niche emergence) and acceleration (niche expansion and niche-regime translation) phases. On the other hand, Kanger and Schot (2016) simplify the multi-phase concept into three phases (start-up, acceleration and stabilisation) to explore the historical transition to the automobile regime in the USA from 1891 to 1964.

As reflected above, there are multiple manifestations of transitions, both successful and unsuccessful (Figure 2.6). The S-curve represents an 'ideal' transition during which the system successfully transforms to a new dynamic equilibrium after going through the four phases. An important point to be noted is that, in reality, the S-curve displays all sorts of erratic variations due to the complexity of the system. Whilst the transition could lead the system to a successful pathway[8], could also lead to less desired pathways, such as lock-in, backlash or a system breakdown (van der Brugge and Rotmans, 2007). 'Lock-ins' can occur when the regime remains stable and strong, blocking the empowerment of niche-innovations (Berkhout *et al.*, 2004). 'Backlashes' can happen during the stabilisation phase as innovation appears to break through, but something occurs to cause its destabilisation, and the system returns to its original state. 'System Breakdown' may occur when the regime destabilises but innovations are not sufficiently developed to replace it (van der Brugge and Rotmans, 2007; van der Brugge, 2009). This multi-phase perspective is useful for focusing attention on the temporal dimensions of a transition and the corresponding change processes.

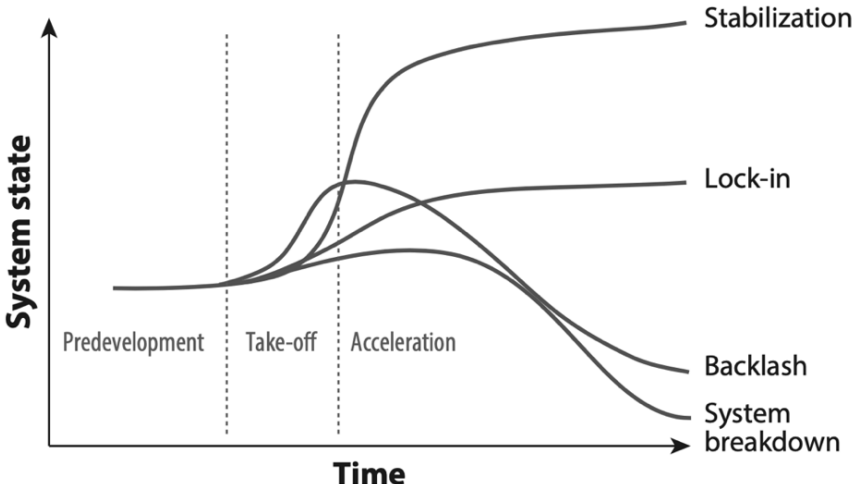

Figure 2.6 Transition phases and alternative trajectories (Rotmans, 2005, p. 24)

[8] A successful pathway is viewed as the system adjusting itself to the changing internal and external circumstances (Rotmans, 2005).

In conjunction with the MLP, the multi-phase concept offers the possibility to explore system changes across time and provides a method for identifying changes in the pace of change. In the context of understanding leapfrogging, the pace of change is a fundamental consideration. Understanding leapfrogging processes against the backdrop of transitions phases outlined by the multi-phase concept provide an opportunity to explore where leapfrogging is taking place during a transition. If the point at which leapfrogging is occurring within a transition can be identified, it also provides an opportunity to assess the influence of leapfrogging on the speed and pace of change within the transition. Similarly, the underlying role of actors facilitating leapfrogging can then be framed within a broader system change and provide insights into the evolving nature of agency.

2.3.3 Possibility of accelerating transitions

In comparison to the 5-10 year timeframes identified within leapfrogging scholarship, the mainstream literature in transitions poses that transitions are long-term processes that unfold over extended periods, between 25-100 years (Geels, 2006; van der Brugge, 2009; Grubler *et al.*, 2016; Sovacool, 2016). This is built on the premise that to counteract path dependence and lock-in, radical, systemic changes are needed, which ultimately results in a process that takes many decades to fully implement (Grubler *et al.*, 2016). Nevertheless, some scholars have asked the question of whether transitions can be quicker? (Bento and Wilson, 2016; Sovacool, 2016; Köhler *et al.*, 2019). However, the expansion of research on the temporal dimensions in transitions studies is relatively new, and empirical examples remain limited. Current studies have mainly focused on the acceleration phase of the S-curve (Frantzeskaki, Borgström, *et al.*, 2017; Ehnert *et al.*, 2018; Gorissen *et al.*, 2018); and accelerated diffusion (Bento and Wilson, 2016; Sovacool, 2016; Sovacool and Geels, 2016).

Sovacool (2016) and (Sovacool and Geels, 2016) both contend that in contrast to the 25-160 year timeframes currently documented within the literature, critical shifts of complex energy-related systems in many developed countries unfolded within 2-15 years. They argue that whilst the theoretical foundations of transitions have been built on historical examples that have taken decades to unfold, the lessons from these historical cases can expedite contemporary transitions. However, to do so, scholarship needs to engage with the pace of change taking place within different parts of a system and across scales (Sovacool and Geels, 2016). The need to consider the length of transitions within contemporary contexts and is also supported by Grubler *et al.*, (2016, p. 24); however, they go on to argue that focus also needs to shift towards understanding "what does it take? to achieve rapid transitions".

In this vein, recent work within Europe has begun to explore the acceleration dynamics of urban sustainability transitions. In a series of articles based on research carried out as part of the ARTS project (Accelerating and Rescaling Transitions to Sustainability), the acceleration phase of S-curve is studied across five European city-regions to better understand the role and impact of transition initiatives in cities and the conditions that can aid accelerating change towards a sustainable low-carbon society (Frantzeskaki, Borgström, *et al.*, 2017; Ehnert *et al.*, 2018; Gorissen *et al.*, 2018). The ARTS team proposes five mechanisms for disseminating and

promoting new ways of thinking: upscaling, replicating, partnering, instrumentalising, and embedding. For these mechanisms to effectively support the acceleration of transitions, agents from both top-down and bottom-up at all levels need to come together. However, these approaches have predominately focused on civil society initiatives in five developed European cities (Brighton, Budapest, Dresden, Genk, and Stockholm) that occurred during a particular transition phase (acceleration phase). Similarly, across this literature, there remains a lack of clarity surrounding how these mechanisms can be operationalised and what factors may influence or support practical action. Both Ehnert *et al.* (2018) and Gorissen *et al.* (2018) describe processes for acceleration as replicating, partnering, upscaling, instrumentalising, and embedding. Nevertheless, these processes are based upon a small sample of transition initiatives (e.g. ten transition initiatives in the city of Genk) identified in relatively niche sectors (e.g. nature restoration) as opposed to basic servicing sectors (e.g. housing or water sector). In limiting the sample to such niche sectors, there is the potential that their findings cannot be generalised across broader sectors. Indeed, as Gorissen *et al.* (2018) note, given the progressive context in which many of the transition initiatives were located, it was not seen to be particularly disruptive or as a challenge to incumbent practices.

Despite these shortcomings, lessons learned to accelerate transitions indicate that policy strategies that are both cost-effective and socio-politically feasible (Frantzeskaki, Borgström, *et al.*, 2017; Geels *et al.*, 2017), innovation is a crucial accelerator (Bento and Wilson, 2016; Geels *et al.*, 2017), and multi-actor collaboration is fundamental (Sovacool and Geels, 2016; Gorissen *et al.*, 2018). Given the prominence of speed and the pace of change within conceptualisations of leapfrogging, these insights offer the potential to support the positioning of leapfrogging and the underlying mechanisms driving it within a broader sustainability transition. However, whether leapfrogging can support the acceleration of a transition is unknown. Critics have argued that the acceleration of transitions to the point where they can be achievable in only a few years or decades is an "unrealistic expectation" when considering the scale of changes required globally (Smil, 2016, p. 194) and potentially "misleading" (Grubler *et al.*, 2016, p. 18). Despite this, the allure of faster transitions continues to drive research (Köhler *et al.*, 2019; Kivimaa *et al.*, 2021), with many studies acknowledging that further research is needed to provide deeper insights into what it takes to achieve the acceleration of transitions, under what circumstances acceleration of transitions occurs, and how the pace of sustainability transitions can be increased. In the context of this thesis, the introduction of leapfrogging as a means to accelerate change processes represents an opportunity to insights into one possible way of increasing the pace of sustainability transitions. Similarly, the exploration of leapfrogging through an empirical case study can expand the understanding of what conditions support both leapfrogging, and by association, the acceleration of a sustainability transition.

2.3.4 Transitions and agency

In addition to examining the temporal dimensions of sustainability transitions, transitions research also argues that governance often plays an important role and a broad range of actors typically work together in a coordinated way to achieve and guide significant shifts in policy and practice (Smith *et al.*, 2005; De Haan,

2018). Consequently, the exploration of how different actors and forms of agency[9] influence the speed and direction of transitions and how they can effectively engage and contribute to desired sustainability outcomes has been highly researched.

Sustainability transitions literature presents a robust agenda to explore the role of actors and agency that influence a systemic change (Fischer and Newig, 2016). For example, studies on this topic have examined actor-dynamics during a transition (Brown *et al.*, 2013); grassroots and community action (Seyfang and Smith, 2007; Wolfram, 2017); intermediary actors (Kivimaa *et al.*, 2019); actors as boundary spanners (Brodnik and Brown, 2017); power relations between actors (Avelino and Wittmayer, 2016); strategic agency (Novalia *et al.*, 2018); transformative agents and their alliances (De Haan and Rotmans, 2018); and institutional entrepreneurship (Huitema and Meijerink, 2010; Meijerink and Huitema, 2010). However, due to multiple conceptualisations of actors and agency influencing a transition, there is conceptual ambiguity in the structure of actors in transitions literature and a lack of clarity about actors being individuals, organisations, categories or roles (Avelino and Wittmayer, 2016). Fischer and Newig (2016) reviewed the importance of actors and agency in sustainability transitions. They found that actor roles in transitions are erratic, as they can change over time, and that actors in transitions literature can be clustered into four different categories, depending on the systemic level (following the MLP); societal realm (state, market, civil society); levels of governance (local, regional, national); and intermediaries (different types of organisations and agencies). Whilst this typology provides a clearer view of actors, the authors recognise that their typology needs to consider that individuals shift between networks, connections to other contexts and actor-related dynamics also need to be considered within sustainability transitions. Similarly, although this thesis does not intend to engage in the development of a conceptualisations or framework to understand actors and agency across a transition, the insights from the above scholarship provide a foundation for understanding the actors involved within Surabaya's transitions. It also highlights the diversity of roles actors can play and the diversity of societal 'groups' that they can occupy. These insights have helped to inform the data collection, data analysis, and overall conceptualisation of a sustainability transition within the developing context of Surabaya.

2.3.5 Sustainability transitions in developing context

Whilst sustainability transitions have been useful to address persistent environmental problems and motivate socio-technical transformations embedded within broader socio-economic systems (Smith *et al.*, 2005), the application of transitions frameworks to a blue-green transition within a developing context such as Surabaya remains relatively untested. As Scoones, Leach and Newell (2015) point out, different versions of 'green' are aligned with politics, in other words, a closer look at the questions what does sustainability transformation mean?, for whom?, and by whom?, is still needed to shape the kind of sustainability transformations that are desirable or possible. These questions are particularly relevant in developing country contexts, where settings

[9] For the purpose of clarity, actors refer to individual and collective participants whose actions influence and generate change (Bos *et al.*, 2013), such as innovators, policy makers and community representatives (Schot and Geels, 2008). Agency, then, relates to actor behaviour (with intention) with regard to such change (Fischer and Newig, 2016; De Haan and Rotmans, 2018).

exhibit a mixture of well and poor functioning institutions where social exclusion patterns prevail (Wood, 2003; Ramos-Mejía *et al.*, 2018). Similar criticisms have been raised regarding the limited scope of geographical contexts (Raven *et al.*, 2012; Yu and Gibbs, 2018) and spatial differentiation (Fuenfschilling, 2017; Wolfram, 2018) within much of the current transitions scholarship. The overwhelming focus on transitions within developed country contexts (Binz *et al.*, 2012; Markard *et al.*, 2012; Yu and Gibbs, 2018) has resulted in a limited understanding of the different dynamics and pathways that can occur under different places and scales (Coenen and Truffer, 2012; Coenen *et al.*, 2012; Frantzeskaki, Castán Broto, *et al.*, 2017). According to Truffer *et al.* (2010), this scholarship could benefit from a more reflexive approach that considers a broader range of context conditions and value considerations. This is particularly important as an agenda for sustainability transitions research in developing countries (Hansen *et al.*, 2018; Ramos-Mejía *et al.*, 2018; Wieczorek, 2018; Köhler *et al.*, 2019). Given the heterogeneity and unevenness that exists in the basic service sectors in developing cities (van Welie *et al.*, 2018), it is argued that a holistic assessment of a sustainable transformation in these settings include a social justice debate (Scoones *et al.*, 2015; Sovacool *et al.*, 2019).

In response, there has been growing interest in exploring sustainability transitions in developing countries to understand the conditions in which transitions are likely to occur and what is required for the transformative process to take place in developing countries. For example, scholars have explored and advocated for the promotion of sustainability transitions that are 'just transitions'[10], in an effort to ensure that equity and justice are emphasised in such transformation (Newell and Mulvaney, 2013; Swilling *et al.*, 2016). Swilling *et al.* (2016) research suggests that a 'just transition' is only possible if the overall goal is human well-being, with respect to income, education and health, within sustainability. However, to comprehend the processes to achieve the overall goal, a better understanding of socio-political dynamics, from a perspective of power and alliances, in a developing country context is needed. In addition, Newell and Phillips (2016) reveal that configurations of power between states and donors have distinct characteristics in developing contexts, which have not been emphasise by western transitions literature. These insights highlight that within the exploration of transitions within Surabaya, special attention needs to be paid to investor-led and donor-shaped policy contexts where decisions can be highly influenced by private and international actors, marginalising, even more, the interests of poorer groups.

Similarly, research by van Welie *et al.* (2018) acknowledges that sustainability transitions need to better account for the heterogeneity of developing cities in terms of service differentiation, spatial diversity, and pro-poor distributions of services. Ramos-Mejía, Franco-Garcia and Jauregui-Becker (2018) also highlight the extra layers of social complexity needed when attempting to understand transitions in developing countries. Table 2.3 contextualises this through by demarcating the socio-economic and political characteristics at a socio-technical landscape and regime level in developed (welfare settings) and developing contexts (informal security and insecurity settings). For instance, guiding any type of governance strategy becomes extra-complex

[10] Just transitions is interpreted as a transition that "ensures the moves towards a low carbon economy are equitable, sustainable and legitimate in the eyes of their citizens" (Newell and Mulvaney, 2013, p. 133).

when regulatory frameworks partially exist or are even illegitimate; and can therefore not be relied upon in the same way as developed contexts.

Table 2.3 Typical characteristics of the socio-technical landscape and regime in developed and developing context (Ramos-Mejía *et al.*, 2018)

Developed context	Developing context	
Welfare settings	**Informal security**	**Insecurity settings**
Socio-technical landscape		
Capitalist economy based on technological progress	Peasant economies within peripheral capitalism	Predatory capitalism
Social relationships are mediated by formal and legitimate rules	Social relationships are mediated by informal rules and exhibit exploitation, exclusion, domination	Social relationships are mediated by informal rules and are often characterised by oppression
States are autonomous and legitimate	States are weak and hardly differentiated from other power systems	States are weak, illegitimate and sometimes criminal
Socio-technical regime		
Centrally planned infrastructure	Uneven centrally planned infrastructure	Generalised lack of infrastructure
Technology and R&D is developed in research centres, often linked to industrial needs	Technology is imported by firms, and technological solutions are usually adapted by indigenous knowledge	Indigenous knowledge and technologies are not appropriate anymore due to environmental changes and global pressures
Firms constitute the basic production unit (firms are main providers of goods and services)	Formal firms coexist with informal family-based businesses and community organisations	Basic production units are informal and often based on family/community organisations
Legal property rights	Formal and informal property rights	Informal or inexistent property rights
Legitimate regulatory frameworks	Regulatory frameworks partially exist or are illegitimate. Enforcement is weak	Regulatory frameworks are inexistent. Strongman's rules
Modern lifestyles based on technology and individual freedom	Urban and rural lifestyles differ widely. Households are patriarchal limiting individual freedom, especially for women	Urban and rural lifestyles differ widely. Households are patriarchal limiting individual freedom, especially for women
People have access to formal labour markets as their main source of livelihood	People develop a portfolio of livelihoods (resources based on access to in/formal markets and community strategies or other forms of social differentiation	People develop a portfolio of livelihoods (resources based on access to in/formal markets and community strategies or other forms of social differentiation

Scholars have also argued that frameworks used to study socio-technical transformations (e.g. MLP) in developing contexts should account for potentially institutionally heterogeneous and dynamically unstable socio-technical landscape drivers, regimes and niches in these regions (Newell and Phillips, 2016; Hansen *et al.*, 2018). Therefore, in considering the conceptualisation and operationalisation of leapfrogging, these insights highlight the need to consider the heterogeneity of access to basic services and the provision of these services. Similarly, attention needs to be paid to variations within the socio-institutional context and the application of regulatory frameworks. In doing so, this research can contribute to the expansion of empirical transition cases within developing contexts and provide insights into how the heterogenic conditions within such a context influence transitions processes.

2.4 Summary

Whilst leapfrogging represents a promising area of scholarship to support rapid sustainable development in developing contexts, this chapter has argued that it is currently under-conceptualised and fails to provide a robust framework to support the systemic changes required for sustainability. A review of leapfrogging literature has identified critical enabling factors supporting technological leapfrogging pathways. These enabling factors provide an initial framing for understanding the conditions that support leapfrogging. However, given the technological focus of the existing cases, it is argued that current understandings of leapfrogging fail to adequately engage with the socio-institutional dynamics necessary when considering sustainability from a systems perspective. To address these shortcomings, three cumulative avenues for expanding leapfrogging scholarship are proposed. Firstly, a sustainability specific definition and conceptualisation of leapfrogging that engages with the systemic changes required to achieve sustainability is developed is required. Secondly, supporting such a definition is the development of a conceptual foundation for leapfrogging that considers the socio-technical dynamics influencing processes of change. Finally, it is argued that building on these foundations would enable exploration into how leapfrogging dynamics can accelerate a system-wide sustainable change. In line with the overarching aim of this research: *to develop new empirical and theoretical insight into the dynamics of leapfrogging to support the rapid development of sustainable socio-technical systems in developing cities,* transitions theory is then introduced to provide a conceptual language for framing the proposed expanded understanding of leapfrogging. However, whilst sustainability transitions introduce a foundation for understanding socio-technical dynamics of change, several key shortcomings are identified in its application to leapfrogging within a developing country. Firstly, the current lack of empirical validation of transitions concepts within the context of under-developed institutional conditions and heterogenous provision of basic services within many developing countries. Secondly, the temporal dimensions of a sustainability transition are currently predominately viewed as a multi-decade process. Whilst recent research has begun to explore the prospect of accelerating transitions and the mechanisms that may drive such an acceleration, this is largely under-conceptualised and represents an opportunity for further development through the integration of leapfrogging concepts. Combined, these two bodies of scholarship provide a strong foundation for exploring the rapid change processes observed within Surabaya's blue-green services system and developing an understanding of the mechanisms underlying such a change. The application of these two areas of scholarship to an empirical case study in a developing context responds to criticisms from both fields of scholarship by expanding the reach of leapfrogging to engage with a sustainable system and exploring both the speed and socio-institutional dynamics of a transition within a developing context. The following chapter presents further details of the Surabaya case study and outlines the research design and methodologies informing this thesis.

Chapter 3

Research Methods

3.1 Introduction

In this chapter, the overall strategy of the research project and the methodological techniques used to address each research objective are presented. My epistemological stance is discussed, followed by a description of the case study design. This includes an explanation of the rationale for the case study approach and the justification for the selected research context. A detailed background of Surabaya's administrative profile and a description of the city's blue-green services, a step required to fully understand the research context, are provided. Finally, the research design is presented, detailing specific approaches to data collection and analysis, and considerations of research validity are explained.

3.2 Research philosophy

Philosophical ideas (also called worldviews or paradigms) behind a research proposal are likely to influence the research design, relate moral-political values to research and guide ethical research behaviour (Neuman, 2011; Creswell and Creswell, 2018). The term worldview is defined as "a basic set of beliefs that guide action" (Creswell and Creswell, 2018, p. 5). At the broadest level, this includes assumptions about the knowledge and reality of each researcher (Morgan, 2007). The general guiding paradigm for this research is aligned with pragmatism, as this is framed by real-world problems that different stakeholders such as urban strategists and policy-makers approach for facilitating strategic actions towards achieving sustainable living in developing cities.

According to Creswell and Creswell (2018), pragmatism arises from actions, situations, consequences and concerns regarding solving problems. This worldview is not committed to a single philosophy but integrates perspectives and approaches in which the researcher is free to choose the methods, techniques and procedures that best meet the research needs and purposes (Johnson *et al.*, 2007; Morgan, 2007; Creswell and Creswell, 2018). More importantly to this research, pragmatism "does not see the world as an absolute unity" (Creswell and Creswell, 2018, p. 10) but understands that a research problem occurs in social, historical and political contexts that involve socially constructed realities. This has guided the research perspective in which core realities about problems in developing cities are acknowledged, allowing a theoretical lens that reflects an understanding of the different socio-political and infrastructure conditions operating across developing cities.

Pragmatic research is often informed by abductive approaches (Morgan, 2007). The abductive strategy also labelled as "inference to the best explanation" (Martela, 2015, p. 549), aims to account for the researcher's observation, pre-understanding, preconceptions and theoretical concepts about the phenomena under investigation (Blaikie, 2007; Martela, 2015; Alvesson and Sköldberg, 2018). This interpretation is subsequently advanced and simultaneously shapes and widens the research horizon. In this way, the empirical research and theoretical concepts keep developing, and in doing so, the proposed theory, pattern, and/or framework is adjusted and refined (Alvesson and Sköldberg, 2018). The results of abductive reasoning may not represent absolute truth, but these might best explain the evidence and potentially provide the most practical results

(Martela, 2015). Therefore, this type of reasoning was considered to facilitate the development of a nuanced understanding of how a city's context and complexity can be navigated to effectively deliver sustainability leapfrogging pathways in developing contexts.

3.3 The case study approach

In this research, an embedded single-case study approach (Yin, 2018) was utilised to investigate potential strategies to effectively deliver sustainability leapfrogging in Surabaya, Indonesia. The case study approach was selected as an overall method as it enabled the examination of a contemporary problem within a real-life situation (Scholz and Tierje, 2002). Yin (2018, p.15) defines a case study as "an empirical method that investigates a contemporary phenomenon (the 'case') in-depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident". Unlike other methods, the case study approach can cope with situations where there are many more variables of interest than data points and unclear boundaries between phenomenon and context (Yin, 2018). Another rationale for selecting a single-case study was the potential for longitudinal analysis, in which the same case is studied at two or more points in time (Yin, 2018). Examining processes of change over time to inform transition theorising requires this type of longitudinal research. Analysis on methods within transitions show that single-case research design remains the dominant method (Köhler *et al.*, 2019), as it fits transition's complex causal relations (e.g. path-dependency), emergent dynamics of change (e.g. niche breaking down a regime), and non-linear development trajectories (Geels and Schot, 2010). A single-case study is, therefore a valuable approach for investigating transformations in urban blue-green services in developing contexts, as is the nature of this inquiry.

Embedded single-case studies can also accommodate subunits of analysis within the case (Yin, 2018). The selected case study focuses on the transformative change of blue-green services management experienced within kampungs (traditional neighbourhoods with mostly low-to-middle income residents) of Surabaya. There were two embedded units of analysis for this case study (Figure 3.1): The change processes associated with metropolitan Surabaya's broad blue-green services transformation (Chapters 4) and embedded within this, the change processes associated with the Surabaya Green and Clean (SGC) program as a key catalysing initiative that led to the rapid transformation of some individual kampungs (Chapters 5). These embedded units of analysis define the spatial and temporal boundaries of the case, which Yin (2018), and Miles, Huberman and Saldaña (2014), argue are necessary to clarify the case.

For the first unit of analysis (change processes associated with metropolitan Surabaya's broad blue-green services transformation), a detailed case history outlines key periods (between 1945 and 2017) of blue-green initiatives spanning three political eras: i) Rehabilitation Era (1945-1964), ii) New Order Era (1965-1999) and iii) Reform Era (2000-2017). These eras align with Surabaya's historical narrative found in existing literature (Dick, 2002; Peters, 2013; Novalia *et al.*, 2020). Whilst not diminishing the kampung improvements and development that came before the start of this case study period, the starting point of the research focus in 1945 was selected because it marks the beginning of kampung improvement under the sovereignty of

Indonesia's people. Historical resources on Surabaya's kampung development can be found as early as the 1800s (Silas *et al.*, 2012); however, numerous kampungs were damaged or completely destroyed during World War II and Indonesia's revolution (Frederick, 1978; Husain, 2015). Within this context, the starting point for the analysis also aligns with a physical rehabilitation process post-Indonesia's declaration of Independence (1945)[11], when many kampungs were rehabilitated and rebuilt (Frederick, 1978; Dick, 2002; Peters, 2013; Husain, 2015). Analysis of the embedded second unit of analysis (change processes associated with the SGC program) took the beginning of the SGC program in 2005 as its starting point. The case study period finalises in 2017, at the end of data collection.

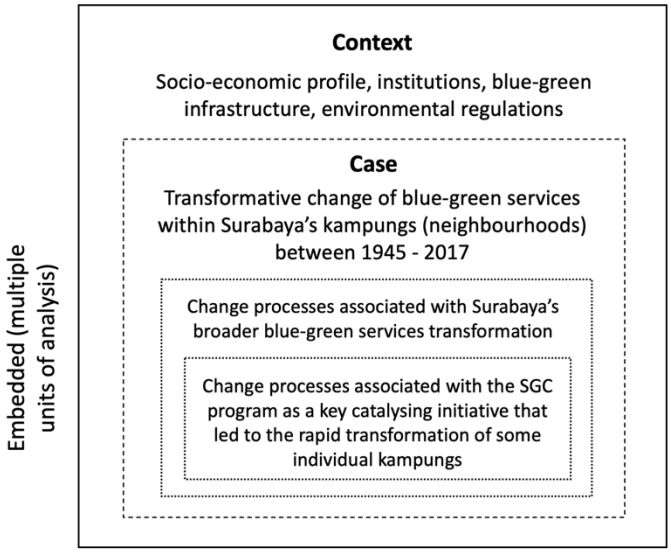

Figure 3.1 Embedded single case study (Surabaya, Indonesia)

Single-case studies have been criticised for their perceived limited ability to be applied to contexts beyond the case, as the data collected are particular to a specific situation. However, whilst they may not be directly generalisable to other cases, the aim of single-case study research is to attain analytic generalisations (generalising theoretical propositions), not statistical generalisation (Flyvbjerg, 2006; Yin, 2018). Additionally, asserts that a single-case study is appropriate when the investigated case is revelatory; this allows an understanding of the phenomenon in depth. As Gray (2014) clarifies, single-case study research tends to be more specific in focus, allowing the researcher to gain an understanding of the different dynamics present within single settings. This in-depth observation allows the researcher to observe details, such as people, organisations or contexts, otherwise not possible. Donmoyer (2000) attributes the in-depth observation of single-case studies as a 'vicarious experience' allowing the researcher to offer a detailed description of the observed setting and the meaning he/she attributes to it. At the same time, this allows the reader to vicariously experience the research, contributing to the social construct of knowledge (Patton, 2015; Creswell and

[11] Whilst the official transfer of sovereignty from the Netherlands to the Republic of Indonesia took effect on December 27, 1949. Indonesian's proclamation of Independence was signed on August 17, 1945.

Creswell, 2018). Another strength of embedded case study design is that different types of data and collection methods can be used for each unit of analysis, ranging from historical to interview analysis (Section 3.4.3).

3.3.1 Case selection

As explored in Chapter 2, the leapfrogging concept presents opportunities for developing new pathways to sustainable living by learning from the mistakes of other communities. Nevertheless, understanding how cities can bypass 'dirty' development stages is still in a nascent form and remains limited to practice-based literature (Poustie *et al.*, 2016). Since this research aims to engage with and influence real-world situations, the use of an empirical case study is revelatory in understanding the leapfrogging concept. The use of a case study that provided a new opportunity to study how to deliver a sustainability leapfrogging pathway was essential.

Surabaya, the second-largest city in Indonesia, is considered a secondary city (i.e. a medium-size urban area[12]) based on the 3 million inhabitants the city is estimated to have (City Government of Surabaya, 2016a). Investigation in secondary cities has become an important focus for research into urban issues in the developing world (Milukas, 1993; Roberts, 2014). The reasons for this are mainly that secondary cities are expected to outpace the population growth of primary cities (Milukas, 1993; Roberts, 2014); perform important functions in promoting regional development for widespread economic and social development (Rondinelli, 1986); have the advantage of learning from primary cities (Biswas and Hartley, 2013; Roberts, 2014); and if strengthened in appropriate ways (e.g. planned and managed appropriately), these cities can serve as a model for sustainable development (Rondinelli, 1986; Biswas and Hartley, 2013).

On this last premise, the main rationale for selecting Surabaya as an embedded single-case study was due to its reportedly innovative and unique approach towards rapidly transforming (in a period of 5-10 years) some kampung areas into sustainable environments (UN-HABITAT, 2008; Joss *et al.*, 2011; Urban Redevelopment Authority, 2018; World Cities Summit, 2018). According to Scholz & Tierje (2002), ground-breaking cases provide the soil to uncover ill-defined problems. These types of problems often arise in "young sciences" where the concepts remain limited or vague, e.g. (for which leapfrogging is a clear example); and sciences that deal with real-world problems, such as environmental sciences that engage with sustainability (Scholz and Tierje, 2002, p. 26). Therefore, selecting a ground-breaking case study that provided an opportunity to learn about leapfrogging was fundamental for this research.

The city of Surabaya has been recognised as one of the most environmentally sustainable cities in South-East Asia due to the innovative strategies employed to effectively plan, design and manage the city's spatial development (Aleluia and Ferrão, 2016; ASEAN Secretariat, 2017; Global Forum on Human Settlements, 2017). The city's strategies for environmental management are challenging conventional trajectories of development through hands-on city government leadership, cooperation between different stakeholders for the restoration of green open spaces and grassroots innovations (UN-HABITAT, 2008; Joss *et al.*, 2011;

[12] Megacities are defined as having 10 million or more inhabitants; large cities as having 5 to 10 million inhabitants; medium cities as having 1 to 5 million inhabitants; and small cities as having 500,000 to one million inhabitants (United Nations, 2019d).

Bunnell *et al.*, 2013; Global Forum on Human Settlements, 2017; Guangzhou Institute for Urban Innovation, 2019). According to Global Forum on Human Settlements (2017) and Urban Redevelopment Authority (2018), the government's approach to implementing different programs, such as SGC, helped with the sustainable upgrade of the kampungs' environments.

Surabaya's efforts to manage the 'green and clean' (e.g. increase vegetation in the neighbourhoods and minimise hard rubbish) of more than 30 per cent of all kampungs (Bunnell *et al.*, 2013) consisted of a unique, independent, community-based waste management system that involved a great deal of community participation (Chapter 5). For instance, by revitalising gas stations and other areas into public parks, resulting in approximately 100 active parks across the city (Urban Redevelopment Authority, 2018). Furthermore, in contrast to other Indonesian cities (e.g. Depok), where the solid waste has increased by 2 to 4 per cent annually (Aprilia *et al.*, 2012; Kristanto *et al.*, 2015), Surabaya's practices managed to reduced municipal solid waste by 10 per cent annually (Damanhuri *et al.*, 2014; Metropolis, 2019). Other comparisons include the optimisation of the city's open green space, achieving 35 per cent of total land area (Global Forum on Human Settlements, 2017), compared to Jakarta's open green space estimated between 5 and 11 per cent (Ramdhoni *et al.*, 2016; Setiowati *et al.*, 2018).

Surabaya's efforts towards becoming an ecological city (Silas *et al.*, 2014) have also made the city more liveable. According to reports from the Guangzhou Institute for Urban Innovation (2019) and Metropolis (2019), Surabaya's programs contributes to: SDG11 by making the city and the community more sustainable; SDG7 by creating affordable energy sources; SDG6 by improving sanitation and ensuring adequate hygiene; and SGD3 by improving the residents' health and well-being through reduced waste. Most significantly, the combination of good governance, planning, resilience, innovation and inclusiveness in the city's development has improved the inhabitants' quality of life (UN-HABITAT, 2008; Tanu and Parker, 2018; World Cities Summit, 2018).

The success of Surabaya to engage people in the implementation of the different programs (explored in Chapters 4 and 5) has facilitated the transformation of Surabaya into a healthy, aesthetically, safe and comfortable city (ASEAN Secretariat, 2017; Guangzhou Institute for Urban Innovation, 2019) and the rapid transition of certain kampungs to greener and cleaner spaces (UN-HABITAT, 2008; Bunnell *et al.*, 2013; Global Forum on Human Settlements, 2017). These strategies have been included in UN-Habitat's database for urban best practice (UN-HABITAT, 2008) and have attracted visitors from various regions who feel inspired by the city and replicate the initiatives (UN-HABITAT, 2008; Joss *et al.*, 2011; Guangzhou Institute for Urban Innovation, 2019). The city has also received a host of environmental awards[13] at national and international levels, including the Dubai International Award for Best Practices to Improve the Living Environment in 2008; the Adipura Award in 2009; the ASEAN Environmentally Sustainable City Award in 2011; the Global Green City Award in 2017; the Lee Kuan Yew World City Prize in 2018; and the Guangzhou

[13] For more information on the city's awards, please refer to Surabaya's city government official website. City Government of Surabaya (2019) List of Surabaya achievements each year, <https://surabaya.go.id/id/page/0/49215/penghargaan>

International Award for Urban Innovation in 2018. Moreover, Surabaya's 'green and clean' reputation has enabled the city to host many international events on environment and sustainable cities such as the Citynet 25th Anniversary Celebration and International seminar on Environment in 2012; 14th Informal ASEAN Ministerial Meeting on the Environment in 2013; 5th High-Level Seminar on Environmentally Sustainable Cities in 2014; the 5th Regional 3R Forum in Asia and the Pacific in 2014; the Preparatory Committee of Habitat III in 2016; and the 7th United Cities and Local Governments Asia Pacific Congress for Sustainable Cities in 2018.

Yet, in the midst of all these achievements, the Surabaya Government has been criticised for the uneven outcomes in the city's spatial planning (Novalia, 2018; Novenanto, 2019), or as Das (2017, pg. 1) puts it: "a city of two tales". The city government's control over spatial planning remains strongly top-down. Critics have warned that this approach has impacted the contestation of power over urban spaces by restricting the representation of the poor (Das, 2017; Novenanto, 2019), concentrating power in elites, and creating uneven outcomes in the city's development (Das, 2015a; Novalia, 2018). The lack of effort for understanding the socio-cultural dimensions of all its inhabitants (e.g. squatter and poor migrants) places the credibility of the government's pro-poor shelter improvements (e.g. Kampung Improvement Program - KIP) achievements at risk (Das, 2017; Das and King, 2019; Novenanto, 2019). This is compounded by a weak monitoring and low enforcement of private sector developer obligations towards contributing to the city's green open spaces and is in contrast to the high-level expectations expected from low-income developments (Novalia, 2018). Therefore, whilst the data analysis is focused on understanding the successful elements of the 'green and clean' transformation of kampungs and the broader metropolitan city, this should be interpreted in conjunction with an awareness of the existing criticisms of the government's actions.

3.3.2 Surabaya: The setting

The city of Surabaya, also known as the City of Heroes[14] is located on the northern coast of East Java (Figure 3.2), is one of the largest urban centres of Indonesia. As a historic port, it has served as and continues to be, the main urban centre for trading, manufacturing and business services for Eastern Indonesia (Dick, 2002; Idawati, 2015). Whilst the economic growth in Surabaya is approximately seven per cent annually (Pamungkas *et al.*, 2017), the impacts of the economic performance varies in terms of development. Like most developing cities, Surabaya is not sufficiently equipped with necessary urban infrastructures (JICA, 2007; ADB, 2012) such as drainage or urban roads. Consequently, the city has received international assistance from multilateral and bilateral organisations to implement different urban development projects. For example, the Kampung Improvement Program (World Bank, 1990); the Surabaya Urban Development Project (JICA, 2007); the Indonesia Infrastructure Initiative (DFAT, 2016); the Water and Sanitation Program (World Bank, 2001); and the Green Schools Program (UNESCO, 2014).

[14] Surabaya is dubbed the City of Heroes due to heroic actions and braveness of the *arek Suroboyo* (people of Surabaya) that took place at the Surabaya Battle in1945 (City Government of Surabaya, 2016c).

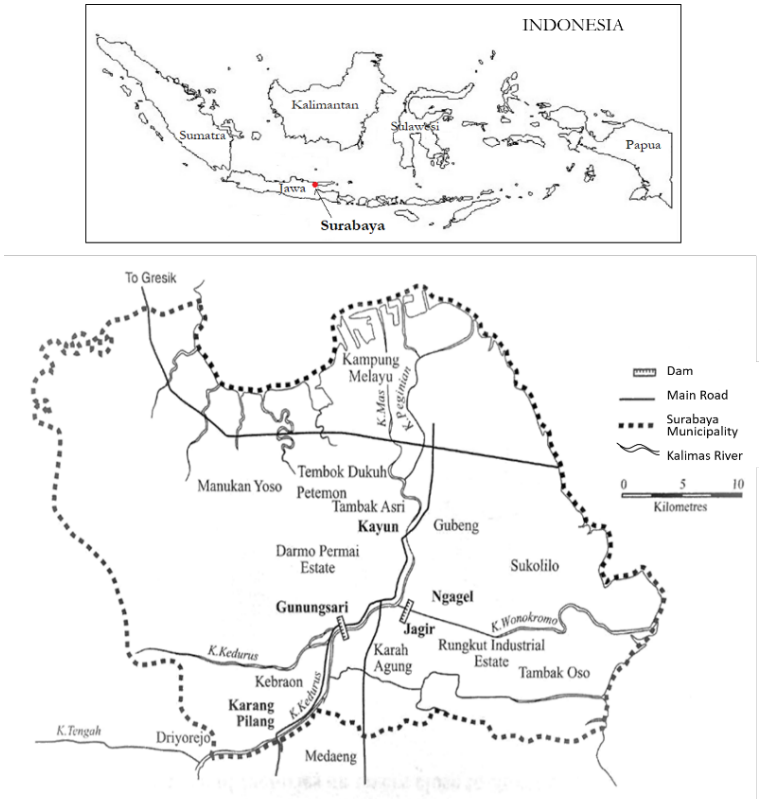

Figure 3.2 The city of Surabaya (Lucas and Djati, 2007)

A decentralisation reform implemented in Indonesia in 1999 eliminated the highly centralised relationships between central and local governments. In accordance with Law No. 32/2004 (regional autonomy), local governments were given the right, authority and obligation to execute and regulate a wide range of responsibilities in areas such as health, education, public works, environment, land, infrastructure services. This represented an opportunity for city *(kota)* governments to plan and manage development in the region with the hope of providing better local service delivery (Nasution, 2016; Suryaningsih *et al.*, 2018). The administrative structure (Figure 3.3) has four sub-levels, including the district (*kecamatan*), sub-district (*kelurahan*), community associations (*rukun warga* – RW) and neighbourhood associations (*rukun tetangga* – RT). In accordance with National Regulation No. 18/2016, the first two levels are formed to improve governance coordination, public services and empowerment of village communities. These levels are led by public officials appointed by the city government, the head of district (*camat)* and the head of sub-district *(lurah*). Community and neighbourhood associations (RT and RW) are created by a registration process undertaken by residents. A neighbourhood association must comprise a minimum of 40 households, and community associations have a minimum size of four neighbourhood associations. Both levels are managed voluntarily by community representatives. In Surabaya, local departments and agencies primarily collaborate with the different governmental sub-levels to implement and evaluate policy changes and actions that could affect the blue and green services. The city comprises a total of 31 districts, 154 sub-districts, 1405 RW and 9271 RT (DKP Surabaya, 2015).

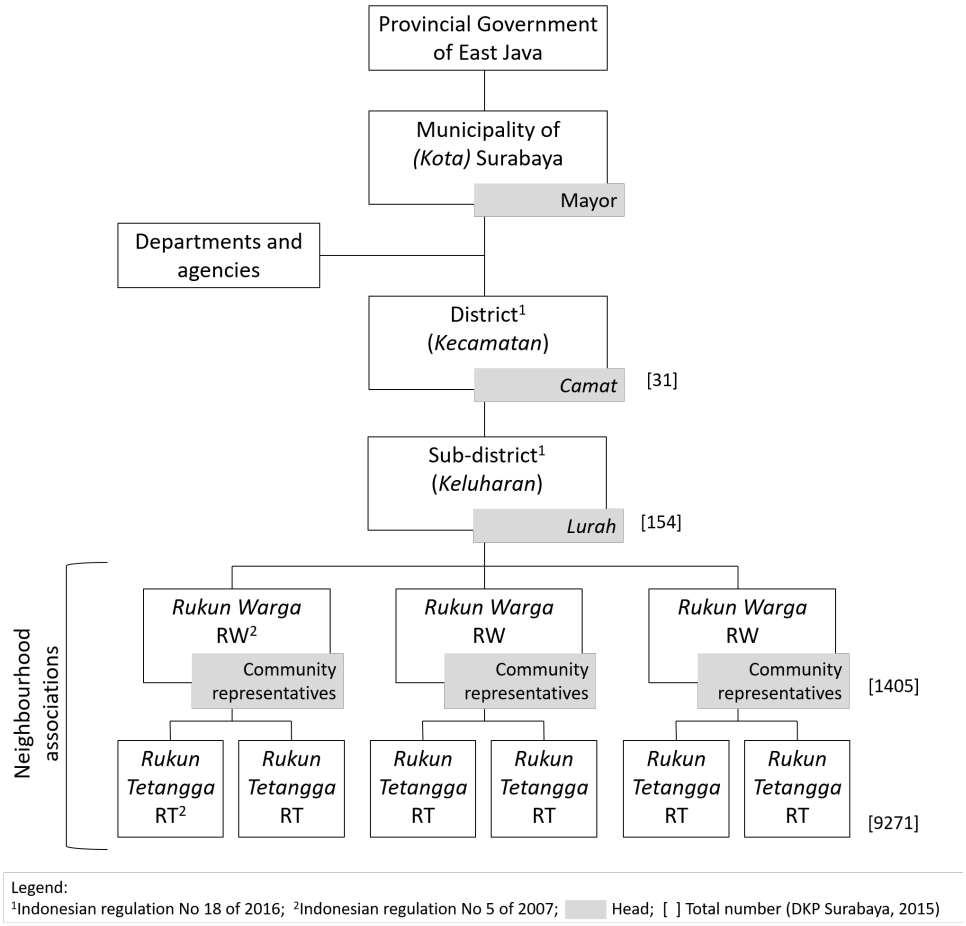

Figure 3.3 Administrative structure of the city of Surabaya

Surabaya is the second most populous city in the country with approximately 3 million inhabitants (City Government of Surabaya, 2016a), and the population is expected to surpass 3.5 million people by 2030 (Dispendukcapi, 2017). A large proportion of the population is concentrated in the city centre, and in some areas, population density can be as high as 8000 persons per km^2 (World Bank, 2012). Population growth in Surabaya has been primarily driven by the rising number of unregistered migrants (Idawati, 2015). As such, the registered population does not represent Surabaya's total population. Whilst the data are unclear, registered residents are individuals who hold government-issued residency cards, normally given to residents living in legal settlements, and this does not account for the number of individuals living in illegal settlements (Das, 2017). The considerable number of migrants attracted to Surabaya has contributed to Surabaya's economic profile and has also contributed to growth in slum areas (Silas, 1989; Ostojic *et al.*, 2013). An estimated population of 200000 to 300000 people are considered unregistered inhabitants living in slum areas (Das, 2017).

Culturally, the city of Surabaya is considered multi-ethnic, with Javanese as the dominant ethnicity. Surabaya's cultural root originates in the Javanese sub-culture, *arek*. A direct translation for the word *arek* to English does not exist. However, literature and interviewees interpret it as the spirit of egalitarianism (Silas *et al.* 2012), rooted in the identity of fighting spirits who live along the Brantas River (City Government of Surabaya, 2016c). This strong character is reflected in *arek Suroboyo*, which refers to the personal characteristics of

Surabaya's people, as brave, honest, fearless, loyal, egalitarian, and solidarity; open to society and change; and that believes in equality, and holds a sense of civic pride (Gervasi, 2011; Wijayanti and Suryani, 2015; City Government of Surabaya, 2016c). This identity also includes the Indonesian belief of *gotong-royong* (mutual assistance or cooperation). This value represents an indigenous cultural tradition that describes the value of mutual cooperation manifested in the principle of individual reciprocity to do something collectively towards the benefit and mutual interest of the community (Bowen, 1986; Slikkerveer, 2019). In Surabaya, particularly in kampungs, ethnic identities and local culture remains strong (World Bank, 1995; Dick 2002).

Kampungs have a rich history that predates rapid urbanisation and planned urban development (Das and King, 2019); as such they are an important feature of Surabaya's modern urban development, as they embody the traditional heritage and *arek* culture. The word kampung translates to village or traditional neighbourhood; however, it is often identified as a slum or squatter settlement. This denotation most likely derives from colonial times, where kampungs were considered slum areas due to the poor physical and socio-economic conditions associated with these areas. Nevertheless, this perception remained post-Independence as programs like the KIP were promoted as an effective strategy for pro-poor urban slum upgrades (Silas, 1988; World Bank, 1995; Das, 2017). According to Dick (2002), it was not until 1969 that they gained municipal recognition as viable living environments rather than slums. The perception of kampungs have come a long way, to the point of being internationally recognised as sustainable living areas (explored in detail in Chapters 4 and 5). For the purpose of this research, I follow Silas *et al.* (2012, p. 9) definition of urban kampungs, who notes that whilst not administratively recognised, kampungs are "neither squatter nor slum, but a form of unique settlement built by its inhabitants mostly long before the city existed, therefore do not follow the formal building construction code that came much later" (unless otherwise stated – e.g. Chapter 4 discusses kampungs as slums in line with the government's recognition prior to 1969). Kampungs comprise only seven per cent of the total urban area but house 63 per cent of the population, mostly from low-to-middle income groups (Naik, 2014). The existence of these traditional neighbourhoods has played a significant role in the development of the city's landscape (Idawati, 2015).

3.3.3 Surabaya's blue-green services

Surabaya has unique features of river, canal and oceanfront areas; however, the fast-growing demand has remained a limitation in supporting the water supply for the city. The Brantas River is the longest river in East Java, providing water for approximately sixteen million people, but rapid population growth and industrialisation has impacted the quality of the water (Pangare *et al.*, 2013). The Brantas River branches into the Surabaya River and the Porong River. The Surabaya River has a basin of 650 km^2 that is the city's main water source (Shirleyana and Sari, 2012; Pamungkas *et al.*, 2017). This river is further divided into the Kalimas River and Wonokromo River. The Kalimas River is approximately 12 km long and flows from north to south through the centre of the city (Figure 3.2), attracting many informal settlements. Additional water resources come from several springs in Pandaan and the Umbulan Spring. In some parts of the city, kampung communities collect rainwater to supplement water supply (Chapter 5).

The regional drinking water company (PDAM) reported a water supply coverage of 95.51 per cent of the registered population in 2016 (PDAM Surabaya, 2017). Under Regional Regulation No. 13/2014, the Surabayan government established the production and distribution of drinking water by PDAM. Whilst the distributed water is mainly used for cooking, showering and washing, most of the city's population (84.70 per cent) purchases water that has been additionally treated for drinking (BPS Surabaya, 2017; Pamungkas *et al.*, 2017). Conversely, the unregistered population relies on untreated water supplied directly from the river.

The city has no sewerage infrastructure, and wastewater is currently managed through septic tanks (98.40 per cent of households) (BPS Surabaya, 2017). The proportion of households with toilets is 70.95 per cent, common in conventional dwellings such as detached houses or apartments; shared private facilities is 25.62 per cent; and 3.43 per cent of households, predominantly in informal housing units, are still openly defecate in rivers and canals (BPS Surabaya, 2017). Health and sanitation, therefore still represent a significant challenge for the city, including the contamination of water supply from septic tank seepage, contaminated landfill leachate (Ostojic *et al.*, 2013), lack of treatment of wastewater sludge (World Bank, 2012) and severe pollution of the waterways (Lucas and Djati, 2007). In addition to domestic wastewater, industrial waste is regularly discharged into the Kalimas River, despite national regulation of wastewater disposal (Ministerial Regulation No. 3/1998). Nonetheless, the Surabayan government also regulates the technical implementation of services in buildings, such as wastewater treatment on-site (City Government of Surabaya, 2013).

Urban green space development has been a challenging task for Indonesian city governments due to the low availability and high prices of land around urban centres (Hasyimi and Abi Suroso, 2017). An example of this is Surabaya, where 90 per cent of the existing land is developed (Siswanto *et al.*, 2014). To overcome this, the national government proclaimed Law No. 26/2007 on Spatial Planning, emphasising the importance of sustainable urban development and enhancement of the quality of the environment by making sufficient green open spaces available. The legislation provides a legal anchor for the provision of urban green spaces, where at least 20 per cent of the total area of the city should cover public green spaces and 10 per cent, private green spaces. Currently, Surabaya's green space has surpassed this target, reaching 35 per cent of the total land area (Global Forum on Human Settlements, 2017).

According to the last city profile developed by the City Government of Surabaya (2016), Surabaya's green space includes urban parks, urban forests and numerous public spaces spread throughout the city. Currently, the city has a total of 372 urban parks, 100 of which are active parks, and 272 remain passive or as parks for ecological and greenery purposes (Urban Redevelopment Authority, 2018). The eastern area of the city preserves 2800 ha of mangrove forest (Global Forum on Human Settlements, 2017), contributing to the largest mangrove conservation of East Java (Hakim *et al.*, 2017). Other green public spaces include trees and flower beds along streets and alleys, and urban farming in kampungs (Chapter 5). The total public green area in Surabaya has increased since 1995 (earliest data) from 3172.81 ha of the total city area to 7267.72 ha in 2016 (Table 3.1).

Table 3.1 Green open space development in Surabaya (Zaky, 2012; Bappeko, 2017)

Type of Green Open Space (GOS)	Total area (Ha)								
	1995	2009	2010	2011	2012	2013	2014	2015	2016
Cemetery	191.95	228.67	228.67	228.67	228.67	228.69	284.11	281.55	283.53
Stadium and sport field	123.83	346.47	346.47	346.47	346.47	346.47	346.55	346.55	350.34
Reservoir and boezem	-	144.33	144.33	144.33	144.33	144.33	176.42	176.42	191.86
GOS from public facility	-	114.29	117.19	117.19	117.27	133.57	151.33	160.43	204.61
Protected area	942.33	4197.34	4197.34	4197.34	4197.34	4198.54	4198.54	4198.54	4548.59
Forest	379.07	41.89	41.89	41.89	41.89	41.89	41.89	41.89	45.23
Park and green lane	1535.63	1603.56	1604.36	1605.46	1518.89	1623.28	1641.2	1647.71	1643.55
Total area of GOS (Ha)	**3172.81**	**6676.55**	**6680.25**	**6681.35**	**6694.86**	**6716.77**	**6840.04**	**6853.09**	**7267.72**
Percentage of total area for GOS to total area of the city	**9.6**	**20.2**	**20.21**	**20.22**	**20.26**	**20.32**	**20.7**	**20.74**	**21.73**

In terms of solid waste management, Surabaya's population generates an average of 0.58 kg/person/day, which is approximately 1782 tonnes of waste daily throughout the city (Bercegol *et al.*, 2017). Until 2001 most of the collected waste was disposed into Keputih landfill; however, following a waste crisis, the city started a process of redemption (Chapter 4). Currently, collected municipal solid waste is transported to the only operating landfill of the city, Benowo, located in the northwest of Surabaya. Research from 2005 to 2011 showed a significant reduction of waste transported to final disposal (Figure 3.4) (Hilman, 2012; Wijayanti and Suryani, 2015). This indicator of success is attributed to the many programs implemented by the city (Chapter 4). Nevertheless, Surabaya's only landfill accepts hazardous, septic and non-compostable waste that remains untreated, posing contamination and disposal issues (World Bank, 2012).

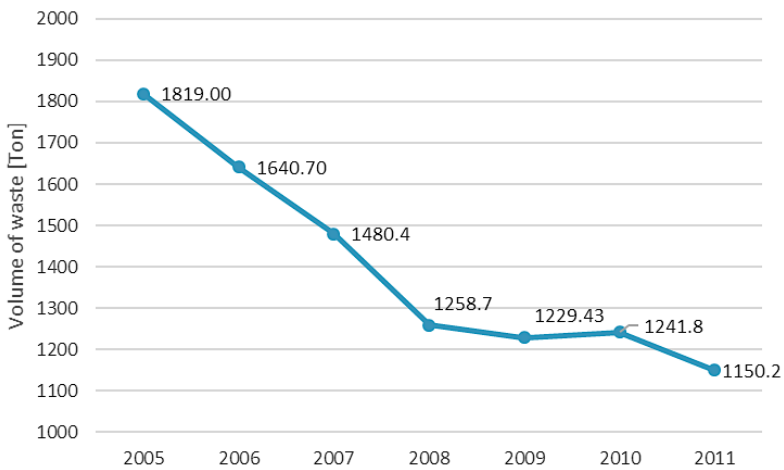

Figure 3.4 Decreasing waste tonnage in Benowo landfill (Hilman, 2012; Wijayanti and Suryani, 2015)

Surabaya's municipal waste consists of approximately 60 per cent organic material and 30 per cent recyclable material, such as paper and plastic (Gilby *et al.*, 2017). The predominance of organic waste makes the implementation of composting strategies ideal. Surabaya has an estimated 19000 composting bins across the city to encourage household composting and 21 small-scale composting centres to treat green waste (IGES, 2017). Whilst the municipal service collects nearly 85 per cent of the city's waste (1529 tons/day), approximately 15 per cent (232 tons/day) is recovered by the residents through waste banks (Bercegol *et al.*,

2017). Waste banks have been established in the city to promote waste segregation at the source; residents separate recyclable items at home and deposit these at the waste bank; waste is sold to recycling companies, and the money returns to the community's waste bank for environmental improvement (Chapter 4 and 5). Waste banks are managed solely at the kampung level as small-scale entrepreneurship. According to Wijayanti and Suryani (2015), middle-to-high income residential communities do not participate in the waste bank initiative since they have a settled economy.

The changes, particularly in the increased level of vegetation, water management practices, green open spaces and waste management, make Surabaya an ideal case study for exploring the aims of this research. Understanding how these changes have taken place, what has driven the changes, who was involved and what strategies were used, forms the foundation of this research. These insights inform a generalisable theoretical framework for facilitating these types of urban sustainability transitions (i.e. sustainability leapfrogging) in developing cities.

3.4 Research design

In order to meet its objectives, the research involved three distinct phases. An overview of the research design of this project is presented in Figure 3.5.

The first phase draws on scholarship from leapfrogging and transitions to develop the theoretical foundations for the research. The literature review contributed to the achievement of Objective 1, which consisted of two components: i) a critical review of leapfrogging scholarship that utilises a scoping study methodology to examine both the conceptual foundations (and limitations) of current scholarship and the existing evidence of enabling factors for leapfrogging, and ii) the identification of conceptual and analytical tools that may be valuable for addressing knowledge gaps within leapfrogging literature.

The second phase involved data collection and analysis of a single embedded empirical case of blue-green services management in Surabaya. This included two sequential parts: i) a historical analysis constructed through a chronological narrative of the key urban blue-green development strategies, and ii) a narrative analysis to identify enabling factors and actor strategies that occurred for kampungs to leapfrog to sustainable kampung environments. The research was informed by primary and secondary data collected between 2016 and 2018 (detailed in Section 3.4.2). The data collected and analysed in this phase of the project form the basis of Chapters 4, 5, 6, and 7, which report the research findings and support Objectives 2 and 3, whilst contributing to Objective 4.

The third and final phase, discussion of results and synthesis, reflects on the insights gathered in the first two phases of the project to provide a theoretical development of leapfrogging and extension of transitions scholarship. Similarly, actions to support strategic planning needed to rapidly achieve sustainability outcomes are identified and developed into a preliminary operationalisation framework.

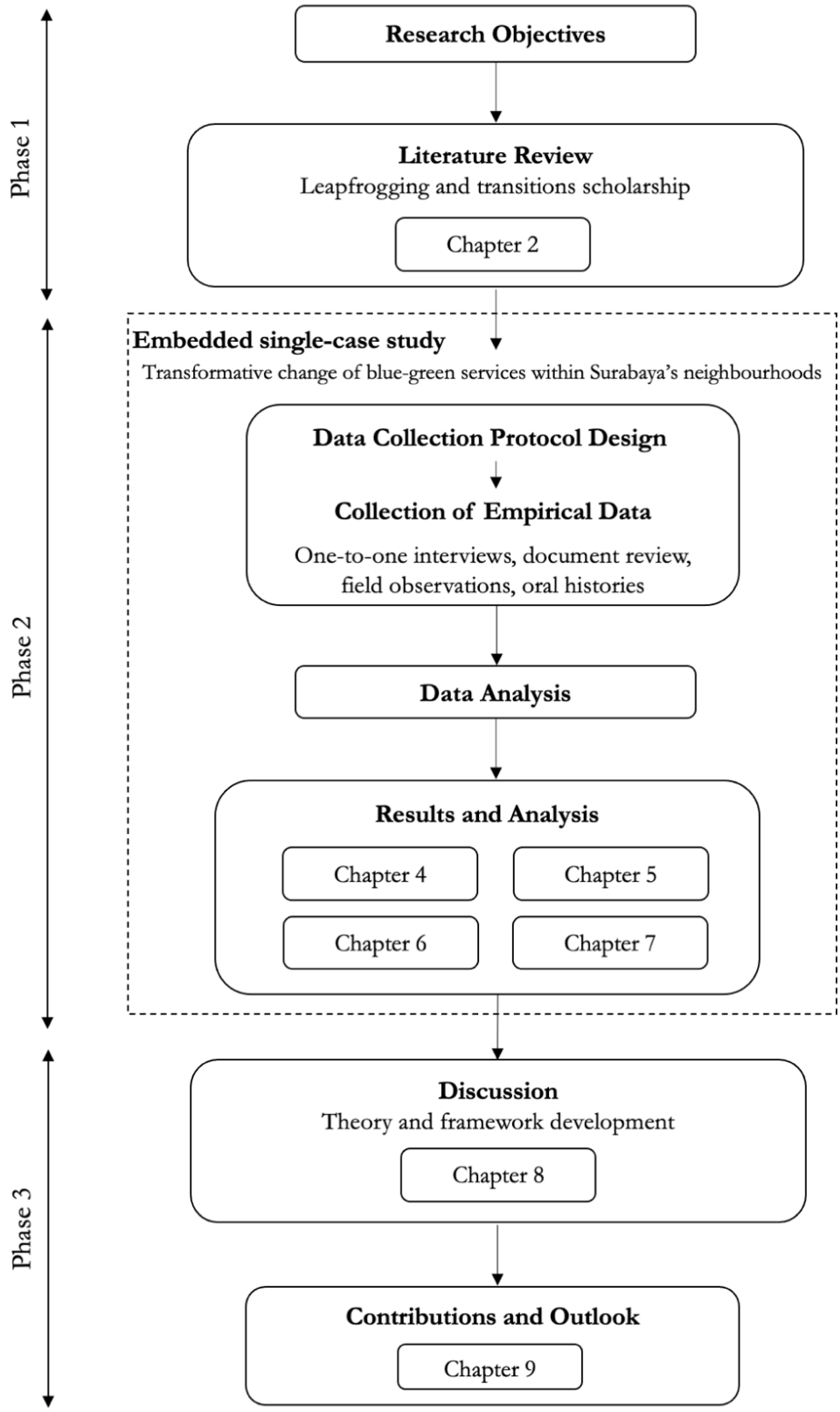

Figure 3.5 Research design

3.4.1 Ethical considerations

Social research is governed by the application of ethical principles to the various issues that arise at different stages of the research. To meet ethical requirements, I followed Bryman's (2012) four ethical principles: research participants should not be subjected to harm; full consent should be obtained from the research participants prior to the study; protection of the research participants' privacy has to be ensured, and any deception about the research must be avoided. To ensure that this research adheres to the highest standard of human research ethics, the Monash University Human Research Ethics Committee (MUHREC) approved the research strategy and all procedures associated with the interviews in March 2016, under the project number CF16/491-2016000244. As part of the research protocol, interviewees were presented with a MUHREC-approved research explanatory statement and consent forms to provide detailed information regarding the purpose of this research. Both documents were prepared in Bahasa and English to secure full understanding of the project according to the participants' native languages. The explanatory statement outlines details about the potential benefits and risks to participants envisaged from participation and the confidentiality and storage of data adopted in this project. Participants were given time to read through these documents at the beginning of the session, after which they could ask any questions, off-the-record discussion or withdraw their consent at any point during the interview. To comply with privacy principles, interviewees were guaranteed anonymity and confidentiality to maximise freedom to speak openly with the researcher. As such, participants remain unharmed as only statements for which consent was given are published in this research.

Cross-cultural research is fraught with ethical challenges, as occur in diverse socio-political, cultural and linguist contexts (Honan *et al.*, 2013; Durham, 2014). However, in the face of globalisation, the rewards are significant as cross-cultural research provides an opportunity to develop and advance useful knowledge (McDonald, 2000). Cross-cultural research requires the acquisition of knowledge of the social group that researchers wish to learn from (Honan *et al.*, 2013). As an outsider to the Indonesian context, I can relate to these statements. Although I found the language barrier challenging, the fieldwork was a rewarding experience, and Surabaya was a unique case I wanted to learn from. I come from Bolivia, a developing country that shares similar challenges to Indonesia, including critical economic issues, bureaucratic corruption and basic infrastructure deficiencies, and similar strengths such as a strong network of social support and survival values (Inglehart and Baker, 2007; Minkov, 2013). Therefore, my intrinsic understanding of the relevant issues helped me to better grasp the socio-political structures and enabled me to deeply appreciate Indonesian culture. This was further enhanced by the support of local research partners and a preliminary scoping visit for context familiarisation and networking conducted from May – June 2016.

The official language of Indonesia is Bahasa Indonesia, and most government documents are written in this language. Aside from speaking the national language, most Indonesians are fluent in at least one of the more than 700 native languages (Lewis, 2009). In Surabaya, people speak Javanese. The language barrier presented a significant challenge during fieldwork because I have limited fluency in the local languages. To overcome this limitation, I followed core cross-language qualitative research methods on conceptual equivalence and

the role of interpreters in the research (Squires, 2009; Squires *et al.*, 2019). This helped to ensure that the participants' ideas contributed to the evidence informing this research.

Conceptual equivalence refers to the level of technical and conceptual accuracy of the translation (Squires, 2009). The dilemma with this concept, however is what Temple and Young (2004) describe as: "in absolute terms an unsolvable problem" since "almost any utterance in any language carries with it a set of assumptions, feelings, and values that the speaker may or may not be aware of but that the fieldworker, as an outsider, usually is not" (p.165). Nonetheless, Squires, Sadarangani and Jones (2019) suggest that to achieve the aspirational goal of conceptual equivalence; the researcher should include the following methodological criteria: validate the translation by a qualified bilingual individual; hire professional transcription services; achieve consensus around the translation of culturally unique words; and pilot test the translated interview guide prior to conducting the study. In conclusion, securing the services of a reliable interpreter is key to this type of research as the interpreter plays an important role in the research process. My approach to adopting these recommendations is explained in the following paragraph.

This research was fortuitously part of a research collaboration between Australian and Indonesian universities funded by the Australian-Indonesian Centre, affording me the opportunity to work with local researchers and form part of a team that included Indonesian colleagues. These colleagues helped me understand the Indonesian context and evaluate my chosen interpreter. After a thoughtful process, I decided to engage the services of an in-person interpreter, an individual who has received specialised training (Squires *et al.*, 2019) on environmental concepts such as sustainability, and has socio-linguistic language credentials and experience (Temple and Young, 2004; Squires, 2009). I was also fortunate to encounter a local interpreter, Mrs Diana, who supported me with live interpretation during interviews, kampung and organisations visits, and translation of a variety of documents and completion of the transcriptions. In line with my philosophical approach, I accounted for the effects of the interpreter's identity. This approach helped integrate the cultural interpretation of the participant's statement into the data (Squires, 2009; Hole, 2015) and elucidate meaning from the data (Hennink, 2008). Consequently, after each interview, I met with the interpreter to discuss whether the language used by participants carried particular socio-cultural meaning and inherent values and beliefs that might be important for the interpretation and analysis of the data. To reflect this, expressions in Bahasa Indonesia have been included throughout the thesis.

3.4.2 Data collection

Case study evidence typically combines data collection methods from a wide variety of sources including archival records, interviews, surveys, visual methods and participant observation (Gray, 2014; Yin, 2018). Accordingly, this research was informed by multiple sources of evidence, including documentation, interviews and direct observation to overcome potential issues with self-reported data (Yin, 2018). Collection and analysis of primary and secondary data was undertaken in the second research phase (Figure 3.5) between May 2016 and December 2017. In line with the pragmatic philosophy, data collection was alternated with periods of data analysis, facilitating immersion in the case-study context and subsequent reflection on and refining the research strategy.

Secondary data, including documentation and direct observation, were collected to build a deeper understanding of the general city context and construct a chronology of change in Surabaya. This information was used to test, corroborate and augment primary interview data. The process began with a desktop review of available English documentation of Surabaya's demographic, governance structure, and infrastructure. The preliminary scoping fieldwork (May to June 2016) was useful for identifying stakeholders; key historical and contemporary secondary data, including academic literature, policy and regulatory documents; organisational reports and presentations; media materials; and other documentation covering Surabaya's process of change. The documentation was collected through desktop searches of the internet, academic databases and private libraries of individuals or organisations. This information was translated, compiled and catalogued for reliable access during the research.

Another source of evidence acquired was direct observation. According to (Yin, 2018), observational evidence is useful for providing additional information regarding the line of inquiry and can add new dimensions for understanding the context and the phenomenon being studied. As such, observational instruments were developed as part of the case study protocol to concretely connect the participants' narratives with the broader socio-spatial realities that individuals inhabit. This included site visits to several SGC winning kampungs (Chapter 5), local public parks and composting centres, observation of local community meetings (*musrenbang*[15]) and SGC roadshow events. These observations were recorded through photographs and notes to show evidence of the physical blue-green improvements achieved by the different 'green and clean' strategies.

Primary data were collected through semi-structured, in-depth interviews with participants who had been directly involved in the kampungs' blue-green transformation over the relevant period. In total, 37 in-depth interviews were conducted to capture perspectives from the state government, the private sector (including media), the community, NGO's, bilateral organisations and academia. Participants were selected through a purposeful sampling technique that included a peer recommendation snowball sampling process (Patton, 2015). Some assistance to recruit potential interviewees was obtained through the AIC project's partnering universities in Indonesia (Insitut Teknologi Sepulah Nopember, Institut Pertanian Bogor, Universitas Indonesia), particularly to access government officials, and have a direct connection with academics, some of which are considered experts on the subject (e.g. Prof. Silas). On-ground networking during fieldwork, such as attending local events (e.g. Surabaya Road Show), helped extend the list of potential participants, particularly at the grassroots level (e.g. community individuals).

The participants held middle-to-senior level positions ranging from policymakers (including the city mayor) to technical advisors, business executives, project managers, community leaders, community members, environmental activists and independent experts. A summary of the interview details, including the type of

[15] *Musrenbang* (development planning meeting) is an annual process during which residents and the local government meet to discuss relevant community issues and decide on priorities for short-term improvements. The process includes smaller meetings in the villages, to which the community invites academics and other experts for consultation.

organisation the interviewee represented, respective organisation code and a number of interviewees from each stakeholder group, is presented in Table 3.2.

Table 3.2 Interview details

Stakeholder group	Reporting code	Number of interviewees
Government officials, including city mayor (n=1); public officials working in specific departments across the city and at the national level (n=13), such as Regional Planning Agency, Regional Secretariat, Cleaning and Landscaping Agency, Environmental Agency, Public Works, Land Department, Agriculture Department, Local Water Company	GO	14
Academics and experts from local universities	AR	6
Community leaders and environmental activists	CM	7
NGO representatives	NGO	3
Individuals from private sector, including private developer (n=1); business executive (n=2); local news editor (n=2)	PS	5
Representatives of bilateral organisations	BDO	2

An initial round of interviews was carried out during the first data collection campaign undertaken from January to February 2017. This campaign was useful for conducting scoping interviews (Robertson *et al.*, 2012) to evaluate, establish and refine the research line of inquiry. This process allowed me to ask questions that satisfied the line of inquiry while simultaneously making the interviewee feel comfortable with the questions, a method suggested by (Yin, 2018). The refinement of my interviewing skills following an open-ended, free-flowing interview stimulated interviewees to provide detailed narratives regarding the key strategies that promoted the sustainability transformation of kampungs. The types of questions asked in the interviews followed Bryman's (2012) guidelines on interviewing in qualitative research. These included introductory questions (also known as icebreaker questions), followed by contextual questions regarding the background that shaped the strategies, specific questions addressing 'how and why' reasoning, and finally, ending questions provided the interviewee with the opportunity to share final reflections. A set of guiding questions was prepared in advance to help conduct the interviews. Intensive data collection took place during the second campaign, between September and December 2017, at which most of the interviews were conducted. The 37 in-depth interviews were conducted during the two campaigns.

Generally, interviews took place in settings that would be most comfortable and convenient for the participant, such as the participant's workplace or residence, except for four interviews that were conducted in a private room during a seminar event. Interviews ranged from 45 to 90 minutes long. Twenty-six interviews were conducted in Bahasa Indonesia with the collaboration of an interpreter (Section 3.4.1), and 11 were conducted in English, either because English was the participant's native language or because the participant felt confident with English expression. The interviews were audio-recorded, with written consent of participants and transcribed *verbatim* by the interpreter (and translated if the interview was in Bahasa Indonesia) or by me if the interview was conducted in English. In conjunction with the interpreters' notes, I took detailed notes during interviews to capture initial reflections and memorable phrases, such as quotes and keywords that were documented for further analysis.

3.4.3 Data analysis

This section describes the overall analytical approach adopted in this research. Additionally, specific data analysis methods are reported for the publication included in this thesis. Data analysis followed a grounded theory strategy (Corbin and Strauss, 2008; Bryman, 2012). Data analysis was a continuous iterative process of examining evidence to find common patterns and divergent views representing rival explanations (Neuman, 2011; Miles *et al.*, 2014; Yin, 2018). The theoretical framework for this research provided the thematic grounding for exploring themes, concepts and processes surrounding leapfrogging, which was particularly useful in identifying patterns related to leapfrogging literature (Chapter 2). This allowed the subsequent augmentation of interview themes to encompass new emergent themes as the analysis developed (Neuman, 2011; Bryman, 2012). This step and the following data analysis were performed using NVivo 12 qualitative data analysis software.

Qualitative data, including the content of the interview transcripts and secondary documentation, were initially analysed to construct a chronological account of the blue-green urban development initiatives that set the foundation for Surabaya's kampung upgrading since 1945 and a more detailed view on changes after the SGC program was implemented between 2005 and 2017. Numerous analytical approaches were used to develop the case narrative, including developing a descriptive case framework and conducting a time-series analysis to trace how events unfolded over time (Neuman, 2011; Yin, 2018). This provided a richer and more insightful basis for examining the description of events and the analysis of causes (Gray, 2014; Yin, 2018). Therefore, the chronological narrative was used as a base for mapping and analysing the transition process of Surabaya, including the structure and practice changes, development of areas and programs, behavioural events and institutional change mechanisms.

The next phase of data analysis involved coding the raw data. Coding is a key analytical process of categorising data to provide connection with themes related to the line of inquiry (Bryman, 2012; Miles *et al.*, 2014). In line with the grounded theory strategy, the process was not linear and was designed to be iterative. As suggested by many authors, such as Bryman (2012), Gray (2014) and Creswell and Creswell (2018), the process began with familiarisation of the whole; transcripts were read multiple times to identify recurring patterns. These patterns were added to the predetermined codes that resulted from the theoretical framework. According to Creswell and Creswell (2018), the combination of emerging and predetermined codes maximises coherence and connection between codes based on theory and those based on data. This followed a process of relating concepts to each other, also known as the axial coding paradigm (Corbin and Strauss, 2008). This process was used to group the responses into themes and subsequently define the causal conditions that shaped the socio-institutional change across Surabaya, the conditions or context within which the change occurred, strategic actions used by the participants, the intervening conditions that influenced the choice of actions and the consequences of those actions. Finally, connections and relationships were made and elucidated across the different themes and conclusions were drawn with other research findings. The initial drafting of chapters helped tighten the analysis by identifying connections and divergences in themes, particularly in relation to the 'green and clean' change process and the leapfrogging concept.

3.4.4 Research reliability and validity

A number of verification processes were adopted to support research quality, including construct validity, internal validity, external validity and reliability. Reliability and validity for qualitative research refer to "whether the findings are accurate from the standpoint of the researcher, the participant, or the readers of an account" (Creswell and Creswell, 2018, p. 185). Case study protocols, including ethical considerations, were designed to minimise errors and reduce potential risks prior to data collection (Yin, 2018). In addition, a case study database was established to organise and document data collected during the research. According to Monash University policy, the data will be stored for seven years and made available to other researchers.

Multiple sources of evidence allowed the development of convergent lines of analysis, which, as Yin (2018) states, provides multiple measures of the same phenomenon and thus theoretical rigour in emerging themes. The use of different data sources follows the logic of triangulation to corroborate evidence (Creswell and Creswell, 2018). Construct validity of the case narrative was ensured through the triangulation of data from the in-depth, semi-structured interviews and the analysis of the secondary documentation. In addition, chains of evidence were continually established between the conclusions and research question formulated for this project, with clear cross-referencing to the data collection procedures and evidence obtained. External verification of the construct validity of the narrative accounts was reviewed by key participants with extensive involvement in Surabaya's process of change, including high-level government officials, community leaders and academics. This qualitative validation approach is called member checking, whereby participants have the opportunity to review and critique the findings and provide critical observations and interpretations (Creswell and Creswell, 2018).

Internal validity is established in the definition of causal relationships that facilitate the emergence of other factors and ensuring relationships have not been misinterpreted, whereas external validity defines the extent to which findings can be analytically generalised (Yin, 2018). A rigorous analysis of the data was conducted through pattern matching and explanation building to ensure internal validity. The analysis focused on key aspects of the case study, and interpretations addressed all available evidence. Explanation building was used to create a logical sequence of the events explained in the case narrative. External validity was built through a review of the results of the case study, and synthesised results were sent for further review by the key informants and academics mentioned above.

3.5 Limitations of the research

Lastly, it is important to acknowledge a number of limitations of this research. In line with Yin's (2018) sampling recommendation, this study sought to include a variety of perspectives that explicitly included diverse organisations/groups, positions within the organisation, genders, and to some extent, age. However, the range and depth of some interviews were limited by practical constraints related to the limited number of interviews done within each stakeholder group. This raises a question as to the extent their statements and especially opinions can be transferred to the whole institution (e.g. government) and if a "gatekeeper bias"

may have occurred (Oppong, 2013, p. 205). As detailed in the data collection, in order to try and overcome this, the sampling rationale included both peer recommendations and on-ground networking. Similarly, language barriers may have influenced the data quality of this research. Whilst strategies were set in place to minimise language barriers (outline in Section 3.4.1), there were still limitations due to the quality of translation services, reduced interview times (in order to allow for real-time translation), and limited opportunity to find and access documents written in Indonesia. If time and resources had allowed, the potential inclusion of qualitative survey data could have provided insights into key phenomena of importance and serve as a basis for more in-depth insights into the interviewee's belief-systems.

A second limitation is an attention given to successful outcomes within this research. The focus of this research is on understanding how leapfrogging occurred and examining the processes, initiatives and activities that supported leapfrogging. This leads to an inherent bias within the research to examine the successes within the journey and the development of research findings based on these successes. Similarly, there is the potential to interpret the reporting of Surabaya's neighbourhood transformations as a smooth process leading to an inevitable change. It should be noted that Surabaya's transitions journey presented many challenges (both inherent to its developing context and socio-institutional conditions), which have been recorded within the results chapters. Whilst these challenges have not been examined in-depth, given the dearth of current scholarship examining leapfrogging within socio-technical systems, this research represents a foundation for success that can provide a launching point for further investigations into overcoming challenges.

The most significant limitation of case study research relates to the degree to which the findings can be applied to different contexts outside the case study of interest. The empirical basis of this study lies in investigating the broad urban blue-green services transformation in Surabaya and embedded within this, the blue-green services management change processes associated with key catalysing initiatives that led to the sustainable transformation of individual kampungs. Given that the case study was undertaken in Surabaya, a city with distinct socio-political, economic and environmental features, cultural traditions and beliefs, and trends in urbanisation, aspects of the findings discussed in this research may not be directly applicable to other geographical contexts. Therefore, the outcomes of this research serve the purpose of informing theoretical understandings in urban developing contexts, and further testing would be required in a range of other empirical contexts, including geographic locations and resource domains (e.g. energy) to uncover different experiences and validate the broader applicability of the findings. Nonetheless, this research is an important step in providing detailed empirical evidence of contemporary leapfrogging dynamics and urban sustainability transition in a developing city.

Chapter 4

The co-evolution of urban blue-green initiatives in Surabaya's sustainability transition

4.1 Introduction

Framed by the case context described in Chapter 3, in this chapter the first set of results are introduced and primarily contribute to addressing Objective 2: to develop and analyse an in-depth empirical case study of the socio-institutional dynamics and actor strategies of Surabaya's blue-green sustainability transition. This chapter examines the broader blue-green development initiatives across the city that set the foundation for a sustainability transformation experienced in individual kampungs. This chapter is organised into three sections. In line with the temporal boundaries of the case (Section 3.3), Section 4.2 presents a broader historical analysis of the development of Surabaya's blue-green initiatives from 1945 (Indonesia's Independence) to 2017 (end of data collection). The analysis includes a detailed chronological report that tracks the city's contextual socio-political and environmental changes over time, drawing on multiple sources of evidence, including primary data collected through recording oral histories (Chapter 3). This is followed by an analysis of the historical development against the four transitions phases of the multi-phase concept (Section 2.3.2). Section 4.3 highlights the mechanisms that stimulated change within the kampungs, with a focus on drawing out references to actors involved in the creation and implementation of key programs throughout each transition phase. Finally, Section 4.4. reflects on how the national and city-wide socio-institutional changes supported the transition of kampungs from slums towards sustainable living areas. In doing so, the Surabaya Green and Clean (SGC) program is identified as a key initiative that supported a leapfrogging process within certain pockets of the city during the acceleration phase of the transition. This helps to frame the case study context and serves as a point of reference for analysis and discussion in Chapter 5, 6 and 7.

4.2 Surabaya's blue-green city transformation

A detailed narrative of the blue-green initiatives that supported a sustainability transformative change in kampungs across Surabaya is presented in this section. The analysis includes broader instrumental regulations and projects that partially influenced the process of change but are not directly related to the rapid transformation of some kampungs (e.g. Surabaya eco-school). This is particularly notable as movement occurred into the present era, where a combination of programs proved to support the sustainable transformative change.

The historical analysis is organised in a chronological grouping of programs, initiatives and outcomes in three distinct periods (rehabilitation, improvement and renewal) on an urban scale identified between 1945 and 2017 (Table 4.1). The timeframes of each period represent a broad marker of Surabaya's urban development that relate to national political shifts. These include the following: (1) the Post-Independence era that started in 1945 after the beginning of the Indonesian Revolution; (2) the New Order, characterised by the initiation of the dictatorial term (Dick, 2002; Das, 2015b) of the Indonesian President Suharto in 1966; and (3) the

post-Suharto democratisation period, set in 1998, also known as the Reform Era (Bunnell *et al.*, 2013; Fionna, 2016).

Whilst the main outline follows a chronological account, some programs take a cross-section of the historical narrative, and a few themes (e.g. bilateral cooperation) have unique chronologies that will be documented under subheadings. A summary of the policy and regulatory changes and blue-green initiatives at three levels (local, national and international) is presented in Table 4.1.

Table 4.1 Summary of urban development programs and key policy and planning instruments between 1945 and 2017

	City Mayor	Key local regulatory instruments and initiatives	Key national policy and planning foundations	Key international agreements
POST-INDEPENDENCE **SURABAYA'S REHABILITATION (1945 – 1964)**	Radjamin Nasution; (1945 – 1945) Soerjadi; (1946 – 1950)	- Efforts focused on restoring the city from the effects of World War II and the Battle of Surabaya in 1945		
	Dowl Arnowo (1950 – 1952)	- 1950 Community-based health programs - 1950 Rehabilitation of the drainage system	- 1950 Focus on education (abolition of illiteracy) and health programs (malaria control plan)	
	Moestadjab Sumowidagdo (1952 – 1956)	- 1952 Kampung rehabilitation project: restoration of rubbish collection, access to public water taps and toilets, health posts		
NEW ORDER **SURABAYA' S URBAN IMPROVEMENT (1965-1999)**	Colonel Soekotjo (1965 – 1974)	- 1969 W.R. Supratman project: kampung improvement - 1970 Master Plan: remove squatter settlements	- 1970 Re-establishment of foreign economic aid	
	Raden Soeparno (1974 – 1979)	- 1976 Kampung improvement program (KIP): extension of water supply system, drainage, solid waste facilities, health clinics and schools		- 1976 Urban development project II (World Bank): support the KIP
	Moehadji Widjaja (1979 – 1984)	- 1979 KIP: improvement of drainage, pumping stations, solid waste management, and sanitary landfills	- Law No. 4/1982 on environmental management	- 1979 Urban development project III (World Bank)
	Poernomo Kasidi (1984 – 1994)	- 1985 Master Plan: Allocation of more green open space in the inner city - Regional Regulation No. 6/1986 about the implementation and administration of the cleanliness of the city - Regional Regulation No. 199/1987, the government established the formation of a cleaning task force, 'yellow troopers', to clean public spaces - 1987 KIP: improving basic urban services, strengthening municipal administration, and local resource mobilisation	- 1988 Adipura Award: cleanest city in Indonesia - 1989 Clean river program (*Prokasih*) - 1992 Million Trees program	- 1987 Urban development project V (World Bank) - 1993 Surabaya urban development project (JICA): extension of the drainage network, water supply and distribution pipelines

	City Mayor	Key local regulatory instruments and initiatives	Key national policy and planning foundations	Key international agreements
		- 1992 Master Plan: Housing and commercial development prioritisation over green open spaces		
	Sunarto Sumoprawiro (1994 – 2002)	- 1996 Master Plan for sewerage and sanitation for 2020 (never implemented) - 1998 Comprehensive kampung improvement program (C-KIP): home improvement, basic infrastructure improvement and economic development	- Act No. 1/1995 on CSR implementation voluntary - Law No. 22/1999 on regional autonomy - Law No. 25/1999 on intergovernmental fiscal relations - National Decree No. 53/2000 on Building Family Welfare Movement (PKK): promotes women's participation in creating a prosperous community	
REFORM ERA **SURABAYA' S URBAN RENEWAL (2000-2017)**	Bambang Dwi Hartono (2002 – 2010)	- 2002 Master plan: slum upgrading and prioritisation of green open spaces - Regulation No. 7/2002 on urban green space management - 2002 Revitalisation of thirteen gas stations to green areas - 2003 Social Rehabilitation of Slum Area program: socio-economic improvement of communities - 2003 UPKM: improve family income through training - Regulation No. 14/2005 establishment of the Cleaning and Landscaping Agency - 2004 Establishment of community-based composting centres - 2005 CSR programs started - 2005 Surabaya Green and Clean (SGC) program - 2006 3R (reduce, reuse, recycle) program - 2007 Surabaya implements *Adiwiyata* green school program - 2008 Establishment of waste banks	- 2004 Gender mainstreaming award (*Anugerah Parahita Ekapraya)* - Law 25/2004 on the National Development Planning System institutionalised *musrenbang* (community discussion) - 2006 *Adiwiyata* green school program: supports education for sustainable development at school-level - Act No. 40/2007 on CSR implementation mandatory - Law No. 17/2007 National long-term plan: cities without slums - Law No. 26/2007 on spatial planning: proportion of green open space must be at least 30 per cent of the urban area	- 2002 City-to-city cooperation with the city of Kitakyushu (Japan): a solid waste management program
	Tri Rismaharini (2010 – present)	- 2010 Small and Micro Enterprise (UKM) program - 2011 Surabaya Eco-school program: encourage schools to implement environmental projects - 2011 Surabaya Eco-campus program: encourages universities to create a green and healthy campus	- Law No. 01/2011 on housing and settlement areas - Law No. 02/2012 on acquisition of land for development in the public interest - 2014 100-0-100 program: 100 per cent	- 2011 Indonesia Infrastructure Initiative – IndII program (Australia): provision of water and drainage connections

	City Mayor	Key local regulatory instruments and initiatives	Key national policy and planning foundations	Key international agreements
		- 2012 Urban area spatial plan (RT/RW): improve the quality of urban spatial planning to ensure the integrity of the environment - 2012 Rehabilitation of ex-Gang Dolly area - 2014 Master Plan: increased proportions of green open spaces in the city - Regional Law No. 12/2014 on spatial planning for 2014 - 2034 - Regional Law No. 15/2014 on urban forest implementation: support a sustainable, harmonious and balanced urban ecosystem - Mayor's Decree No. 188.45/143/436.1.2/2015 on priority areas for improving the quality of housing and settlements	access to drinking water, 0 per cent urban slums and 100 per cent access to sanitation - 2016 KOTAKU program: Improve the quality of slum areas	- 2011 Indonesia Urban Water, Sanitation and Hygiene project (USA): sanitation programs

4.2.1 Restoring the city: Surabaya's rehabilitation (1945 – 1964)

Indonesia's Independence in 1945 led to liberation from colonial administration. However, the aftermath of World War II and the Battle of Surabaya left the city devastated. As Dick states, "the period between 1942 and 1966 can be seen as a losing struggle to restore an ideal of good government" (2002, p. 208). In Surabaya, the new government inherited a city in decay, leading to years of rehabilitation, whilst keeping up with the massive influx of new habitants from rural areas seeking work in the city. The main consequences of this high immigration rate included insufficient funds, housing shortage, highly visible squatter housing along the riverbanks and railway lines, development of several factories along the Brantas River and scarcity of new landfill sites for garbage disposal. As a result, rivers and canals became severely polluted by rubbish and industry contaminants (Lucas and Djati, 2007), leaving Surabaya with a permanently contaminated drinking water supply system and no further improvements in the water system (Dick 2002).

The priority of the new republican government in 1950 was to develop education and health programs (Lowenberg, 2000; Dick, 2002). The main strategy of the education program focusing on the abolition of illiteracy was to introduce adult literacy classes in kampungs (Lowenberg, 2000). A greater challenge for the government was to overcome the resurgence of malaria. As part of the malaria control plan in Surabaya, the government implemented community-based health programs in kampungs (Elyazar *et al.*, 2011), rehabilitation of the drainage system and restoration of rubbish collection (Dick, 2002). More than three thousand illegal dwellings, considered slum areas at the time, were established in Surabaya, some of which were later legally recognised as kampungs (Dick, 2002; Silas *et al.*, 2012). Consequently, the kampung rehabilitation project was established in 1952 to extend the malaria control plan under the leadership of city mayor Moestadjab Soemowidagdo (1952 – 1956). Kampung rehabilitation focused on providing access to rubbish collections and sanitary controls such as health posts (Elyazar *et al.*, 2011) and public water taps and toilets (Husain,

2015). By the end of 1953, the government claimed that 100000 ha of kampungs had been rehabilitated (Dick, 2002; Peters, 2013).

Despite these efforts, illegal settlements rapidly occupied public land as Surabaya's population doubled from 1948 – 1952 (Peters, 2013). This massive growth was beyond local governmental control, forcing acceptance of unauthorised occupancy of urban spaces. In subsequent years the city's economy was "caught in a downward spiral of budget deficits" (Dick, 2002, p. 433), and no further kampung improvement projects were undertaken until the New Order government restored economic stability.

4.2.2 Preparing the ground: Surabaya's urban improvement (1965 – 1999)

The mid-1960s heralded the beginning of a new era for Indonesia, the New Order, also known as the term of the second Indonesian President, Suharto (1966 – 1998). The New Order represented a significant shift for Surabaya's political stability, economic rehabilitation and infrastructure development (Dick, 2002; Rock, 2003). Progress towards the city's urban improvement was initiated under the leadership of the new mayor, Colonel Soekotjo (1965 – 1974). The mayor's strategy was to develop a master plan to remove squatter settlements in the city. The late 1960s witnessed the formation of ongoing (to date) cooperation between government and academia. Soekotjo's strategy relied on collaboration between government officials and researchers from the local university Institut Teknologi Sepuluh Nopember (ITS), who developed Surabaya's master plan. Whilst the government's vision for the master plan was to eradicate squatters, ITS researchers led by Prof. Silas proposed a different approach, one of preservation rather than eradication (Peters, 2013; Colombijn, 2016). This represented the beginning of a long process of city development and planning with a commitment to improving low-income areas such as the kampungs (Dick, 2002; Silas, 1992).

Building on earlier attempts at kampung improvement during the colonial era (Silas *et al.*, 2012; Husain, 2015; Versnel and Colombijn, 2015), kampung improvement was revisited in 1969 through a program called the W.R. Supratman Project that was concluded in 1974. Peters (2010) considered this the "first wave" of kampung improvement programs. The aim of the project was the improvement or provision of housing, targeting kampungs that were in a marginally better state than many (Dick, 2002; Peters, 2013) by applying a 'self-help' approach[16] (Silas, 1992; Husain, 2015). This entailed encouraging and working with the community to improve kampung infrastructure (e.g. construction of footpaths) by facilitating technical assistance and providing some building material (Turner, 1988; Silas, 1992). Nevertheless, Peters (2010) argues that the underlying driver was not a promotion of community participation but rather the lack of economic resources from the municipality, that ultimately had to rely on voluntary labour by the local people. Whether intentional

[16] The self-help housing approach is based on Turner's theory that urban poor are capable of improving living conditions through the provision of basic resources and land titling (Turner, 1967; Turner and Fichter, 1972). According to Turner and Fichter (1972), government should advocate freedom for slum dwellers to build housing according to personal needs that are best known to the inhabitants.

or not, community involvement would become the key factor for the success of kampung improvement in the following years. One of the interviewees reflected on this point as follows:

> "…being poor isn't a curse but it's a blessing as long as you take poverty as a challenge, not as a problem. By thinking that as a challenge, you build the city, you build the local resources, you build knowledge. That's what Surabaya [government] did, worked with the people" (AR 2.1).

Despite the economic disadvantage, the most significant achievement of the project was socio-political in nature due to the new status kampungs were afforded in the master plan. Kampungs were recognised as viable living environments rather than slum areas (Dick, 2002) thereby including these in the city's urban plan. This provided kampungs access to basic services such as piped water, solid waste, urban roads and health posts, and most importantly, saved kampungs from relocation or demolition (Husain, 2015).

Foreign economic assistance was re-established in Indonesia in the early 1970s as part of Suharto's strategy to lift the country's economy. According to Chowdhury and Sugema (2005), foreign assistance played an important role in the transformation process of Indonesia, after the crises left by the 'Old Order'. A clear example of this is the formation of five phases of urban development projects with the assistance of the World Bank. The first phase of this project was initiated in 1974, with the aim of improving access to better physical infrastructure and housing of the urban poor in Jakarta (World Bank, 1974). The program proved to be successful, as about 20 per cent of Jakarta's urbanised area was upgraded to a centralised system (World Bank, 1976), and this was extended to the city of Surabaya, as part of the urban development project II (1976 – 1979), III (1979 – 1983) and V (1987 – 1990). The total Surabaya KIP funding by the World Bank during the years 1976-1990 was US$23.63 million (Das and King, 2019). The objective of project II was to support the government by providing financial and technical support for the kampung improvement program (KIP). Consequently, the second wave of kampung improvement officially began.

The intention of Project II was not to supersede the W.R. Supratman Project, but to modify and extend the work to target the poorest kampung areas. The municipality was able to improve kampung infrastructure and health assistance with available funding and experience (Dick, 2002). Infrastructure facilities included paved footpaths, an extension of centralised water supply distribution systems, latrines, drainage systems, solid waste disposal facilities, primary schools and health clinics (World Bank, 1976). The transition to improved drainage and garbage collection systems began in the late 1970s with project III (World Bank, 1979), focusing on conventional and centralised approaches. Improvement of the drainage entailed dredging and desilting main drainage canals and rehabilitating existing pumping stations, which contributed significantly to flood prevention, particularly in large public areas. Solid waste management was more successful in local urban communities such as kampungs, where initiatives included collection, transportation and sanitary disposal of wastes, and sanitary landfill construction. However, insufficient municipal capacity, and inadequate location and design, caused the drainage component to fail in kampung areas, whilst local participation facilitated the success of the solid waste management component (World Bank, 1990).

The 1980s marked an important shift in environmental awareness in Indonesia. After several mainly industrial pollution incidents in the 1970s and mass media covering river pollution protests (Lucas and Djati, 2007), the Ministry of Environment was pressured to provide a regulatory framework to address urban environmental issues. As a result, the national government passed Environmental Law Statute Act No. 4 of 1982, revised in 1997. Whilst this law has been considered the foundation for environmental protection (Hardjasoemantri, 1989), there has been no guidance for the inspection, monitoring (Faure and Niessen, 2006) or enforcement (Dick, 2002).

There was, however, an environmental initiative that proved to be successful in raising environmental awareness, the Adipura Award. This program was established in 1986 and remains active in more than 380 cities across the country (Dethier, 2017). Adipura is awarded to the cleanest city in Indonesia by the national government, considered the catalyst for promoting a greener and cleaner urban environment and has inspired similar local programs such as the Surabaya Green and Clean (SGC). This was as noted by the following interviewee: "Adipura gave us the criteria for green and clean…to take care of the environment" (GO 4.8, translated).

The objectives of the program were to reduce waste pollution and create a culture of cleanliness by involving the community in the process (Santosa, 2000). Similarly to the KIP, the Adipura program demonstrated that integrated efforts between government and community were vital for success, based on the community's ability to improve living environments by developing plans that best suited local conditions (Santosa, 2000). Furthermore, Dethier suggested that the program's success was due to the implementation of a cultural strategy for promoting competition within the community, a so-called 'reputational incentive based on honour and shame, well suited for Indonesian culture' (2017, p. 74). This idea was substantiated by an interviewee who stated, "I believe that pride is the biggest capital, pride is the biggest thing so that they can be more competitive ..." (PS 7.2). In addition, the World Bank's (1995) report on the legacy of the KIP highlighted culture and tradition as factors that influenced the success of the program. The report emphasised that "the community spirit, and mutual cooperation (*gotong royong*) [of the Javanese] is strong" (World Bank, 1995, p. 20). This sense of community cooperation, *gotong royong* was apparent in all stakeholder group interviews (government, community and private sector). The following quotes from the interviews exemplify this idea:

> "We must care about the problem in Surabaya [otherwise] the city will sink. I said to the people. They must know about the problem of the city and we can solve together. *Gotong royong*" (GO 4.1).
>
> "The community created a solidarity with good communication. So the community itself communicate a lot, cooperate, do *kerja bakti* together, so the mutual cooperation (*gotong royong*) is there, the Indonesian culture, the mutual cooperation emerges by itself… the mutual cooperation is strong, they [the community] are not individualist, they are unified" (CM 5.3, translated).

Meanwhile, in Surabaya, the new mayor Dr Poernomo Kasidi (1984 – 1994) concentrated on improving public infrastructure and providing health services, particularly after a dengue[17] outbreak in 1985. Poermono's attention to improving community wellbeing through education and health programs proved successful (Puspitasari, 2016) since practical improvements were implemented (Dick, 2002). This was accomplished through programs supported by a regulatory framework with community involvement at the core, and as a result, the city gained national and international recognition.

The 'green and clean' vision in Surabaya started with the revised version of the city's master plan in 1985 that incorporated the allocation of more green open spaces in the inner city. By 1986, the cleanliness of the city and public awareness of garbage disposal had become priorities. As such, efforts towards cleaning the city included the enactment of Regional Regulation No. 6/1986 regarding the implementation and administration of the cleanliness of the city, which prohibited disposal of garbage into rivers, canals and public spaces. Another strategy to clean up the city was to reallocate or remove (illegal) street vendors from public spaces. The presence of street vendors was considered to create disorder; trigger unacceptable behaviour in people who tended to dispose of dump garbage carelessly; narrow streets and road space; and damage the aesthetic of the city (Puspitasari, 2016). Consequently, the local government issued several regulations to control and manage street vendors, such as Regional Regulation No. 15/1987 on permit requirements. Regional Regulation No. 10/1987 focused on coaching and creating a business place for street vendors under safe, harmonious and clean conditions. This form of governance proved the government's commitment to creating public awareness regarding the importance of city cleanliness by emphasising education and providing alternative options for community business development. Following this path, the government established one of the most successful programs at the time, 'yellow troopers', under Regional Regulation No. 199/1987. This formation of a cleaning task force that cleaned public spaces and duplicated waste facilities (e.g. garbage trucks and bins), ultimately delivered a cleaner city. Culminating in 1988, two years after the Adipura program was initiated, Surabaya won the first Adipura Award and has consistently been granted this award since that time. This success can be attributed to the continual development of government programs. For example, in 1992, the government launched the Million Trees program that aimed to increase greenery in the city, reduce air pollution, improve parks and expand green open spaces (Puspitasari, 2016).

Efforts to create environmental awareness had largely focused on community engagement, and the government still needed to address industry. By 1989, industrial pollution was severely affecting water quality in the Brantas River basin (Lucas and Djati, 2007), one of the major water resources in East Java. To reduce effluent discharges into the rivers, the central government introduced the Clean River Program (*Prokasih*) in 1989 with financial assistance from the Japanese International Cooperation Agency (JICA). The implementation of the program in Surabaya targeted the Surabaya River, the city's main water source. By the mid-1980s, there were frequent community protests against pollution from factories. Particularly in the dry season, the water was turbid and odorous, and considered hazardous due to effects on health (e.g. skin

[17] Dengue fever is predominant in developing countries, as Aedes mosquitoes thrive in areas with limited access to basic health services (WHO, 2001)

itchiness) (Dick, 2002; Lucas and Djati, 2007). An environmental audit in 1985 determined that 80 per cent of pollution entering the river originated from industrial waste (Dick, 2002). This was not surprising since many factories were built along the Surabaya River and discharged waste directly into the water. Industry boomed due to the low cost of land, improvements in the city and the minimum requirement to install waste treatment plants (Dick, 2002; Lucas and Djati, 2007; Puspitasari, 2016). As part of the *Prokasih*, the local government prosecuted operators along the Surabaya River whose waste was not treated before discharge to the river. Additional actions included the introduction of sanitation facilities for riverside inhabitants, the establishment of a 'water troop' to clean the river, solid waste management campaigns, and planting of trees along the river (Puspitasari, 2016). An important consequence of the program was that collaboration began between government, the private sector (media and private enterprises) and the community to promote the river for recreational purposes, such as swimming and rowing. Whilst lack of enforcement of factory discharge lead to a minimal reduction of pollution levels in some segments of the river, the program drew attention to heavy pollutant contamination (Lucas and Djati, 2007). More importantly, the program improved community awareness, given that the river was no longer perceived as a receiving body for discharge but rather as an asset to the city (Santosa, 2000).

The urban development project V (1987 – 1990) was implemented at the same time as these local programs. The project's objectives were to continue improving basic urban services, strengthen municipal administration and mobilise local resources (World Bank, 1992). As in projects I, II and III, physical activities included the improvement of roads, water supply and sanitation services, and expansion of the drainage network and disposal facilities. Conversely, the main difference from previous projects was the inclusion of programs to ensure continuity of the KIP. These included municipal management training in areas such as financial planning, project administration, budgeting, and technical training related to engineering, management and advisory services. However, despite the commitment to promote municipal training, the project outcomes remained infrastructure-focused (World Bank, 1995).

At this stage, the KIP was proving to be a 'real' alternative for slum improvement (Turner, 1988) internationally and a showcase for community participation (Annez and Friendly, 1996; Puspitasari, 2016), winning awards such as the Aga Khan Award in 1980 and 1986, and the World Habitat Award in 1992. Findings from an audit undertaken by the Operations Evaluation Department revealed that infrastructural objectives were achieved; however, concern was expressed about the focus of urban development projects being 'too physical' (World Bank, 1995). This raised questions about environmental improvements and local capacity building, and hence the sustainability of the project. The extent of community participation in the projects was questioned. According to Septanti (2016), the World Bank's top-down approach to deliver KIP limited community involvement.

Whilst in the 1980s progress was made to slow environmental degradation down, in the 1990s, there was some backward movement of such progress. In 1992 the revised Master Plan prioritised housing and commercial development over green open spaces, followed by the boom of private development led by the new Mayor Sunarto Sumoprawiro (1994 –2002). In 1994 Surabaya failed to uphold the Adipura Award. The

government's justification was that the cleanliness level declined due to the incorrect anticipation of the rainy season (Puspitasari, 2016). As a political strategy, in 1996, the government worked on the development of an ambitious master plan for sewerage and sanitation for 2020 with a private Indonesian consultancy, but the plan was never implemented due to lack of funding (Prihandrijanti *et al.*, 2008). Nevertheless, this development trend soon collapsed due to the Asian financial crisis of 1997, which ultimately ended with Suharto's New Order regime in 1998[18]. The end of the New Order brought a new face for democratisation and government decentralisation (Dick, 2002), and with a newfound autonomy, the city initiated the third wave of kampung improvement.

The C-KIP, initiated in 1998, aimed to improve kampungs through a community-led effort; however, the financial crisis affected implementation and the program resumed in 2001. The prime objective of the program was to empower the community. Unlike other KIP programs, the city government financed the C-KIP, facilitated by local universities (Septanti, 2016) and followed a 'bottom-up' approach (Das, 2015b). This approach meant that citizens were given the opportunity to participate in decision-making and program planning (Dhakal, 2002; Swanendri, 2002). The C-KIP consisted of three main programs: home improvement, basic infrastructure improvement and economic development. The first two achieved similar improvements to the previous KIPs, including renovating toilets, building road pavements, planting trees, repainting schools, and improving drainage. The community economic development program was a first-time initiative that sought to economically empower the poor by providing small community loans to improve or develop businesses (Santosa *et al.*, 2010; Septanti, 2016). This was supported by an institutional framework based on collaboration between local government agencies, different administrative levels (*keluharan* and *RW* officials), non-governmental organisations (NGOs) and community members (Dhakal, 2002; Das, 2015b; Septanti, 2016). As suggested by the World Bank (2001), this framework emphasised the role of NGOs, who were supposed to act as facilitators between government and the community (Swanendri, 2002)(Das, 2015b). However, this did not work as many government officials emphasised the difficulty of working with NGOs and consequently preferred to rely on university facilitators and community volunteers (Das, 2015b).

The sequence of programs up to the C-KIP served as preparation for benefiting low-income communities. As with the KIP, the C-KIP improved the quality of housing conditions and infrastructure. More remarkable was the development of 57 per cent of small and middle scale businesses managed by the community (Santosa *et al.*, 2010). However, despite the potential of the program, the challenge involved in having communities deciding and managing development remained unresolved (Das, 2015b). Ultimately, both the KIP and the C-KIP programs provided a socio-political shift in urban planning (Silas, 1992; Santosa, 2000) through changing government perception by officially recognising kampungs as respectable living areas (Dick, 2002; Silas *et al.*, 2012) and integrating these into city planning.

[18] Whilst Suharto's New Order improved Indonesia's economy and urbanisation; this coincided with a rapid expansion of corruption, abuse of dominance and power monopolisation (Dick, 2002).

This period ended with the introduction of regional autonomy legislation in 1999, with the national government passing Law No. 22/1999 on regional autonomy and Law No. 25/1999 on fiscal relations between central and regional government. This political reform has since been described as the world's largest democratic decentralisation process during a significant political and economic transition of the country (Smith, 2008; Miller, 2013). For local governments, this meant a sudden newfound autonomy; however, this was constrained by significant inadequacies in resources and capacity to act effectively (Hofman and Kaiser, 2006). Yet, against these challenges, many authors suggest that decentralisation helped Surabaya to enable civic and environmental activism (Das, 2015b; Novalia *et al.*, 2020); foreground municipal leadership (Miller, 2013; Novalia *et al.*, 2020); and ultimately push the local government towards effective planning, governance reorganisation, and development of strategic innovative programs (Das and King, 2019).

4.2.3 Catalysing change: Surabaya's urban renewal (2000 – 2017)

Whilst the 2000s began with several hurdles, the following decade marked a new beginning for Surabaya's urban renewal (Peters, 2013). Generation of solid waste reached a peak in 2001, surpassing the capacity of the main disposal site, Keputih, established in 1970 (Gilby *et al.*, 2017). The landfill's condition was undeniably endangering the health of surrounding residents who reported contracting diseases related to air and water pollution (e.g. diarrhoea and skin infections) (Silas, Santoso, *et al.*, 2014). Consequently, a judge ordered the immediate closure of the landfill, causing a 'solid waste disaster' (Bunnell *et al.*, 2013). While construction of a proper sanitary landfill was taking place, the streets of Surabaya were accumulating tons of daily waste produced by the city. This challenged the public's perception of the city, leading media to characterise the situation as a 'waste crisis' (Novalia *et al.*, 2020). In the face of this environmental deterioration, the city (including different actors) started a process of 'redemption' that aimed to make Surabaya clean again (Dhokhikah *et al.*, 2015; Bercegol *et al.*, 2017).

Sunarto's deputy mayor, Bambang Dwi Hartono, redesigned Surabaya's urban planning agenda. Bambang guided the city as mayor from 2002 – 2010 but was unable to run for another term due to Indonesia's Election Law; nonetheless, he became deputy mayor to Tri Rismaharini (popularly known as Bu Risma) from 2010 – 2013. Some achievements under his term included urban beautification and reassessment of environmental and urban planning policies (Peters 2013). This is supported by a statement from one of the interviewees,

> "In the past mayor's leadership term, there was not much greening, then starting from Mr Bambang, everything was styled and with diversity…green and clean of the city was held in Mr Bambang's leadership term" (GO 4.8, translated).

Bambang initially updated Surabaya's master plan in 2002, prioritising slum upgrading and green open spaces. To continue the socio-economic improvement of communities, the Social Rehabilitation of Slum Area [Rehabilitasi Sosial Daerah Kumuh (RSDK)] program was launched in 2003. The RSDK targeted the lowest income urban settlements, and like the C-KIP, this program is a community-based approach that aimed to improve community welfare by addressing social needs through self-development (Nugrahani *et al.*, 2012;

Koswara *et al.*, 2017). The program allocated funds to form local institutions in each sub-district called the Poor Family Development Unit [Unit Pembinaan Keluarga Miskin (UPKM)]. The goal of these units was to incentivise small and medium-sized businesses by providing business skills training, assistance in the form of handicrafts or material (e.g. sewing machines) and guidance to increase family incomes (Nugrahani *et al.*, 2012). Interestingly, most of the program's participants were women, later recognised as important contributors to environmental improvement due to active participation (Rolalisasi, 2006). Whilst the outcomes of the program were not as substantial as the results of the C-KIP, early foundations for catalysing small and medium businesses were laid for what would later become the very successful Small and Medium Enterprises program [*Usaha Kecil Menengah* (UKM)].

In 2002, the government also commissioned a study on riverbank settlements[19] to ITS university, in order to have a better understanding of the socio-economic conditions of the dwellers and formulate appropriate policies (Soemarno, 2010). The government's efforts to deal with riverbank settlements became more challenging as a majority of the dwellers lacked a resident identification card (provides access to any city-subsidised service). Whilst the government was able to move 'legal' residents to communal shelters, 'illegal' squatting communities along the Strenkali River were evicted. That spurred civil society organisations (including legal residents, NGOs and university students) into taking actions to defend human rights, particularly of most vulnerable groups (women and children) amongst squatters. As a result, in 2005, the first civil society organisation was formed, the Surabaya Strenkali People's Movement [*Paguyuban Warga Strenkali Surabaya* (PWSS)]. This grassroots organisation contributed to reducing vulnerability and enhancing the resilience of these squatter communities, helping them improve their housing conditions by ensuring septic tanks were in place and raising awareness of proper sanitation (e.g. eliminate human discharge to the river) (Some *et al.*, 2009; Taylor, 2015; Das and King, 2019). This transformation process was done within five years and was further supported by Bu Risma's administration (Taylor, 2015; Das and King, 2019). Nevertheless, despite these positive outcomes, a prejudice against poor migrants and apathy towards planning and designing pro-poor shelter for squatter communities remains within the government's policy (Das, 2017; Das and King, 2019; Novenanto, 2019).

By 2004 the national government enacted Law 25/2004 on the National Development Planning System institutionalising *musrenbang* (community discussion) at all government levels. This bottom-up process was introduced to replace Indonesia's centralised system of governance (Salim and Drenth, 2020) and combines a bottom-up and top-down approach to influence the sustainable development planning of the community (Prasad, 2018). While the *musrenbang* is a formal mechanism run by the government, it helps to bring together the aspirations from the grassroots-level with the local and national government. The government of Surabaya has an online-base system platform called e-Musrenbang, where all citizens have the option to

[19] Whilst riverbank settlements can be found along different rives of Surabaya. This study referred to slum settlements along the Kali River, located in south Surabaya. The river is also subdivided into areas, one of which is the Stren-Kali area, to which PWSS's (*Paguyuban Warga Strenkali Surabaya*) name is related to.

participate in planning the city's development. Beyond being a government strategy, the *musrenbang* has opened a window of opportunity for other interactions amongst the community. As one interviewee stated:

> "The *musrenbang* is to collect any information from the community and trying to solve challenges, it's kind of like a workshop, a community discussion… there are different levels of *musrenbang*, in some you can find Bu Risma, other is report from *Kecamatan*… personally I like the *musrenbang* hold by women, women are very motivated, they used it as an opportunity to learn and innovate" (AR 3.2)

The government's strategy to achieve a greener Surabaya was through improved land management. The increasing urban population and illegal occupation of land has challenged the capacity of urban planning in Surabaya (Damayanti, 2006). In an effort to expand the urban green open spaces whilst overcoming this land pressure, Bambang's government focused on the construction of new parks and revitalisation of derelict areas (Kwanda *et al.*, 2014; Silas, Santoso, *et al.*, 2014). For example, the former Keputih landfill was revitalised into a 'harmonious park' (Figure 4.1). The aim was to create a harmonious space that provided ecological, social (including spiritual) and economic functions (Silas, Santoso, *et al.*, 2014).

Figure 4.1 Harmonious park, *ex* Keputih landfill (Photo: Author, 2016)

4.2.3.1 Revitalisation of thirteen gas stations

Another example, and probably one of the most remarkable transformations of land use in Surabaya, was the revitalisation of thirteen gas stations across the city. Under the green space management program, the government had a clear objective to return the land allocation to the original purpose for green open spaces (Suryaningsih *et al.*, 2018). The gas stations were built in areas designated for green spaces, but after inappropriate approvals from the former administration, the owners (private developers) obtained legal permits to rent the land for commercial activities. The land reconversion process, well documented by Hasyimi and Abi Suroso (2017), occurred as follows: Despite the legal contradiction, the government implemented Regional Regulation No. 7/2002 on urban green space management, that provided authority for the local government to cease any activity that deviated from using the green open space for protection and improvement of the environment. Under this scenario, the government (that did not intend to renew the permits of the gas stations) allowed owners one year to relocate businesses. Ten dissatisfied private developers filed lawsuits against the government. This was not surprising for Bambang's team, who had already engaged

with the affected community, governmental agencies and NGOs to support the land reconversion plan. Eventually, the Supreme Court ruled in favour of Surabaya's municipality, and the gas stations had to be relocated. The land reconversion process was arduous; the transition from 'grey infrastructure' to green space took almost a decade. Nonetheless, the government was firm and clear about achieving objectives. As one interviewee pointed out,

> "… some areas reserved to be green belts were used as gas stations instead. Since there was the function restoration plan, we stopped them from renewing their permit. When the permit expired, we closed down the gas stations, and we converted them to public open spaces. The owners (private developers) reacted strongly at first. They rejected it strongly. But since the government was persistent, that was in Mr Bambang's leadership term, the plan went on" (GO 4.9, translated).

Recovering the land was the first step towards urban revitalisation, while 'greening' the city was the next step. In anticipation of the next phase, under Regional Regulation No. 14/2005, the government integrated the Cleaning Agency *(Dinas Kebersihan*) and Parks Agency *(Dinas Pertamanan*) into the current Cleaning and Landscaping Agency [*Dinas Kebersihan dan Pertamanan* (DKP)]. This strategic decision facilitated the planning and management of public open spaces and heralded the rise of the following city's leader, Bu Risma, who at the time was assigned Head of DKP (2005 – 2008) and later Head of the Development Planning Agency [*Badan Perencanaan Pembangunan* (BAPPEKO)] (2008 – 2010). The city government has been actively developing programs to improve the city's overall green and clean performance since that time (Diliani and Susanti, 2015; Fionna, 2017).

Whilst the areas to be revitalised were relatively small[20] (Kwanda *et al.*, 2014), the government took almost a decade (2005 – 2014) to transform the gas stations into public parks (Figure 4.2). As the head of DKP, Bu Risma's strategy was to focus on developing relationships with the private sector and the community (Hasyimi and Abi Suroso, 2017) due to DKP's limited budget. Despite this financial constraint, the strategies that DKP implemented proved to be successful, with the delivery of the parks and sustainable, as these laid down the principles for future programs (e.g. SGC). To overcome the budget limitation, the government offered partnerships to private companies to sponsor the revitalisation of some parks, or as one interviewee noted "…as foster fathers we would fund the development of the parks, we could assign a certain theme, put our banners ..." (PS 7.4, translated). The theme varied according to the focus of the park (e.g. Fruit Park, Flora Park), and parks are equipped with educational and recreational amenities, such as jogging tracks, playgrounds, WI-FI connections, and libraries. As part of the blue-green transition, some elements provide an environmental service, such as rainwater tanks for irrigation, compost houses for fertilisation and vegetation cover to control air pollution and reduce urban heat. These elements improved the living environment of the community and, in this way, encouraged the community to use and value the parks (Kwanda *et al.*, 2014). Revitalisation of the parks gained international recognition by winning the 2013 Asian

[20] The average area of the parks is 2,000 m^2, except for Bungkul Park that has an area of 15,483 m^2 and Flora Park, 33810 m^2 (Kwanda *et al.*, 2014).

Townscape Award granted by the United Nations. The program was nationally registered by the Indonesian Records Museum as the biggest urban park revitalisation project in the country in 2009 and won the Best Park Management Award in Indonesia in 2011.

Figure 4.2 Revitalised parks (Photos: Author, 2016)

4.2.3.2 Green open space

These green initiatives proved useful in 2007, when the national government enacted Law No. 26/2007 on spatial planning. The law stipulated that the proportion of green open space in an urban region must be at least 30 per cent of the urban area, covering 20 per cent of public green open space and 10 per cent of private green open space. By 2009, the city managed to achieve the needed coverage of public green open space with 20.18 per cent (DKP Surabaya, 2015). Whilst there are no data available on the per centage of private green open spaces, initiatives to promote 'green buildings' can be traced, e.g. the Esa Sampoerna Centre built in the city centre in 2011, that is an example of construction that follows an eco-green concept (Zaky, 2012).

Whilst public green open space in Surabaya has surpassed the 20 per cent target, the conditions of green spaces for ecological functions were less than optimal in 2012 (Ernawati, 2015). The dominant element of the green space does not accommodate ecological function, such as improving groundwater quality or reducing air pollution. Examples of green spaces with no ecological function are evident in grass playing fields of stadiums or water reservoirs, the main function of which is water storage. To improve the quality of public green open space, the local government established different regulatory mechanisms since 2012.

According to the 2012 – 2032 RT/RW (Urban Area Spatial Plan), the Surabaya city's development mission is to improve the quality of urban spatial planning and city infrastructure to ensure the integrity of the environment and the safety, capability, welfare and quality of life of the community. As such, it stipulates that the total area of the urban forest should be at least 10 per cent of the total area of the city. To achieve this outcome, the government updated the master plan to increase the proportion of green open spaces in the

city in 2014. However, this represented a challenge as land scarcity had been a constant problem for planning in Surabaya (Damayanti, 2006). The local government addressed this issue by involving different stakeholders in urban spatial planning and providing fair compensation to private landowners for the procurement of land to be rezoned for urban forests. This compensation was based on Law No. 02/2012 concerning the acquisition of land for development in the public interest.

In addition, the local government enacted Regional Law No. 15/2014 to facilitate the development of urban forests, in line with National Regulation No. 63/2002 concerning urban forests. The purpose of implementing urban forestation according to each regulation differs slightly. The national regulation articulates the function of urban forests to improve and maintain the microclimate and aesthetic value, absorb water, create balance and harmony within the city's physical environment, and support the conservation of Indonesia's biodiversity. The local regulation states that the purpose of urban forests is to reduce the increment in air temperature and pollution, prevent a decrease in groundwater and soil surface, and prevent flooding, inundation, drought, seawater intrusion and increasing heavy metal content in water. Whilst the national regulation serves as a foundation for the implementation of urban forests; the regional law draws attention to the importance of urban forests in providing essential ecosystem services to create a sustainable urban landscape. This is important as urban forests represent a cost-effective system that provides local governments with opportunities to become ecosystem beneficiaries (Hirokawa, 2011).

4.2.3.3 Bilateral cooperation

While making Surabaya greener, the government also undertook important initiatives to create a cleaner city. The waste crisis forced the government to seek solutions for this problem. In 2002, a significant 'city-to-city' level cooperation agreement was initiated with the Japanese city of Kitakyushu[21] (Bunnell *et al.*, 2013; Gilby *et al.*, 2017). Through the project, the volume of organic waste generation was reduced by 30 per cent, and the project also served as an example for promoting international cooperation (Kurniawan *et al.*, 2013). Prior to the collaboration, Surabaya's solid waste management system had many deficiencies, such as improper waste management, insufficient financial and human resources, poor law enforcement, low public awareness and participation, and a lack of cooperation between the government and community (Kurniawan *et al.*, 2013; Gilby *et al.*, 2017). To improve performance, the project aimed to reduce the amount of organic waste, mainly from households, through composting programs.

Multiple strategies contributed to the success of the program, including collaboration at different levels, selection of appropriate capacity building, knowledge and technology transfer. Political support between both city governments was imperative to establish and sustain the program (Gilby *et al.*, 2017). This partnership enabled the connection between international and local actors, such as local NGOs. Consequently, an

[21] The city of Kitakuyushu is home to an inter-city environmental cooperation program under the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). This program is generally used as a case study to illustrate strategic waste management and recycling (Hammer *et al.*, 2011; Yusuf, 2013).

important step in initiating the composting program was the development of a collaboration between Kitakyushu International Techno-cooperative Association (KITA) from Kitakyushu City and Pusdakota[22], a local NGO. These organisations worked towards selecting the most appropriate technology that suited local conditions, was convenient and cost-effective, and had simple training requirements (Gilby *et al.*, 2017). The Takakura method also referred to as the Takakura bin, is a device for composting household and market organic waste. This method was portable, simple to use, appropriate for indoor use, did not produce unpleasant odours or attract rats or insects), and represented low cost production for the community (Kurniawan *et al.*, 2013; Gilby *et al.*, 2017), and was therefore suitable for local conditions.

The assimilation and diffusion of the Takakura method occurred in three stages. The first stage involved the capacity building of government officials, who attended training programs on municipal solid waste management in Kitakyushu. These officials were subsequently promoted to higher positions and were responsible for transferring new knowledge to other government staff and creating the necessary organisational capacity to promote efficient solid waste management at different levels (Kurniawan *et al.*, 2013). Another responsibility was to select government officials to serve as environmental facilitators who encouraged community participation through periodic workshops on waste management.

The second stage of the waste management project included the distribution of technology and knowledge, supported by a community-based scheme (Bunnell *et al.*, 2013; Kurniawan *et al.*, 2013). Once the local government had established the organisational network, the local NGO (Pusdakota) distributed the Tatakura bins to the households participating in the pilot project. At this point, Pusdakota joined forces with the social organisation *Pemberdayaan Kesejahteraan Keluarga* (PKK) or the Building Family Welfare Movement. PKK[23] is a women's organisation that works with the government to promote social welfare. The environmental facilitators, in collaboration with Pusdakota and PKK Surabaya organised a network of community volunteers (environmental cadres) to promote environmental awareness and provide technical capacity to the community.

The third was the diffusion of Takakura bins city-wide (Kurniawan *et al.*, 2013; Gilby *et al.*, 2017). During this stage, multiple actors were facilitating the implementation of solid waste management strategies. Aside from the international actors, government officials, NGO staff and community groups and representatives, public media and members of the private sector also played important roles. The local newspaper Jawa Pos

[22] Pusdakota is an organisation that began as a research institute at the University of Surabaya in 2000. The goal of the organisation is to work closely with village communities to solve waste-related problems (Pusdakota, 2013).

[23] The PKK was established under Decree of the Minister of Home Affairs and Regional Autonomy No. 53/2000 on Building Family Welfare Movement. The PKK groups are present in every level of the Indonesian community, from the national level to the neighbourhood level. This social organisation assists the community with education, health, environmental awareness, community cooperation (*gotong royong*), food and security. Women are the prime motivator of this organisation, as such, it promotes women's participation in creating a prosperous family, gender equality and women independence (Imelda, 2011; Anggraini *et al.*, 2016).

disseminated information about the bins and promoted public campaigns, while private companies like Unilever supported the program with finances and household training. An interviewee exemplifies this 'bottom-up meets top-down' approach,

> "…it was the sub-district leader who appointed me… at first, there were two motivators [facilitators] per sub-district, it was hard task, 'How to engage people when they are not given any facilities?' So that's why I coordinated with the BKM[24]. I asked for takakura to them. Then BKM gave each sub-district 100 takakuras. Then I divided them. Soon as I received them, I created a schedule and I trained each RW, because each RW had its own Environmental Cadre. At this time, Unilever was still guiding me, on how to manage takakura, on how to manage waste composter …" (CM 5.6, translated).

The program allocated funds and technical support for building the first composting centre in 2004. By 2015 the local government had established 26 community-based composting centres (DKP Surabaya, 2015). Compost was used to support the city's growing demand for fertiliser in the expanding parks network. In addition, in 2013 the Kitakyushu city, under a JICA partnership project, funded a large-scale waste-sorting facility to promote more efficient waste management (Gilby *et al.*, 2017).

The bilateral collaboration between Indonesia and Japan also produced results beyond waste management actions. Broader city-wide improvements were brought about through the Surabaya Urban Development project funded by the Japanese Bank for International Cooperation from 1993 – 2007. Overall, the project helped ease urban pressures by constructing new roads and solid waste deposits, extension of the drainage network, water supply and distribution pipelines, and provision of technical assistance. Through the project, significant reduction in the amount of flood damage was achieved through improvement works in the Brantas River (JICA, 2001) and Surabaya River (JICA, 2000). However, although the project was highly significant in Surabaya's development, a third-party assessment evaluated the project as moderately satisfactory (Sarosa, 2007). As reported by JICA (2007), the project scope remained incomplete due to difficulties in land acquisition and poor administrative coordination between the organisation aid and the executing agency (national government). Water infrastructure was further strengthened in 2009 when the national government ordered a strategic environmental assessment of environmental impacts and risks that aimed to enhance the coverage of flood disaster areas (Government of Indonesia, 2009). Under this strategy, centralised infrastructure such as floodgates and channels has been built, while the number of inundations continually increases (Pamungkas *et al.*, 2017).

Other bilateral collaborations included the provision of aid from Australia and the United States (US), that both assisted with improved access to higher quality water and basic sanitation programs to support the Indonesian government in achieving the Millennium Development Goals. Since 2011, the Australian government has supported Surabaya through the Indonesia Infrastructure Initiative (IndII) program by

[24] *Badan Keswadayaan Masyarakat* (BKM, Community Welfare Agency) is an institution at the *keluharan* level that aims to reduce poverty.

providing water and drainage connections to poor households. This government has also worked closely with the city's water company (PDAM) in preparing a detailed five-year business plan related to the Umbulan Bulk Water Supply Project (DFAT, 2016). Under the Indonesia Urban Water, Sanitation and Hygiene (IUWASH) project, the US government has been funding programs in Surabaya since 2011. The programs include installating piped water through a master meter system, promoting hygiene behaviour activities in collaboration with local NGOs, and a community-based sanitation program (IUWASH, 2012, 2015).

After the waste crisis, governmental efforts focused on promoting waste reduction, but the programs were not reaching high levels of participation. As a result, DKP established programs in the form of competitions, such as SGC and the 'free from waste' (*Merdeka Dari Sampah*) program in 2005, to gain higher levels of community participation and ultimately motivate people to manage waste independently. The SGC proved to be one the most successful programs for inspiring the kampung community with a green and clean vision (Bunnell *et al.*, 2013; Nurul, 2016). Whilst details on the evolution of the program will be further explored in Chapter 5; it is important to highlight at this stage the sustainable upgrade of some slums because of the SGC. Kampungs originally considered slum areas (e.g. Kampung Jambangan) in the 1960s had become empowered community areas inhabiting functional, eco-friendly, sensitive urban environments by 2017.

4.2.3.4 Corporate social responsibility

In line with the national CSR (Corporate Social Responsibility) policy[25], the government engaged with the private sector to co-finance park development. This partnership extended to the revitalisation of kampungs under the CSR program in 2005. Attributes of these revitalisation programs included community empowerment, capacity building, technology transfer and environmental preservation. For example, Unilever Indonesia, a multinational consumer goods company, is well-known for working closely with the community (Radyati, 2014) and initiated a program in kampung Jambangan to reduce waste in the Brantas River by improving community awareness. Whilst Unilever has been working in Surabaya since 2001, it was only in 2005 that they started conducting CSR programs (Unilever, 2018). Programs aimed to create community awareness on waste management and develop skills for managing the waste. Unilever trained environmental cadres in waste segregation and management, community members in recycling solid waste into handicrafts and developed and contributed to different waste collection programmes, such as Eco-collector and Waste Banks.

CSR programs were also implemented by Telkom Indonesia, a multinational telecommunications company. This enterprise empowers the community through technology by implementing a '3P' pillar CSR policy: people, planet and profit (Telkom, 2018). This includes training and educating the community through a technology-based learning approach under different programs, such as Indonesia Digital Learning, Socio Digi Leaders, Digital Library and the Broadband Learning Centre. The last two programs are facilities built by

[25] CSR policy has been practised voluntarily in Indonesia since 1995 under Limited Company Liability Act No. 1/1995. However, after the enactment of Limited Company Liability Act No. 40/2007, implementation became mandatory.

Telkom across Surabaya kampungs (e.g. kampung Kue). Telkom is also involved in the capacity building of the UKM community by providing digital training to promote and market UKM products. From an environmental perspective, both Astra, a multinational manufacturing company and Pertamina, a state-owned energy company, exemplify the role of CSR in supporting the greening of kampungs. For example, kampung Keputih Berseri Astra and kampung Jagir Pertamina were transformed into green kampungs with the support of respective CSR programs, and this is the reason that these are named after the corporations. Astra's CSR policy includes conservation and protection of green open spaces (Astra, 2015) and implementation of green strategies (Hidayati, 2011). Accordingly, Astra contributed to the greening of kampung Keputih Berseri by providing materials for plant cultivation such as seeds and equipment and waste management such as garbage banks and compost bins. Astra also conducted training programs on waste management, on-site water treatment plants, creation of natural fertilisers and nursery management. Similarly, Pertamina's CSR initiatives comprise environmental conservation programs such as Pertamina Berdikari and Pertamina Hijau (Pertamina, 2018). Pertamina was involved in the greening of kampung Jagir by providing material and technology for urban agriculture (e.g. seeds and cultivation technology) and supported the programs running in the kampung, such as hydroponics and UKM herbal medicines.

Whilst CSR programs proved beneficial for Surabaya's development; private investors also benefited from the partnership with the government. According to Radyati (2014), this collaboration enhances companies' brands (Figure 4.3), leading to increased sales; good relationships with the community, that means the business will have no interruption on profit; and given the good relationship with the government, permissions and other administrative stages tend to run smoothly. An interviewee remarked on this beneficial partnership as a 'win-win' situation,

> "Private sector do two things: accumulate capital, make profit. As long as these two are there, they work well with you. Once you ensure that they can do that but in a proper way, they will be there and they appreciate what's going this way. They support a lot of these environmental issues, but they're doing good business. To make sure they're doing good business, they will repay you. Get them in a good relationship that benefit both side, win-win situation. They need to make profit, they need to build their capital, and then they will share some of that to help the others" (AR 2.1).

Whilst some see this situation as a 'win-win', others perceive this as the private sector benefiting the most from land-use arrangements and waived requirements, or lax enforcement of contributions to open green spaces (Novalia, 2018).

Figure 4.3 Exposure of the brands in kampungs by different corporations (Photo: Author, 2017)

Following the national waste management initiatives, the government of Surabaya implemented a 3R approach (reduce, reuse, recycle) in 2006 to further promote waste management and environmental awareness in kampungs and elementary schools. The 3R approach was effective in changing people's perspectives and improved behaviour towards the environment (Gilby *et al.*, 2017). This became a core strategy to reduce solid waste in Surabaya's Medium-term Development Plan for 2010 – 2015. In addition, the government collaborated with different local NGOs to disseminate the 3R approach and train environmental cadres in waste management. Data from the City Government of Surabaya (2007) show the NGO contribution to be as follows: Bangun Pertiwi reached 54 districts, training 1000 environmental cadres; Uli Peduli covered 15 districts and educated 1001 cadres; Sahabat Lingkungan worked in the Karah district (kampung Jambangan) educating 159 cadres; and Bina Mandiri trained 115 cadres in the Kenjeran district.

In 2007, the Adiwiyata[26] Green School Program was first implemented in 15 schools from elementary to high schools, and by 2013, more than 1000 schools were participating in the program. Adiwiyata encourages the acquisition of knowledge and promotes awareness in an effort to preserve the natural environment and foster sustainable development through participation. Adiwiyata Surabaya is managed by the Environmental Services Agency (*Dinas Lingkungan Hidup*) that runs a certification and award system to motivate the school

[26] The Adiwiyata program was developed by the Ministry of the Environment in 2006. This is a nation-wide, school-level initiative that supports the concept of Education for Sustainable Development (ESD) and is promoted by the United Nations (UN). ESD is a framework that enables communities to devise sustainable local solutions to alleviate poverty, improve the environment and promote ideals of gender equality and human rights. ESD gained momentum between 2005 and 2014 when the UN emphasised education as a critical element in attaining a more sustainable world (Wals of Wageningen, 2012). In this context, ESD seeks to synchronise learning institutions with sustainability; hence schools become sustainable schools, eco-schools or green schools.

community to participate in the program. As with other programs, Adiwiyata is implemented in coordination with NGOs, whose strategy has a 'learning-by-doing' approach with a special focus on generating a sense of belonging and togetherness. However, Tanu and Parker (2018) argue that the program could be more efficient if less bureaucracy was involved and more incentives from the national level would go towards inspiring the teachers who play a crucial role in the development of the children. The program is described by one of the interviewees as,

> "Bu Risma is now targeting more to schools to love environment more. There is a dedicated competition for school, called Adiwiyata. Children are obedient towards their teacher but not too much towards their parents, so it's up to the schools to educate these children … in Adiwiyata, we shared with each other a lot … this is Adiwiyata, is a teaching process, to educate the children nowadays to love environment, to love their kampung" (CM 5.6, translated).

The city government also launched two other programs to support the nexus between the environment and youth. Surabaya Eco-School was launched in 2011 to encourage all schools in the city to implement sustainable environmental programs. Unlike the Adiwiyata program, schools are required to attend government environmental workshops and training programs. Nevertheless, the program also holds a competition that combines culture (e.g. music) and environmental awareness (e.g. recycled costumes) to motivate students to participate. Each year the program targeted a different theme; for example, the Eco-school 2012 theme was a green lifestyle in school, and the Eco-school 2013 theme was water conservation in school. The government also launched the Eco-Campus program in 2013, targeting universities to create clean, beautiful and healthy environments on campuses.

In 2008, waste banks were established to educate people on waste reduction, recycling, waste separation and waste saving. Since its inception, the number of waste banks in Surabaya has grown rapidly, from 15 to 180 by 2013 (Wijayanti and Suryani, 2015). Waste banks are considered small-scale businesses and are managed by community members. Residents deliver separated recyclable waste, and in return, they receive a payment in cash, or it goes to the bank's deposit funds (Gilby *et al.*, 2017). The profit is used for loans or to fund community projects (e.g. greening the kampung), hence the word 'bank'. Waste banks are developed in kampung communities as the profit generates income to support living expenses (Wijayanti and Suryani, 2015).

Bu Risma, elected in 2010 as the first female mayor in Surabaya, developed policies that catalysed Surabaya's green movement[27]. Under Bu Risma's leadership, Surabaya received national and international recognition for outstanding environmental, governmental and educational achievements. These included the Adipura Award (awarded consecutively since 2010), the ASEAN Environmentally Sustainable City Award 2011 and the Global Green City Award in 2017. Bu Risma's achievements were recognised through the Globe Asia's

[27]At the end of a five-year term as mayor of Surabaya, Bu Risma was highly popular and won the 2015 mayoral elections by far (86 per cent to 14 per cent), against Rasiyo-Lucy (Fionna, 2017). Securing a second term, Bu Risma continued to strengthen the established programs and support the sustainable development of the city.

prestigious 2012 Women Leader Award and the World Mayor Commendation in 2014. Bu Risma was also named one of the ten most inspiring women by Forbes Indonesia in 2013, one of the top mayors in 2014 by the City Mayors Foundation and one of the world's 50 greatest leaders by Fortune magazine in 2015. Most importantly, Bu Risma gained the public's trust by leading with the "power of *arek Suroboyo*" (Gervasi, 2011, p. 2), "integrity and with the heart" (Diliani and Susanti, 2015, p. 295), and caring for other people (Budiharso, 2014; Maichal and Urbanus, 2014) which ultimately attributed her the title of 'mother of the city' [Bu (mother) Risma], as highlighted by most of the interviewees.

Bu Risma's primary policies emphasised education and women's empowerment as key drivers in reducing poverty. These were realised through the allocation of 30 per cent of the city's regional budget (City Government of Surabaya, 2016c) to providing free education up to year twelve, socio-environmental awareness campaigns and training programs. The training programs supported government targets to empower communities, one of which was the UKM.

The UKM contributed significantly to Surabaya (Cahyono, 2018) and Indonesia's[28] economic growth. The program was launched in Surabaya in 2010 with 92 businesses, which grew to 3000 in 2016 (Chandra, 2016). According to Kurniawati *et al.* (2018), this rapid growth was due to Bu Risma's strategy to promote the diffusion of the UKM program and encourage people to participate. Strategies included motivational discourses on entrepreneurial spirit, as illustrated in Bu Risma's (2017) public speech to entrepreneurs at a UKM event[29] (Figure 4.4),

> "…you need to create your own jobs, to become independent …developing the local community, to elevate your family economy ... So our city can become prosperous" (translated).

Figure 4.4 Bu Risma at a UKM training event (Photo: Author, 2017)

The government also focused on providing free training programs on different skills (e.g. crafts), technology development (e.g. business software), environmental management (e.g. usage of recycled goods), and the

[28] Micro, small and medium-sized enterprises are key to Indonesia's economic growth, contributing 58.9 per cent of the Gross Domestic Product (GDP) and providing 97.3 per cent of employment nationwide (Financial Service Authority, 2016).

[29] The A to Z UKM event was held on 22 October 2017 at Kapas Kampung Plaza Lantai 2 in Surabaya. The seminar was part of the Economic Hero training programs.

production and marketing of the product. Whilst the training programs are open to any Surabayan resident; the government targets women to foster economic independence and increase family income (City Government of Surabaya, 2016c). The government also built and provided spaces for UKM centres. The centres serve as exhibition, training and transactional facilities and are primarily situated in tourist areas, inside main shopping malls or dedicated centres. One of the main UKM centre buildings is in Putat Jaya Gang (*ex* Gang Dolly, a brothel area) that was transformed into the Dolly Saiki Point, a creative industry centre, in 2015. Following the theme of empowerment of women, the government launched the *Pahlawan Ekonomi* (Economy Hero) program in 2014, a community-based empowerment program that supports the development and improvement of small businesses and recognises successful women in building UKMs.

The city government closed five prostitution districts[30] from 2012 – 2014, aiming to improve the livelihoods of women and children in the districts and surrounding community (Kurniawati, 2016). In doing so, Bu Risma faced political pressure from opponents concerned that the forced closure was against democratic rights (National Commission on Human Rights - Komnas HAM, 2014 in Harsaputra, 2014), adding that if the prostitution areas were closed, the local budget would be impacted. Similarly, certain community members were concerned that prostitutes, particularly mothers, would be left without income (Fionna, 2017). In response, the government focused on people's needs and the delivery of a long-term plan to provide financial support and training to start small businesses (Kurniawati, 2016; Fionna, 2017). District areas were transformed into more habitable living environments following the green policy. The government allocated money to buy the brothel buildings and converted these into shopping and creative industry centres; the budget was also used to greening the surrounding areas with gardens and parks (Kurniawati, 2016). Whilst some authors see the closure of Dolly as reflective of Risma's integrity (Kurniawati, 2016; Tuti and Adawiyah, 2020), others suggest that the forcible closure was a moral-themed move aimed at masking the displacement of poor communities (Harsaputra, 2014; Das, 2015a).

During this time, the government also implemented multiple initiatives as an strategy to reverse corrupt practices and promote transparency and accountability (Diliani and Susanti, 2015; Prabowo *et al.*, 2018; Pramusinto and Purwanto, 2018). The e-government system was established to facilitate transparent procurement and public access to information (Diliani and Susanti, 2015; Prabowo *et al.*, 2018). Similarly, the Government Resources Management System (GRMaS), a control system to assess staff performance, transparent promotions and appropriate placement of employees (KPK, 2011; Pramusinto and Purwanto, 2018), was implemented. As highlighted by one government official interviewee,

> "In Surabaya there's a policy from Bu Risma to make civil servants not to accept anything [bribes], there are incentives that maybe don't exist in other cities. It's done in order to improve our professionalism … That incentive is to improve our performance … Every incentive is legal and

[30] Despite Local Government Regulation No. 7/1999 that bans buildings in Surabaya from being used for immoral activities, prostitution still existed. The city had five prostitution districts, of which Gang Dolly was one of south-east Asia's largest red-light districts with 1020 registered and an estimated 9000 unregistered sex workers (Fionna, 2017).

regulated by the Mayor's Regulation ... We have performance incentive based on report grade … if we perform good, our pay goes up, if we come late, our pay got cut. So it can increase or decrease based on our own performance" (GO 4.4, translated).

At the same time, the local government enacted Regional Law No. 12/2014 to support sustainable regional spatial planning, recognising the need for integrated development between various actors (government, private sector and community). In addition to the 2014 Master plan revision and the enactment of Regulation Law 15/2004 on urban forests implementation, Bu Risma's government was steadily pursuing their green and clean vision. For example, by 2015, Surabaya's park area under the city's care was 117 ha, a 2.5 fold increase in park area compared to 1991 (DKP Surabaya, 2015). This period was also marked by the rapid diffusion of the SGC program in certain kampungs (further explored in Chapter 5).

4.2.3.5 Zero per cent of urban slums

Although the proportion of slum areas had been halved, approximately 30 per cent of the population still had inadequate access to basic urban infrastructure and services in 2014 (World Bank, 2016b). To address this problem, the national government implemented the National Medium-Term Development Plan to achieve liveable, productive and sustainable settlements. Through the 100-0-100 program, the Indonesian government aims to reach the target of 100 per cent access to drinking water, 0 per cent of urban slums and 100 per cent access to sanitation by 2019 (Government of Indonesia 2014). According to the 2015 – 2019 Strategic Plan of the Ministry of Public Works (*Renstra Kementerian Pekerjaan Umum dan Perumahan Rakyat*), the government focused on three strategies to accomplish this target: building a system of mainly centralised infrastructure projects, such as large-scale storage and wastewater treatment plants; facilitating local governments by providing institutional and financial support; and empowering the community by encouraging innovation and technology development, building a trust relationship and creating incentives.

According to Law No. 1/2011 concerning housing and settlement areas, a slum settlement is a unit of housing or settlement entity that is not habitable due to the irregular conditions of the building, and facilities and infrastructure quality do not meet local requirements (Table 4.2). City councils have used these physical characteristics to identify slum areas.

In an effort to support the 100-0-100 program, the national government launched the No Slum City program [*Kota Tanpa Kumuh* (KOTAKU)] in 2016 that was implemented in 271 cities to prevent further development of slums and improving the quality of existing slums. The national slum upgrading program was supported by the Asian Infrastructure Investment Bank (AIIB), co-financing the project with the World Bank (marking the first joint co-financing between these two multi-lateral organisations) (World Bank, 2016a). The program aimed to build an integrated system, a 'collaboration platform', where the local government collaborated with different stakeholders (e.g. private sector and NGOs) in the planning and implementation of the program and promoted community participation (Department of Settlement and Regional Development, 2016). A key component of the program was to increase capacity building in terms of behaviour and skills through training,

workshops, advocacy, mass communication and public relations. This strengthened the roles of different administrative levels and fostered community-based programs.

Table 4.2. Physical characteristics used by the national government to determine slum areas (Department of Settlement and Regional Development, 2016)

Facilities and infrastructure indicators	
1. Building - Irregularities in dimensions, orientation and form - High density is not in accordance with provisions in the spatial plan - Incompatibility with technical requirements.	**5 Wastewater management** - Lack of wastewater management systems - Pollution of the surrounding environment.
2. Road - Road surface conditions preventing safe passage of vehicles - Inadequate road width - Inadequate road completeness	**6 Waste management** - Lack of solid waste management systems - Lack of waste management facilities and infrastructure - Pollution of the surrounding environment by garbage
3. Drinking water supply - Lack of access to drinking water - Unsatisfied drinking water needs of individuals - Not fulfilling the quality of drinking water according to health standards.	**7 Fire safety** - Lack of active and passive security systems - Lack of water supply for firefighting - Lack of access for fire trucks
4. Drainage - Inability to effectively drain rainwater runoff - Causes odour - Lack of connection with urban drainage systems	**8 Public open space** - Lack of land for green open space - Lack of land for non-green open spaces/public open spaces

Due to initiatives that supported the upgrade of urban slums, only 10 per cent of slum areas remained unimproved in Surabaya by 2014 (Das, 2017). To upgrade these, the mayor issued Decree No. 188.45/143/436.1.2/2015 that prioritised housing and settlement quality improvement. Five districts were identified as top priorities for housing and settlement quality improvement: Kenjeran, Bulak, Wonokromo, Rungkut and Semampir, as they presented some of the characteristics exposed in Table 4.2. Of these five districts, the Kenjeran area, also known as kampung Pelangi, was the most highly dense slum district to be improved through the KOTAKU program.

The improvement of Kenjeran district appears to be a governmental led structural change process. Strategic planning started in 2015, and the implementation involved the collaboration between different levels of government (national, provincial and local), private sector and community. Regulations, guidelines and programs across national and local government provided a strong foundation for the development of the project (Ambar and Meirinawati, 2018). For instance, through the directorate general of human settlements, the national government released technical guidelines on capacity building, community-based activities, stakeholder engagement, and operational procedures. These guidelines were implemented by the development agency of Surabaya (BAPPEKO). This was further supported through the local government master plan, which proposed interventions to develop the coastal area of Kenjeran. The coordination process also included the allocating budget, national and provincial funding supported regional scale activities that require high costs, such as construction and paving of roads. Whereas funding from the city government was directed towards the construction of small-scale infrastructure such as communal wastewater treatment

plants. The private sector was also involved financially through the CSR program, directing funding towards small-scale environmental activities such as the provision of painting and plants.

Community participation has been a key strategy for the implementation of the KOTAKU program in Kenjeran (Zainul, 2017; Ambar and Meirinawati, 2018). In line with the community-based environmental management program, the KOTAKU committee focused their strategy towards encouraging synergy between the government and communities in the planning and implementation process; increasing the capacity of community institutions and local government to be able to manage the project independently and be self-sustaining; and encouraging changes in attitudes and behaviour of the community (Directorate General of Human Settlements, 2015). The actions included environmental and health awareness campaigns; gender mainstreaming; training and workshops of local officials and community facilitators; partnership with local universities; replication of environmental activities (e.g. SGC); and foster creative and innovative solutions among the community.

According to Zainul (2017), the government of Surabaya has succeeded in the implementation of the KOTAKU program as a result of the solid multi-stakeholder collaboration the city built over time. By 2017, kampung Pelangi was transformed into a colourful urban settlement, which led to international attraction as the rainbow kampung. Buildings and roads were restored, provision of latrines and health campaigns helped improve sanitary behaviour and drainage was improved. Green and clean activities included household waste sorting, use of composting bins, kampung ornamentation with plants and the start of a waste bank. Nevertheless, it is worth mentioning that the new physical appearance does not always parallel with lifestyle or habitual improvements from the community (e.g. environmental education, awareness, responsibilities)(Agustin, 2020). Whilst kampung Kenjeran is still in the process towards becoming more sustainable; it demonstrates the capacity for these areas to rapidly transformed when there is a clear target (zero slums) and the support of a multi-level and multi-stakeholder collaborative platform.

As this section highlights, Surabaya's blue-green transformation had a long history of initiatives that supported the city's current green reputation. There is a clear co-evolution of government and community values around sustainable environments taking place alongside socio-political drivers of change. In particular, a collective shift in 'green and clean' values has proved successful in promoting a sustainable change across the city, as evidenced in the development programs, policy and regulatory instruments. The foundations laid by this change in values have supported a sustainability transformation in individual kampungs and influenced accelerated sustainable development in these areas. To better understand this transition process, the following section reframes parts of the city-wide historical analysis through a transitions lens with a specific focus on Surabaya's kampungs.

4.3 Surabaya's kampung transition process: from slums to sustainable living areas

This section characterises the overall architecture of Surabaya's transition of kampungs (once considered slums) to sustainable living areas, depicting the evolution towards sustainable kampung environments (SKE)

and reflecting on its alignment with the transition frameworks outlined in Chapter 2. Surabaya's transition to improved urban kampung services management has reflected typical major transition phases, influenced by activity from the macro, meso and micro levels. The analysis draws on the multi-phase concept (Section 2.3.2) to explore Surabaya's transformative process through six phases: two sub-phases within pre-development, identified as 'landscape shift' and 'niche emergence'; take-off, or 'niche formation'; two sub-phases within acceleration, including 'niche expansion' and 'niche-regime translation'; and pre-stabilisation over the course of the transition (Figure 4.5).

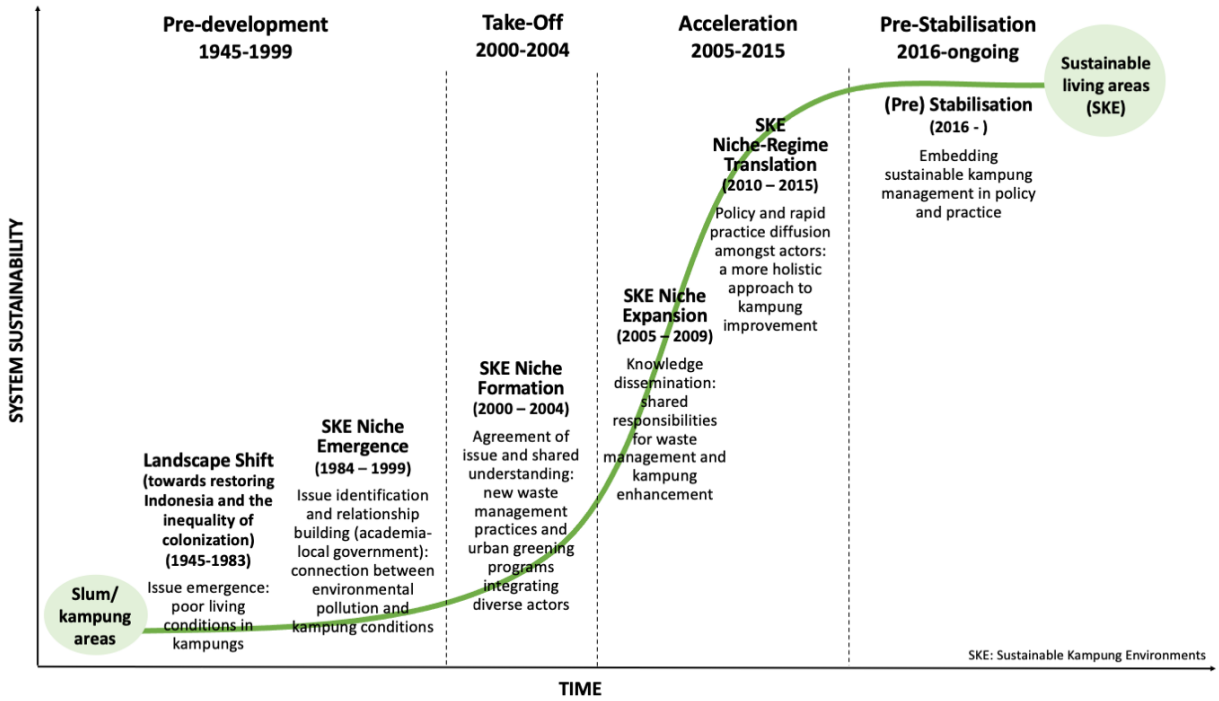

Figure 4.5 Transition phases towards sustainable kampung environments

4.3.1 Pre-development (1945 - 2001): Landscape shift and SKE niche emergence

4.3.1.1 Landscape Shift: towards restoring Indonesia and the inequality of colonisation (1945 - 1983)

Surabaya's path towards SKE experienced a long, build-up of macro-level processes. During the colonial era, kampungs were just deplorable areas that needed to be evicted to facilitate the Dutch real estate boom (Dick, 2002). This perception changed with Indonesia's Independence (1945) when kampungs (also referred to in this period as slum areas) had legal status and gained municipality recognition. This meant that despite being considered slum areas, the government could allocate funds for the provision of services in these areas. Nevertheless, the aftermath of World War II and the Battle of Surabaya left the city devastated, and many kampungs were destroyed. Consequently, the rehabilitation of the city was the post-independence focus and not necessarily the improvement of kampungs. Moving away from the colonial system brought changes in the broad Indonesian societal trends, such as macro-economic developments and politics. In addition, the high influx of immigrants post-independence and the fast-growing squatter settlements challenged the population dynamics and natural environment for the new Surabaya government.

The city's blue-green services management (e.g. water and solid waste) were dominated by the remains of a centralised infrastructure from colonial times, guided by a cost-conscious mode of governance. Poor flood control and drainage systems resulted in the resurgence of malaria, making the kampung communities particularly vulnerable (Dick, 2002; Elyazar *et al.*, 2011). Controlling the spread of malaria became the focus in the 1950s, and efforts to eradicate this disease, drove attention back to kampungs, prioritising their rehabilitation. By the end of 1953, access to rubbish collection and sanitary facilities were a common service in kampungs, however no further projects towards their improvement took place until economic stability was restored by the New Order government.

As urban slum areas expanded, Surabaya gained socio-political and economic stability by the late 1960s, stimulating a change in socio-environmental conditions in these areas. The government delivered a long-term plan to reduce the problem of squatting, resulting in the first wave of kampung improvement that began in 1969 (Peters, 2013). One of the main challenges for improving services in kampungs were limited financial and technical resources, which led the government to encourage community self-help projects (Silas, 1992) and collaborate with science researchers from the local university. The subsequent KIPs (1976, 1979 and 1987) were developed under the financial assistance of a multi-lateral organisation; the projects also followed the same 'freedom to build' notion (Turner and Fichter, 1972) conducted by the community.

Undoubtedly, these solutions have provided access and improved basic services and recognised kampungs as viable living environments rather than slums. This was also taking place during a rise in global environmentalism in the late 70's (Falkner, 2012), and the national government was pushing an environmental policy across Indonesian cities, in the form of Law No. 4/1982 on environmental management. The landscape shift in public and government priorities towards environmentalism was on the cusp of changing kampungs' environment. It revealed the importance of these first decades in stimulating a change in social conditions in kampungs and building a socio-political and economic capital. This placed stress on the regime structure and allowed a foundational context to develop and promote actor strategies that supported the emergence of the niche that followed.

4.3.1.2 SKE niche emergence (1984 - 1999)

In response to this macro-level change, this phase involved institutional adjustments, witnessing the development of a loose network of champions from government, academia and community, which allowed the SKE niche to emerge. These individuals were initially driven by a common vision for health and environmental protection by keeping a clean city. A 'green and clean' vision of Surabaya was embedded in the government's agenda by the local political figure at the time, Mayor Poernomo Kasidi (1984 - 1994). In addition, during the post-Suharto democratisation period, Indonesia implemented decentralisation legislation in 1999 that enabled local governments to adjust their policies and programs to deliver improved public services and public welfare, to increase community participation, and to have accountable local governments (Salim and Drenth, 2020).

In Surabaya, the rise in environmentalism translated to significant advancements towards public health protection (Dick, 2002) and environmental protection progress (Lucas and Djati, 2007). An influential national environmental initiative that proved to be successful in raising environmental awareness was the Adipura Award in 1986. This national award set a starting point for promoting cleaner environments in public spaces, such as streets, rivers and kampungs. Challenged by informal street vendors and low community awareness, the local government managed to clean public spaces and secure the national award through different programs like the 'yellow trooper' in 1988 or the clean river program in 1989. However, it was mainly Poernomo's strategy to direct collaboration between local officials and ITS researchers, led by the prominent urban planner Johan Silas, that ensured Surabaya's environmental stewardship and sustainability award for multiple consecutive years (1988 – 1993).

Collaboration between academia and the local government provided a protected space for new ideas on kampung improvement to be developed and led to a new strategy to reduce poverty in the urban area, a co-productive arrangement with the community to greening their kampungs (Novalia *et al.*, 2020). This community-based approach is well recognised as a key component for the success of slum-upgrading (Das, 2015a; Imparato and Ruster, 2003; Minnery et al., 2013; Patel, 2013). Community participation has been found to shape the role of the community by fostering their active involvement in the improvement of their basic needs and their ability to influence decision-making in the political arena (Choguill, 1996; Davidson *et al.*, 2007). Consequently, the C-KIP (1998) focused on empowering the community through economic development programs, which ultimately provided them with resources to self-improve their housing and start small and mid-sized businesses. By this point, kampungs were officially recognised as respectable places to live (Dick, 2002; Silas *et al.*, 2012).

However, whilst programs like the C-KIP began a community-led approach for kampung upgrading and environmental awareness, the co-productive arrangements were closely circumscribed by the local authoritarian context, holding possibilities for greater grassroots empowerment (Das, 2015a). The refinement of these ideas within this network of champions led to the development of new institutional space between key actors within the existing meso-level as well as the innovation of new actions at the micro-level. During this phase, a significant relationship was built among leading actors from different organisations focused on identifying and understanding key challenges related to improving kampung environments. This phase also provided the foundations for radical innovations and new collaborative relationships formed in the next phase.

4.3.2 Take-off (2000 - 2004): SKE niche formation

This phase witnessed Surabaya's champions' determination to improve the urban environmental quality of the city and kampungs through a strong and active connection between key actors at the meso-level, and the development of niche activities at the micro-level. The collaborative relationships between local government and academia were further strengthened and expanded by incorporating of a broader range of actors (e.g. NGOs, private sector and international organisations) which helped create a shared understanding of the

issue and cement the formation of the SKE niche. Instrumental to this period was: i) the establishment of a formal inter-organisation partnership to promote decentralised practices; and ii) the role of key local champions, who articulated and built on momentum to facilitate the next phase.

After the waste disaster in 2000, there was a public concern for environmental aspects of the city, which led to a redemption process to clean the city (Dhokhikah *et al.*, 2015; Bercegol *et al.*, 2017), and ultimately trigger action for a large scale change. Under the leadership of the city's mayor, Bambang, the government prioritised green open spaces through land transformation initiatives and slum upgrading with the cooperation of actors at different levels. One of the strategies that shaped the green space management of the city was the revitalisation of thirteen gas stations into green areas (Suryaningsih *et al.*, 2018). This transformation not only improved the aesthetics and social amenity in the city, but also strengthened the relationship between the government and private sector.

The formation of the niche was built on the successful partnership among key champions through cooperative arrangements across kampungs at the grassroots levels. This co-production at the kampung level was seeded through the 'city-to-city' level cooperation agreement with the Japanese city of Kitakyushu in 2002 (Novalia *et al.*, 2020). Through the solid waste management program, this collaboration managed to establish community-based composting centres and raise awareness in the kampung community on waste management. This program also became the breeding ground for grassroots leaders, known as environmental facilitators and environmental cadres, who emerged from the collaboration between government, NGOs, and the community. Grassroots participation in slum upgrading has been noted as an effective strategy for immediate urban improvements (Mitlin and Satterthwaite, 2007; Padawangi, 2013; Sticzay and Koch, 2015). The extension of this partnership also triggered waste sorting behavioural change, which ultimately empowered community members by adopting decentralised technology and generating innovation and profit through the waste banks.

During the take-off phase, the need for a change became evident, representing a shared understanding that supported a shift towards the development of strategies for SKE across Surabaya. As the niche became more established, it gained momentum and exerted greater influence over the regime conditions. An alternative vision of a 'green and clean' crystallised and diffused; this promoted the institutional partnership among key actors, who created structure and influenced the new direction; and a focus on the implementation of grassroots programs increased awareness and proved new vision could be successful.

4.3.3 Acceleration (2005 - 2015): SKE niche expansion and SKE niche-regime translation

4.3.3.1 SKE niche expansion (2005-2009)

This period continued the momentum built during take-off, supporting the rapid diffusion and expansion of the SKE niche. A collective learning-by-doing process and knowledge dissemination were facilitated during this phase through four key actions. First, key actors involved in the solid waste management program launched through the Surabaya government the SGC program in 2005. Whilst the aim of the program was similar to other programs (e.g. solid waste management and reducing waste generation to improve local

hygiene and kampung aesthetic), the main difference was the framing; the SGC was launched as a neighbourhood competition. It encouraged the community to participate in the SGC, with reputation and prestige for the greener and cleaner kampung as the major incentive. Second, new local regulations and programs were developed following a formal communal vision. For instance, programs such as the CSR, 3R, and waste banks, all of which supported the green and clean agenda, and the uptake of the SGC program amongst the kampung community. Third, further diffusion of the program to more inaccessible areas was facilitated by grassroots organisations, such as the PWSS. This helped areas with meager resources to feel motivated to engage in the process of environmental change of their kampungs. Finally, several members within the actor-network actively engaged in expanding the momentum of the program locally, nationally and internationally.

At this stage of Surabaya's transition, the 'green and clean' vision was reaching more and more inhabitants. The government took on the role of stimulator through the SGC program, which catalysed the paradigm. Whilst the niche expansion was related to kampungs; this phase also helped the government consolidate a group of non-state actors (e.g. environmental cadres) to become the drivers for a sustainable transition beyond their local communities.

4.3.3.2 SKE niche-regime translation (2010-2015)

During this latter part of the acceleration phase, the focus was on reinforcing widespread implementation and embedding while influencing the speed of development of the new niche across kampungs. This was done through by creating an institutional environment targeting sustainability policy and vision, which enabled the up-skilling of grassroots actors through financial and capacity building programs and incentives. Under Bu Risma's close direction as the new Mayor of Surabaya in 2010, the government was encouraging a greener and cleaner kampung, ensuring environmental sustainability through community empowerment (particularly of women and children), and stimulating innovation and creativity of diverse fit-for-purpose practices (such as urban farming and on-site wastewater treatment plants) in the community. Programs such as the UKM and changes in regional laws and strategic plans supported an increase in broad community familiarisation of the niche. The success of the SGC program encouraged the network of champions to innovate and developed different sustainable practices within kampungs. As the community became more aware of the SGC program, on-ground implementation and demonstrations reached their peak in 2010. That year, approximately 30 per cent of all kampungs had been upgraded through the SGC (Bunnell *et al.*, 2013). As such, a process of replication and an accelerated transformation process started, supporting rapid practice diffusion and mainstreaming of the niche. The SGC program managed to upscale the number of kampungs implementing sustainable practices and to induce a co-learning process of green and clean practices across the city, attracting visitors that wanted to learn from it, both nationally and internationally.

By the end of this phase, latecomer kampungs not only followed the same SGC path of frontrunner kampung winners but jumped the linear progression of conventional practices and, in some cases, developed more progressive initiatives than kampungs already considered SGC champions. Within the acceleration phase, a booming number of initiatives emerged, provoking innovative and forward-thinking sustainability practices.

For instance, some latecomer kampungs went from irregular services (e.g. lack of a waste management system) that did not meet local requirements to sustainable services management (e.g. decentralised 3R waste management and behavioural change plans). As a result, a new way of sustainable services in kampungs began to be accepted and recognised internationally by many organisations who refer to this approach as a best practice (UN-HABITAT, 2018).

4.3.4 Pre-Stabilisation: Embedding sustainable kampung management in policy and practice (2016 - ongoing)

The stabilisation of the SKE niche was supported by political leadership and trust; the enactment of local and national policies; and a well-established network of actors. Notwithstanding this positive transitioning momentum, work remains to be done so that SKE becomes mainstream across kampungs, and ultimately enables the social embedding of new sustainable thinking and practice to other areas across the city of Surabaya. At the point of data collection finishing in 2017, Surabaya focused on diffusing the insights of the SKE niche. This was enabling a stabilisation of the niche to take place; however, it is still not totally integrated across socio-institutional and technology-environment domains at the meso-level. This means that although the system may reach a new regime and become an established system, based on the research until 2017, the Surabaya transition is at a pre-stabilisation stage.

Over twenty years have passed since the niche emergence, during this time, many of the early champions gained expertise and are now in senior or leadership roles across government, the private sector, community and academia. With the re-election of Bu Risma in 2015, these individuals worked to maintain the green and clean vision and supported the rapid transformation of other kampungs. The momentum gained throughout the last transition phases led to the successful implementation of the KOTAKU (zero slums) national program in 2016. The city managed to rapidly advance the development of some districts identified as top priorities for housing and settlement quality improvement, according to local regulation. While the KOTAKU program financially supported the kampung upgrade, the groundwork done in Surabaya (multi-stakeholder collaboration and community-based environmental approaches) influenced the success of the national initiative locally, in contrast to other local governments (Zainul, 2017). The rapid implementation of this program in Surabaya reflected the strong and consolidated actor-network and capacity of the city. A potential vulnerability in this newly stabilised niche is the important role of Bu Risma, in maintaining the vision. Without her leadership, arguably, many of the shifts in regulation and on-ground implementation may not have gained the momentum they did. However, despite her instrumental role, there are signs that a broader stabilisation may be possible, regardless of the strength of the city leader, as public support, awareness and endorsements from other influential non-state actors (such as academia and the private sector) has grown beyond the need for a charismatic, public leader to be pushing the clean and green agenda in Surabaya.

While these new technical practices and policy shifts suggest that the SKE niche is developing towards becoming the new regime, it is not yet mainstream across all kampungs in Surabaya. In fact, some areas of

the city are still challenged by kampungs with inadequate living environments, including unavailable or low-quality services, and a persistent rise in slum settlements. Nevertheless, the influence of the emergent transformation process of services in kampungs is turning into optimisation processes (rapid kampung upgrade through the zero slums program), suggesting the development and stabilisation of a new regime (van der Brugge and Rotmans, 2007). This transformative process is supported by a desktop analysis during 2020 (three years after the end of data collection) that shows Surabaya's ongoing and effective agenda, as evidenced by international recognition, including the Guangzhou International Award for Urban Innovation in 2018, a special mention in the 2018 Lee Kuan Yew World City Prize, Women Empowerment Award in 2019 by Her-Times, and as the city host for the Global Observance of the World Habitat Day 2020 – Housing For All: A Better Urban Future. Similarly, the observed transition process suggests that many of these laggard kampung communities have the potential to jump directly to SKE by leveraging the resources and practices that have supported the broader transition to date.

4.4 Reflecting on Surabaya's blue-green transition process

The historical analysis of Surabaya's blue-green initiatives described in this chapter demonstrates the significant progress that the city has made over the past 70 years towards mainstreaming a 'green and clean' paradigm for kampung upgrading. The eco-friendly transformation of kampungs and other integral areas of the city's landscape can be distinguished across three periods (urban rehabilitation, urban improvement and urban renewal) and four transition phases (pre-development, take-off, acceleration and stabilisation). Figure 4.6 outlines a graphic summary of the analysis contained in Sections 4.2 and 4.3. The figure highlights the drivers, challenges and outcomes of key blue-green initiatives that took place over time. The dark green programs are those that were directly targeted at improving kampung environments, whilst the light green programs are those that were part of Surabaya's broader "green and clean" strategy. These supported the transformations within the kampungs but were not directly targeted to do so.

Overall, the blue-green transformation process shows the growing breadth of health-related concerns within Surabaya's planning strategies as they progress towards not only cleaner, but also greener environments (Figure 4.6). In the first decade in the aftermath of the war (1945-1964), the Surabaya government focused on the city's rehabilitation of services and the socio-economic crisis. The urban improvement period (1965-1999) prepared the groundwork for the subsequent programs in the next period to include a holistic green and clean approach. Key programs during this period include both local and national initiatives, the kampung improvement program, the Adipura award and the comprehensive KIP. Finally, the urban renewal period (2000-2017) provided catalyst programs that assisted the dissemination of blue-green initiatives. The programs included the green space management program, the solid waste management program, the SGC, and the zero slums program, all of which had local, national and international inputs.

In mapping the development of the key urban green and clean initiatives over the past seven decades, there is an evident system change taking place at the city scale that has gone through four major transition phases.

The analysis suggests that whilst the SKE transition is yet to be completed; it provides an example of an ongoing and influential reform agenda that is currently in practice in some areas of Surabaya. This narrative shows how these transition dynamics played out in Surabaya, following six transition phases (four major and two subphases) described in the previous section. During the pre-development phase, socio-political and economic foundations were established, and an emerging health concern began to exert pressure on the government to prevent disease from spreading. This led to the identification of the issue and the creation of an informal network of people working towards a common vision, the improvement of kampungs. The next phase witnessed the niche formation, as a shared understanding and agreement on kampungs' environmental problems and solutions were being established. During the acceleration phase, rapid knowledge dissemination and policy and practice diffusion of the niche took place. This was facilitated through a clear vision and goals that guided communication (e.g. *musrenbang*), building familiarisation and implementing new sustainable knowledge and practices across a broad range of actors. At the scale of kampungs, this phase witnessed a rapid transformative reconfiguration of some kampung blue-green systems, contributing to accelerating sustainability transition in these areas and often leapfrogging from relatively basic or poor service provision directly to sustainable green and clean outcomes. The final phase, (pre) stabilisation, saw an optimisation of the transformation process begin to take place. Whilst the new regime has not stabilised yet, the embedding of SKE across kampungs is on its path to becoming mainstream.

The historical analysis reveals a blue-green transition at the city scale as a result of a range of interconnected actors and programs, which ultimately shaped the context for leapfrogging to take place within some areas of the city. However, as outlined in Section 4.3, leapfrogging processes supporting slum upgrading appear to have occurred during the acceleration phase and only within particular kampungs. During this phase different, dynamics that were reinforced by the previous phases not only accumulated to force the regime to transform, but this transformation was rapid, and managed to skip a linear progression to achieve SKE. This represents a departure from traditional transitions scholarship, which has largely focused on understanding transitions at a single scale (often with sectoral boundaries) (Coenen *et al.*, 2012; Truffer and Coenen, 2012). However, what is evident in the Surabaya case study, is that whilst there was a broader, overall transition happening within Surabaya, this was a shaping force in providing the contextual conditions for more local/kampung-scale transitions to take place and leapfrogging to occur. A key program that helped to catalyse this leapfrogging pattern was the SGC. In this sense, this chapter has examined the socio-institutional context and its foundations that allowed the success of the SGC within the acceleration phase. The SGC program managed to influence more than 30 per cent of all neighbourhood units (*RT*s) in the city and was able to support kampungs bypassing stages of conventional kampung improvement to directly implement more sustainable approaches. These kampungs are seen as successful pockets of environmental improvement, which ultimately resulted in some kampungs leapfrogging from basic or non-existent blue-green services to sustainable living areas (Silas *et al.*, 2012; Wijayanti and Suryani, 2015; Das, 2017; Shirleyana *et al.*, 2018). Therefore, to have a deeper understanding of the strategies within the acceleration phase and consequently the leapfrogging process, the next chapter will closely analyse the innovative activities and related actor-network within the SGC program and the impact of the local context on the program.

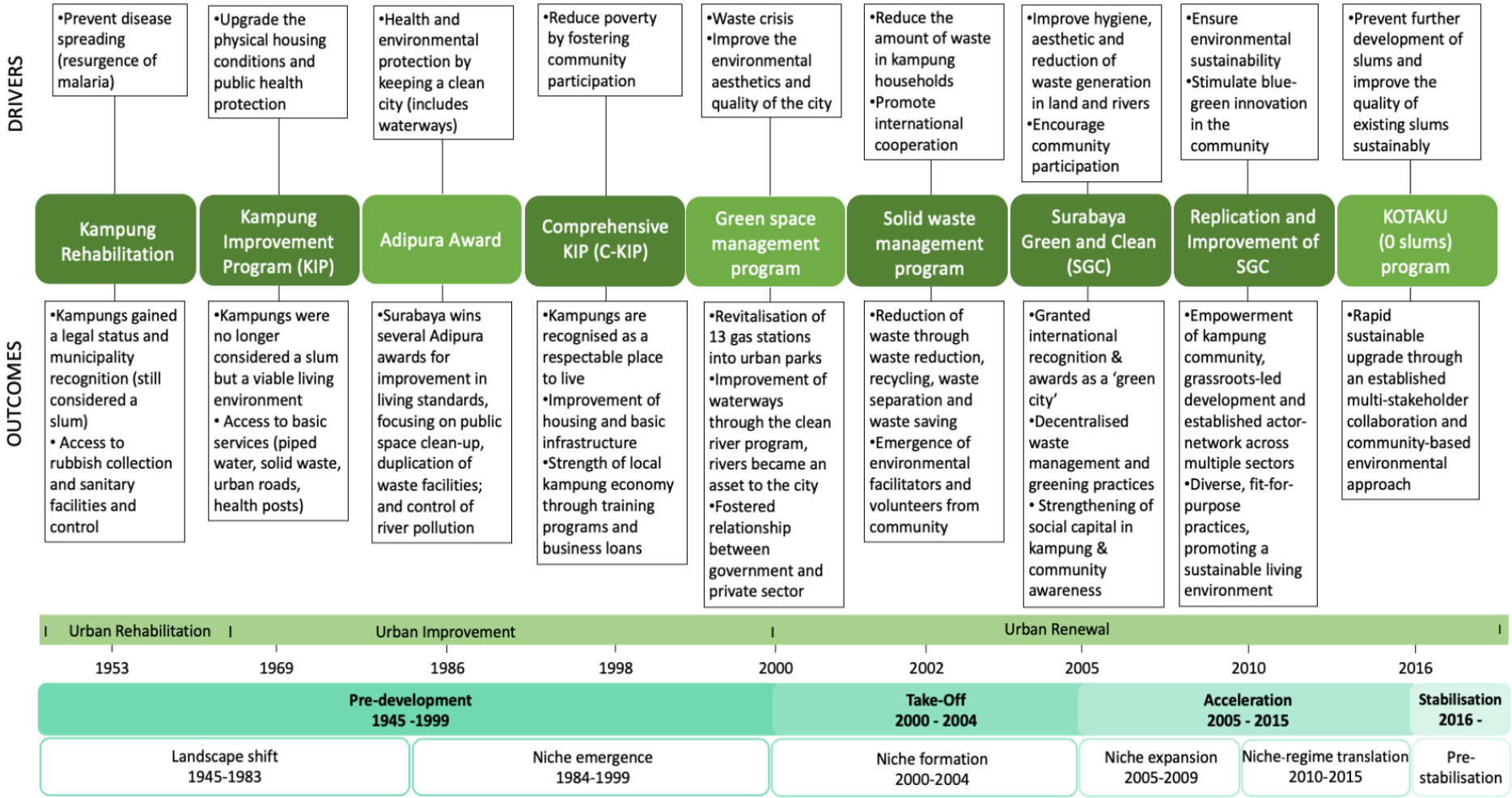

Figure 4.6 Key initiatives that influenced Surabaya's blue-green transition supporting the sustainable upgrade of kampungs environments

Chapter 5

Leapfrogging within kampungs, a sustainability process

5.1 Introduction

The previous chapter provided an analysis of the blue-green development initiatives over the past 70 years that shaped Surabaya's successful green transition in tandem with the rise of sustainable kampung environments (SKEs). These historical developments served as a foundation for the success of the Surabaya Green and Clean (SGC) program, a transformative and local initiative that became an important catalyst for SKE change. As Chapter 4 outlined, the SGC program was a critical component of the rapid innovation and implementation of blue-green practices across Surabaya's kampungs during the acceleration phase of the transition.

In order to explore the mechanisms underlying the success of the SGC program, this chapter begins with a detailed descriptive analysis of the program from its beginning in 2005 through to the end of data collection in 2017. Two phases are identified that characterise the socio-technical change processes and institutionalisation of the "green and clean" approach in some kampungs across Surabaya, 'the engagement', and 'the leap'. As the name suggests, it is during the later stages of the SGC program (aligning with the acceleration phase identified in Chapter 4) that leapfrogging towards SKEs began to occur within kampungs.

Following the descriptive analysis, Section 5.3 begins to address the limited practical and scholarly understanding of how to enable a rapid sustainability change (leapfrogging) (see Chapter 2) (Binz *et al.*, 2012; Poustie *et al.*, 2016; Yu and Gibbs, 2018) by identifying nine (9) enabling factors that contributed to the SGC program supporting leapfrogging. These acceleration factors are: political leadership and trust (AF1), community champions (AF2), women's empowerment (AF3), grassroots initiatives and participation (AF4), prioritizing the vulnerable (AF5), capability building (AF6), targeted incentives (AF7), strategic financial resources and CSR sponsorship (AF8), and market opportunities (AF9). This contributes to the thesis's third objective: to identify and characterise the enabling factors and actor strategies that have driven Surabaya's sustainability transition and examine how they influenced parts of Surabaya to accelerate change through leapfrogging.

The chapter concludes by reflecting on the significance of these enabling factors in supporting the acceleration phase and begins to position them as part of the broader transition within Surabaya. The interconnected nature of the enabling factors is also highlighted, whereby the success of an individual factor is often dependent and support by one or multiple other conditions from both this phase and those from the historical development of Surabaya.

5.2 The evolution of the Surabaya green and clean program

Surabaya's urban renewal agenda, which started in the 2000s, kickstarted the improvement of the urban environmental conditions; as such, many programs were implemented during this period. One of the most awarded programs the city developed was the SGC, which has evolved throughout time into the holistic program that it is now. This section provides an overview of specific phases in the historical evolution of the

SGC program that built upon the national and city initiatives outlined in Chapter 4. This includes an exploration of the origins, structure, practical initiatives and outcomes of the program and how these initiatives influenced the rapid upgrade of certain kampungs. Between the start of the program in 2005 and 2017 (end of data collection), I distinguish two distinct phases, the engagement (2005 - 2009) and the leap (2010 - 2017). These phases show a broad marker of the evolution of the program, which are outlined in Table 5.1.

Table 5.1 Description of initiatives and key features within the SGC between 2005 and 2017

Initiatives/ key features	SGC (2005 – 2009) The engagement	SGC (2010 – 2017) The leap
Purpose of the program	- Growing impact of community-based waste management program through a cleanliness and hygiene contest	- Increasing community participation in managing waste, water usage and greening their environments by encouraging innovation and creativity
Focus/ Assessment criteria	- Gradually increasing innovation and creativity for waste management and greening	- Innovation, creativity and independent environmental and economy management of waste management, water usage, forestation, environmental education.
Processes/ activities	- Media campaign to promote the contest, including a roadshow to showcase kampung results. - Monetary prize for the winners under two categories: advanced and newcomer kampungs	- Partnership between community, research institution and private company is enhanced, there is a more systematic community approach, and more private companies join the SGC. - Grassroots innovation evolved as different incentives emerge, such as community recognition and monetary prize for the winners under four categories: beginner, developing, advance and champion, also had some incentives for best communities and environmental facilitator
Key actors	- Government agency, private companies, media, environmental facilitators, NGOs, environmental cadres and community (mainly women)	- Government agencies, political representatives, private companies, media, environmental facilitators, NGOs, research institutions, environmental cadres and community associations, community (including women and young people)
Outcomes include:	- Program started with 3.6 per cent of RT (neighbourhood units) participants. Approx. 263.93 Ha - National and international recognition	- Around 35 per cent of all RT (neighbourhood units) participated in the program, surpassing 430 Ha - National and international recognition

5.2.1 SGC 2005 – 2009: The engagement

This phase experienced a continued and improved development of the SGC program through the engagement of different actors and experimentation. The overall purpose of the program during this phase was to continue the momentum and expand the community-based waste management programs that were being implemented in Surabaya in the early 2000s, and gradually increment the greening conditions. Whilst the participation had a small start (325 RTs participating in 2005), as a result of the collaboration between multiple actors and the use of different incentives, including national and international recognition, the end of this phase saw participation grow to 1942 RTs in 2009 (DKP Surabaya, 2016). This phase also fostered

the role of local champions and women in mainstreaming environmental values, whose work was consolidated in the next phase.

The first SGC competition was officially launched in 2005 and was promoted as a cleanliness and hygiene socialisation contest among RTs in Surabaya. To promote the program, the government collaborated with Unilever and Jawa Pos, under the CSR program. The local government strategically coordinated this partnership for three reasons: it provided human capital, financial support, and helped to create public interest. At the time, Unilever was already working closely with Pusdakota in training environmental cadres in kampungs, and the media was in charge of popularising the competition. A significan action Jawa Pos did was to rename the program to SGC, initially named Surabaya Environmental Program (*Program Lingkungan Surabaya*). It is important to note that the name of SGC is in English, unlike all the other programs of the government that are named in Bahasa Indonesia. Whilst it is unclear whether the change of name made a difference in the final success of the program, it helped to attract more attention beyond the kampung community, as pointed out by one interviewee:

> "You know kampung is a traditional community, by using English we hope that it can be mixed with modern society …it's more suitable if it's in English rather than in Indonesian. We make a program so we can attract people to make Surabaya greener and cleaner. If we make it 'Surabaya Hijau dan Bersih' [exact translation of Surabaya Green and Clean], it's not really attractive compared to Surabaya Green and Clean. It's intentional. It's just to attract more people to join us." (PS 7.2)

The first campaign ran from March to May 2005 with a total budget of IDR$120,000,000 (AUD$12,000) (Nurul, 2016). The prize was a financial reward given to the kampung leader, to be used for further improvements of the neighbourhood unit. That year, 325 RTs participated in the competition. Whilst the participation remained limited, it surpassed the organisers' expectations and motivated them to improve the program for next year, as expressed by one interviewee:

> "To be honest, we didn't expect so much participation, because the main thing [purpose] is we wanted to make Surabaya greener and cleaner… we talked with the mayor and it was Mr. Bambang... He agreed to work with other sponsors like Honda …we discuss the program for next year, and each of us maintain their own room, like Jawa Pos published the story, and government they provide the support like manpower and budgeting and of course we got budget from sponsors too." (PS 7.2)

In an effort to support this momentum, the government included the SGC program under the community-based waste management strategies in the city's strategic plan 2006-2010. This meant that the government had to allocate a budget for the development of the program over the next five years. As a result, the government's contribution to the program grew significantly from IDR$50,400,000 (AUD$5,040) in 2005 to IDR$200,000,000 (AUD$20,000) in 2006 (Nurul, 2016). Similarly, the contribution of the other partners increased, making the overall budget for the program higher. Whilst the financial contribution by each actor remains unclear given the lack of official data on the subject, Nurul (2016) highlights the shared commitment of all the actors to improve the program.

Another improvement to the SGC was the increased exposure of the program. To achieve this the Roadshow Green and Clean (Figure 5.1) was introduced to generate more environmental awareness and motivate other kampungs to participate in the program by showcasing the results. The event was hosted by the 2005 award winning kampung (RT 2 RW VI Gundih, Bubutan district) and was sponsored by Jawa Pos. As a strategic policy tactic, high-level government officials attended the event, bringing legitimacy to the program (Nurul, 2016). This strategy proved successful, as award-winning kampungs became noticeable, more media covered the events, making the program more visible. Exposure of the program, kampung reputation and the spirit of competition increased the number of participants. According to Gervasi (2011), this type of competition served as an incentive for the community to manage their environment, as the concept of 'reward' and 'punishment' helped sustain the effort to keep their kampung cleaner.

Figure 5.1 Activities at the roadshow green and clean 2017 (Photos: Author, 2017)

The roadshow was also a governmental strategy to involve more private companies in the competition. The strategy was straightforward; private companies would sponsor the competition in exchange for showing their brands and products during the roadshow. This event brings together community, media and government; hence the market opportunities that this type of event generates results in capital growth for private companies. One interviewee highlighted this:

> "So private companies know, if they are involved in this program [SGC], their company would be benefitted from it. Just take a look, the roadshows in the kampung, it will be crowded! … kampung competition... In Surabaya, that's the only one where is crowded. In other cities, no….So this is unique, this is a roadshow, this is a big city. Other cities won't be like this because the community 'feels' these companies. They [private companies] know exactly that if they are involved in this event,

> they join this event, they would make a profit. It's for sure. So they will take a lot of part in these events" (GO 4.2, translated)

Subsequently, SGC 2006 was launched with an added focus on waste management. This was further supported by the launch of the 3R (reduce, reuse, recycle) program. With the assistance of the environmental facilitators, the participant kampungs would have to demonstrate their ability to manage their waste independently, and waste sorting became a parameter in the competition. The prize went to the kampung RT 7 RW 13 Kertajaya from the Gubeng district. By 2007, the SGC program was attracting national and international attention. RT 1 Jambangan from the Jambangan district became an exemplar kampung as the winner of the SGC 2007. The national government encouraged other big cities, such as Jakarta, Yogyakarta, Balikpapan and Pontianak, to replicate the SGC program (UN-HABITAT, 2008). It further pushed the green agenda with the *Adiwiyata* green school program, implemented in Surabaya in 2007. Internationally, the program won the Green Apple Awards for Environmental Best Practice from The Green Organisation in London and the UNESCAP (United Nations Economic and Social Commission for Asia Pacific) Award 2007 for Urban Environment Improvement.

With the 3R program operating in the city, the competition introduced recycling as a new dimension. By this stage, waste sorting and waste reduction were mandatory in each participant area. The introduction of a new parameter and the limited guidelines for the competition seemed to confuse the participants. Particularly, because the assessment did not consider the method and creativity used for waste processing. In response to this, the next SGC included the community's innovation, creativity and effort as part of the assessment criteria. Enhancement of the program also included improvements in the marketing through increasing the number of publications in the Jawa Pos.

In 2008, the program was awarded for a third consecutive time (2006 - 2008) the national Adipura award, and the uptake began to accelerate. As the popularity of the SGC increased, so did the number of participants, which grew to 1797 RTs (DKP Surabaya, 2016) spread along the 154 sub-districts of the city. Nevertheless, such an overwhelming participation forced the SGC organising committee to do the first cut through administrative selection, which reduced the number to 500 RTs. Later, this number of participants was separated into two categories. The advanced category, which included the kampungs that have already participated in the program, and the growing category for newcomer kampungs. The changes made to the program proved to be successful in driving the creativity and innovation of the community. That year, RT 3 RW XIV Kalirungkut from the Rungkut district won the advanced category for demonstrating a sophisticated way of processing waste. The environmental facilitators of Kalirungkut kampung applied the knowledge gained from their engagement with Unilever and Pusdakota by practicing the Takakura composting method and encouraging every household to adopt the home composting approach. One interviewee explained this capacity building process:

> "At first, we weren't independent. There were guides from an institution. That institution was Unilever. They dubbed us 'Environmental Warrior'. They came to each sub-district (RW & RT). Whoever wanted to could become Environmental Warriors…There were motivators from Unilever

> who explained that to us. It was hard at first, not everybody would want to. It was in 2004. Then they held seminars, workshops, they explained about the environment and waste management… I love clean, beautiful environment. I did it voluntarily and happily. We would wear uniforms and vests… The process is step by step. Besides cleaning the parks, we also helped to plant some trees. Then we learned to make handicraft, garbage sorting. Unilever donated a composting machine to manage trash. We sort garbage into the organic and inorganic categories. We recycle the inorganic garbage into some handicrafts. Step by step. We welcome ladies who can recycle inorganic garbage into some handicrafts, according to one's ability" (CM 5.7, translated)

The SGC also inspired the participation of low-income earners (many of whom pick trash for an income) living at the riverbank squatters along the Strenkali River. Communities around these areas lacked resources and had long suffered from a reputation as poorly regarded areas. Despite these challenging conditions, within four years and only supported by the grassroots organisation PWSS (Surabaya Strenkali People's Movement), two riverbank kampungs Bratang and Gunung Sari won the newcomer category of the SGC in 2008. The community and the PWSS worked together towards a green and clean transformation of their kampungs, and building a positive reputation of the area (Some *et al.*, 2009; Das and King, 2019). Behaviour change amongst the community was the first step into the transformation. Although this was mainly driven by changing the perception of a 'dirty slum', it also raised environmental awareness amongst the community, to the extent of portraying themselves as guardians of the river (Some *et al.*, 2009). The PWSS also helped residents secure toilets and septic tanks; manage garbage waste, clean up the river, clean and green space, and widened paved roads (Some *et al.*, 2009; Das and King, 2019). One of the most significant contributions of the PWSS was building community resilience (Taylor, 2015) and independence, as most of the kampung improvement was funded with household contributions and self-help labour (Taylor, 2015; Das and King, 2019).

The popularity also generated move involvement of NGOs and private corporations. In collaboration with the government, the companies Telkom and Honda contributed financially to that year's SGC total budget through their CSR programs (Nurul, 2016). These extra financial resources also contributed to the establishment of waste banks across the city. In the case of the role of NGOs, previously, their waste management programs would support kampungs in isolation, or at least they were not fully integrated into the government framework (like Pusdakota). Whilst, their work supported the community awareness, it was not until the SGC that the community developed a stronger motivation to implement the programs, as expressed by one interviewee:

> "In the beginning, Bu Risma asked that each kelurahan has facilitators. We then trained those facilitators… Then facilitators implemented it but people didn't engage… [Then] In the first time, we didn't know about this SGC kampung [competition], so we learned from Mr. S [kampung leader]… So we actually we do all of this [implement the training, because]... there's a competition, if there's a competition we want to make it better and better so it's kind of an evaluation, kind of like that… we change little by little." (CM 5.1, translated)

With the spirit of competition as a driver, the community felt more engaged with the work of the NGOs. At the same time, the NGO representatives felt motivated not only to help the communities to become greener and cleaner, but to actually win the SGC competition. The sense of pride after winning the competition that was perceived by one interviewee as:

> "I educate a lot, including in Surabaya Green and Clean, I help the City Council to guide the kampungs in Green and Clean. I am tasked by Bu Risma and the Environmental Department to help convert ugly kampungs into green and clean kampung… At first, the community would reject, but after I did some real actions with good result and example, then they followed... we won the 3rd place of kampung Green and Clean in East Java, we also got an award in Jawa Pos… I bring the success in Surabaya to other regencies and cities. I got trusted by Ministry of Environment and Forestry to become one of the judges for Adipura and also a speaker for community empowerment about garbage management." (NGO 6.2)

Despite the name of the program, up to 2008, the competition was more focused on the 'clean' rather than the 'green'. This changed in 2009, as the SGC program incorporated a new theme, urban farming. According to DKP Surabaya (2015), this theme unified both targets of the program. Some kampung strategies towards applying urban farming comprised of recycling of different materials to use them as pots (e.g. PET bottles, wheels); plant labels, in some cases this included different types of information, such as the scientific name or health and nutritional benefits; and the provision of land (Figure 5.2). Whilst planting would typically happen along the walls of the community houses; some kampungs would vacate land for community farming (e.g. kampung Wonorejo Timur). The advanced category winner was granted to the first winner of SGC, kampung Gundih.

Figure 5.2 Examples of urban farming in different kampungs (Photos: Author, 2017)

SGC 2009 witnessed the biggest number of participants of this phase, a total of 1942 RTs (DKP Surabaya, 2016). According to Nurul (2016) this level of participation challenged the government's institutional capacity to have efficient control over the partnership dynamics (e.g. NGO - environmental facilitators - community), mainly because only one agency (DKP) was responsible for the program. As a result, the Association of Surabaya Environmental Facilitators (*Paguyuban Fasilitator Lingkungan Hidup Kota Surabaya*) was established on May 2009. The purpose of the association was to provide a formal structure to the facilitators' network and regulate their activities in order to sustain the program (Ramdhani, 2010). Consequently, the association followed the same governmental administration structure as the city (see Chapter 3), providing different levels of responsibilities and coordination at each level. As Nurul (2016) suggests, this institutionalisation has facilitated the partnership dynamics, contributing to the city's good governance. This is further emphasised by one interviewee:

> "… environmental facilitator, they motivate the community. They help the kecat [head of district]. So here how it goes. Kecamatan [the district] is assisted by facilitator, they work with cadres… to help to communicate with the community. Because sometimes we [high-level government officials] can't go directly, sometimes fellow community members need to talk with each other first, to find solutions… then we can go in." (GO 4.10, translated)

5.2.2 SGC 2010 – 2017: The leap

This phase witnessed the rapid diffusion of the insights from phase one and the institutional legitimacy of the program nationally and internationally. The grassroots innovation of new activities and technologies evolved to deliver practices that would reduce waste and water usage and greenery their environment. The government introduced a variety of inclusive programs to strengthen creativity, partnership, and participation of different groups. This phase also revealed the importance of intra-organisational collaboration and cultural beliefs.

The SGC 2010 program continued escalating nationally and internationally as Bu Risma became the city mayor and the UKM program was launched. That year the program reached its biggest number of participants to date, a total of 2774 RTs (DKP Surabaya, 2016). The success of the program was mainly supported by Bu Risma's passion for green areas (Diliani and Susanti, 2015), energetic and hands-on leadership approach (Bunnell *et al.*, 2013; Pramusinto and Purwanto, 2018; Tanu and Parker, 2018). This style of leadership has proven attractive in gathering popularity as evidenced in both mayoral elections (2010 and 2015) and recognised by some interviewees:

> "Ms. Mayor is very very strong. She only sleeps two hours a day. She's incredible. When I was at DKP, starting from five in the morning, she has gone around …she rarely stays in the Mayor Office …inspecting cleanliness, inspecting parks, she even knows each person individually. Later in the evening, she'll go around again, she works very late every day …Let's take an example when Bu Risma had to change Jalan Darmo, it used to be dry, dirty, so barren-looking, she would be digging, mixing fertile until midnight..." (GO 4.2, translated)

> "Bu Risma is a disciplined person. Strong leadership, I think …really shows commitment to the program of the government of Surabaya. She created many parks in Surabaya …she can sweep the road before she goes to work. She can clean the drainage before she goes to work. She also can stay awake for two days to finish all of her jobs" (PS 7.5, translated)

For its good community-based waste management system through the SGC, Surabaya was awarded as the Best City in Asia Pacific by IGES and UNESCAP. As had become the norm, the organisers introduced a new parameter to the competition, waste-water recycling. The concern from the government came as kampungs started to fill up with plants, and the increased consumption of water represented a challenge. Nevertheless, the results of the challenge far exceeded the expectation of the government as communities and academics partnered to develop new greywater recycling technology. One example of this was the APAL (*Alat Pengolah Air Limbah)* a wastewater treatment device. Technology that led kampung Gundih to win the SGC 2010 for the third time. Nonetheless, kampung Gundih was not allowed to participate in SGC 2011 as the capacity of the community was deemed to be beyond the rest of the kampungs; the organisers thought that this might be seen as unfair to the rest of the kampungs and it could discourage other participants. This led to a significant change in the next year's SGC awarding categories, hoping to encourage more innovation. The categories changed from two (advanced and beginner) to eight award categories: the best of the best kampung; the greenest kampung; kampung with the best water management program; with the best environmental program; the best community, the most active community; the most innovative community; and kampung with the most independent community.

The APAL was created by Edy Martono (community leader – *RT* head) in collaboration with ITS. Edy started as an environmental facilitator in kampung Gundih and currently coordinates all the facilitators of the central region of Surabaya. The APAL system works as follows: the greywater of the community is collected through a pipe network into a water reservoir located under the road. This water is then pumped into three filter tubes (pipes) with a diameter of 15 centimetres and a length of 1.5 meters each. Each tube contains stones, sand, gravel and pineapple fibres as filter materials, which are changed every six months. Then the filtered water is collected and used for watering plants in the kampung. By 2016, Gundih contained 27 APAL units partially financed by the Mandiri National Community Empowerment Program. Each APAL unit has a construction cost of IDR$10 million (AUD$1000), of which 80 per cent is subsidies by Mandiri's CSR program and 20 per cent relies on the resident.

Similarly, an integral strategy of the government focused on building effective collaboration with academia. The government of Surabaya and academia (particularly ITS university) has maintained a continuous relationship, and their continued collaboration has been key for the urban development of the city (Colombijn, 2016). In maintaining this relationship, Bu Risma consults academia for policy advice, development of programs, review development proposals from the private sector and training of government staff. One of the academic interviewees reviews this partnership as:

> "The strong leadership from the mayor also have made a lot of changes, in terms of bureaucracies… compared to other municipality, Surabaya has a good level of government officers, because the intake [capacity building] is also there, not really advanced but good level… To some extent, it could be like that because the local government now is a bit open for the academics, they call it expert. So it's kind of a big opportunity for us to deliver our message to implement the material and literature and also the law or the plan from the government …she also has open-minded and she tries to be open to the colleagues, to her staff… One of the benefits for me, from the academic point of view, she keeps the door always open. I ask their staff and they feel the same with what I feel. Because they have the opportunity to give suggestion, to do something for the goodness of Surabaya." (AR 3.1)

In 2010, Unilever support for the program ended. Whilst there are no official records of the termination of this partnership, Nurul (2016) suggests that Unilever's CSR program changed its target from working with kampung communities to business communities. However, more than one interviewee suggested that the reason was that the company claimed the success of the program and excluded the support of the partnership; this behaviour was not in line with Bu Risma's philosophy of collaboration. This is highlighted by an interviewee as: "Our success was claimed as Unilever's success. Us, NGO, was never credited, City Council was never credited, Bu Risma got upset… Unilever got a lot of international awards when was here, but the partnership was never mentioned…" (NGO 6.2, translated). Whilst this could have negatively impacted the program, at least financially, SGC 2011 was able to gain more participants than in 2010.

To avoid a repeat of the Unilever situation, Bu Risma's government, who have been strong proponents for involving the private sector to support the city's development; formally, started signing a memorandum of agreements (MOA) between the Surabaya government and different corporations to define the objective and scope of their cooperation (Mustofa *et al.*, 2016). The objective was to empower the community to manage waste and environment through CSR programs independently. The agreement includes determining the development area, training of environmental cadres, preparation of waste and environmental management programs, and monitoring and evaluation (City Government of Surabaya, 2011). This was further strengthened by the level of trust businesses had in Bu Risma's government. As emphasised by both sides (government and private sector), this partnership is built by trust:

> "…the partnership is belong [built] by trust. We can't do it without trust, so the private is trust with me and then also citizen is trust with me, so the program can work. I'm trying to build trust for the government because the government is accountable and also transparent. So while the citizen trust with us, also the private is trust with us so we can work together." (GO 4.1, translated)

> "…Bu Risma doesn't befriend businessmen much. But she's very welcome towards us... She gain [our] trust… We also don't ask much of her. Just where we have to collaborate, she says, then we collaborate …we are very open about giving a donation to kampungs, for competitions, events, to schools' art performances ...we maintain the image …and can gain community's trust." (PS 7.1, translated)

The SGC 2011 saw the organisers committee assessing actions towards having a healthy air, with the theme for the year being 'SGC blooming and blue sky' (*SGC Berbunga Berlangit Biru*). The overall winner was RW 03 kampung Jambangan for applying all the parameters so far introduced in the program through systematic community participation. This included maintaining regular meetings for kampung improvement discussion (e.g. reforestation of the kampung and implementation of APAL system); training of residents; UKM (small and medium enterprise) initiatives, administrative matters concerning the kampung's waste bank; launch of eco-programs to reach school and university engagement, and organising the internal structure of the kampung by assigning roles to different individuals of the community (including children). The latter relates to the significant role played by environmental cadres and women.

The environmental cadres (Figure 5.3) are community representatives who voluntarily act as information providers to other community members on how to keep their environment green and clean. One interviewee observed their role as:

> "Each kelurahan has a prominent figure to spread the knowledge [a facilitator]. The facilitators engaged with the community members that care for the environment…these are the environmental cadres… then cadres are trained to spread the knowledge they got from the Surabaya City Council to the people in their kampung." (CM 5.5., translated)

Figure 5.3 Environmental cadres and facilitators displaying their practices (Photos: Author, 2017)

The majority of cadres were formerly housewives who became involved after the recruitment of 'environmental warriors' in 2004. Under Risma's lead, the role of these women has been enhanced, and through different programs, the government helped to empower these women to become spokespersons for the SGC program. Some of the strategies include educational campaigns to promote gender equality with the support of public media, the facilitation of socio-economic programs, and the Surabaya Gender award, which holds different competitions such as the most gender-responsive *kecamatan* (district). These efforts were

recognised by the national government awarding Surabaya with the *Anugerah Parahita ekapraya*[31] consecutively from 2008 to 2014, in recognition for implementing gender mainstreaming strategies.

Where formerly they had little motivation to engage with the community on sustainability issues, the competitive nature and pride felt for their kampungs inspired them to play a key role in promoting SGC. The activities of these empowered women were critical in helping to mainstream the SGC program across multiple kampungs in the city. As one interviewee highlighted, change needs to involve everyone:

> "…sometimes they [men] don't trust woman can be the leader… we can't blame this to men, that they are first… but I try include women in Surabaya, because we must work together so the problem will be solved… I try to explain that. If you want to change Surabaya, we need everyone… we can do it. For example, like economic they are not enough for their life but it's not the end, if women work from home, they can get income but still be in the house with children… so we improve the moms to make a better economy for the family" (GO 4.1, translated)

The SGC 2012 had the support of different companies, including Jawa Pos, MPM-Honda and EMCO. It was launched with the theme *Surabaya Cantik* (Beautiful Surabaya), aiming to encourage the community on waste management and water use, strengthening the environmental cadre community and waste bank implementation. Kampung Rungkut achieved these and won the best of the best prize award. Similarly, Jawa Pos, MPM-Honda and ESIA supported SGC 2013. This time the theme was *Surabaya Bersinar* (Surabaya Shines), aiming to encourage the community to sustain a clean, healthy, and green kampung by focusing on waste management, urban farming, responsible water usage and environmental education. That year the committee agreed on four main categories for assessing next year's SGC namely, beginners (*pemula*), developing (*berkembang*), advance (*maju*), and champions (*jawara*). The champions' award was granted to kampung Jambangan. According to one interviewee, this categorisation served to stimulate all participants:

> "These are the winners….they participated in the competition and they practiced these things. There are several categories: beginner, intermediate, advanced, champions. These are the top 150. They are chosen from 400 out of some thousands. The top 150 will get incentives and then be reduced to top 75. The top 75 will get more prizes. Why all these categories? So that the community can feel it [winning], so it's reciprocal, they do the green and clean process, they get the prize, and then they give back to the community." (CM 5.4, translated)

The growing participation was consistently high every year; in less than ten years, the program was able to congregate around 30 per cent of all neighbourhood units (Bunnell *et al.*, 2013). However, engaging with the community required different types of incentives at different levels, such as performance assessment (Chapter

[31] The *Anugerah Parahita Ekapraya* is a national recognition driven by the Ministry of Women's Empowerment and Child Protection since 2004, awarded to a ministry, organisation or local government for their commitment and implementation of strategies that support gender mainstreaming, women empowerment and protection of children.

4), monetary prizes, community recognition, material and resources, social sanctions and financial opportunities (Table 5.2). As one interviewee noted:

> "…recycling has a financial value that can improve their welfare and sustainability. Besides there are a lot of guests coming from all over Indonesia, they want to learn about SGC… so community show their kampungs and they also sell souvenir in many forms, like bags, syrup, etc. To manage garbage or keep cleanliness can also create job opportunities, they don't need to work in an industry, but they can stay at home and take care [green and clean] the kampung and create financial opportunity" (NGO 6.2, translated)

The SGC 2014 was particularly important for the replication of the program due to the previous final changes in the competition assessment. This new assessment served as an example to show what level of green and clean the judges were looking for (i.e. how a 'champion' kampung looks). With the new criteria, kampungs that were considered beginners could escalate to champion level by learning from their neighbour communities. In this context, the SGC *Berseri* (Surabaya Glows) was launched with the goal to increase community participation in managing waste, maintaining and beautifying the environment to create a clean, healthy and green city. The champion award was granted to RT 2 kampung Kebonsari from Jambangan district and kampung Dukuh Setro from Tambaksari district. Besides presenting a green and clean environment, both kampungs were actively involved in *Adiwiyata* School;they also allocated land for an environmental library and waste bank. Distributing a portion of land for environmental purposes was highly praised by the judges, as that same year the government modified the Master Plan and enacted two regional laws to increase the proportion of green open spaces.

Whilst, kampung Kebonsari was already implementing green and clean activities since 2010, these were limited to a basic level (e.g. planting trees) as opposed to what they displayed in 2014. This change can be attributed to three reasons: the momentum that SGC generated among the community, the leadership at different levels, and rapid knowledge transfer from 'expert' environmental cadres. The Jambangan district has four sub-districts Jambangan, Kebonsari, Karah and Pagesangan. As noted above, the Jambangan sub-district won the SGC on three occasions (2007, 2011 and 2013), exhibiting green and clean characteristics, and providing a good example to emulate. The Jambangan district facilitated a platform for the training of environmental cadres, in which the cadres of the different sub-districts will interact. Following this, Kebonsari cadres, led by the community leader (*RT* head), seek support from Jambangan cadres, who initiated actions to improve the conditions of the kampung, in the spirit of *arek* and *gotong royong*. These actions were further supported by PKK organisation and the Kebonsari lurah [head of sub-district], who manage the team effort. The proximity of frontrunner examples, local leadership, and processes in place to facilitate knowledge transfer across the Jambangan sub-districts provided the necessary support that allowed kampung Kebonsari to win the 2014 champion award. This transformation process is observed by an interviewee:

> "In my opinion, our own area has much potential… so I talked with other cadres, they voluntarily did it, they have the spirit of *arek*. We had meetings, many things that were done at the meeting included delivering message from other RW [neighbourhood units], even many RT programs were

> delivered at the event because the information was faster delivered in such a manner so that it was very helpful in the program. It also received full support from the village head, even before office in the morning he took the time to go around the village to control the condition of his area if there was something that needed improvement so he did not hesitate to upload on the Whatsapp Group that had been provided for the environment so that those who had the area were ready to fix it. In Kebonsari there is good cooperation between the community and the most basic level of government representatives, there is mutual cooperation (*gotong-royong*)." (CM 5.4, translated)

Contrary to the bottom-up approach that led kampung Kebonsari to win the SGC 2016, the other winner, kampung Dukuh Setro achieved this through a top-down approach. The process started with the head of Tambaksari district encouraging the heads of the eight sub-districts to improve their kampungs by joining the SGC and learning from already green and clean developed areas. In an effort to persuade this change, the head would provide incentives such as technical training or plants. An interviewee explains this approach:

> "First, we build communication with the leader of the kelurahan, we persuade them so that they want to ask their community members to join Green and Clean. Second, we ask them to take a look at already developed areas. We ask the prominent figures to see the developed areas. When they see a kampung that has similar characteristics to theirs but is better, we hope that they will change their mind and their kampung just like what they have just seen. Like a comparative study… To keep their spirit, we give them help. We give them help but we don't give them money, no, but we only give them bait [incentives]. The most important thing is that they want to change or follow our guidance. So, we will give them help regarding those problems." (GO 4.10, translated)

The SGC competition continued as one of the main programs of the city. SGC 2015 was launched under the theme of Surabaya EMAS (*Elok* - Presentable*, Mandiri* - Independent*, Asri* - Beautiful*, Sehat* - Healthy). Similarly to other years, the objective was to create a clean, green and healthy environment; nevertheless, the committee emphasised the importance of having an independent community. The winner of SGC 2015, kampung Lawas Maspati from sub-district Bubutan, was able to generate their own resources to improve their kampung. Lawas Maspati is one of the oldest kampungs in the centre area of the city; as such, it was important for the community to keep the heritage alive, as it receives frequent outside attention (Soeastono, 2018). A combination of replication, culture, food production and creativity made this possible. The UKM program, which had already proven successful in other kampungs (e.g. Jambangan), served as a basis for the residents to make products from the urban farming produce, such as passionfruit syrup, aloe vera drinks and grass jelly. These were later showcased to tourists as part of the 'historical village of old Kampung Maspati' showcase. The guided tour includes a welcome to the visitors by Maspati residents wearing traditional clothes and seeing different sections of the kampung (recycling house, production house and greenhouse). By embracing the traditional history and identity of the kampung, the community was able to collect funds for the empowerment of the kampung economy (Soeastono, 2018). This is rather important, as many interviewees have stressed the importance of keeping the 'character building of the kampungs' alive, instead of losing the history, as a result of 'modern development':

"Every kampung has their own uniqueness, their own distinctions, their own character, even their own history, and that's good… it would be sad to lose that." (AR 2.1)

"Surabaya's power is in their kampung…Try Maspati, wow, it's become a tourist spot, it's trending. People build a kampung not just for living comfortably but is a source of income for its people so that people can love their kampung…. just like in several kampungs, and one of them is Maspati. It's true that influence from the investors to buy their land is big, but because their kampung is nice, the environment is nice, they are reluctant to sell their land to investors because they won't find an atmosphere like this in another place. That's how kampung people really hold on to their kampung… if they sell their land, they won't get the kampung atmosphere anymore, the kinship, the *guyub* (closeness) in another place, like in real estate." (GO 4.2, translated)

The SGC program has served as a mechanism to prevent this from happening. It was important for the government to change the perception of kampungs as slums areas without losing their identity; therefore, applying a green and clean strategy was an important tactic. Furthermore, the UKM program was able to generate economic resources in the kampung, which helped overcome the temptation of kampung residents to sell their lands to developers. As one interviewee noted: "I appreciate the SGC because it creates communities who cared for the environment which can help the economy, fasten the health and education service" (AR 2.2, translated). This was further strengthened by the push from the national government through the 100-0-100 program and the state policy to prioritise areas for quality improvement of housing and settlements.

In order to maintain the motivation among participants, SGC 2016 introduced new incentives to the competition. In an effort to involve young people as potential environmental cadres, the committee decided to recognise the hard work of facilitators in the category of Best Environmental Facilitator. In addition, the budget allocated prizes (Table 5.2) not only for the winners of the main four categories, but also for all the 200 RTs that passed the first selection (City Government of Surabaya, 2016b). The SGC 2016 also benefited from the launch of the national KOTAKU program, aiming to improve the quality of areas considered slum settlements.

Table 5.2 Winner monetary prizes (City Government of Surabaya, 2016b)

Winner	Monetary prize
Best 200 RT	IDR$1,500,000 (AUD$150)
Beginner Category	IDR$9,000,000 (AUD$900)
Developing Category	IDR$12,000,000 (AUD$1,200)
Advanced Category	IDR$13,500,000 (AUD$1,350)
Champion Category	IDR$16,500,000 (AUD$1,650)
Best Facilitator	IDR$5,000,000 (AUD$500)

Whilst the monetary prize was a good incentive for the community, many interviewees indicated that their motivation was not the cash prize, but social. The drivers included love for the environment and the city,

healthy kampungs to raise kids, pride, a sense of belonging, mutual cooperation, becoming independent women. As one environmental cadre said:

> "… the cadres aren't paid. Salary can be in a lot of forms… I was very concerned with Surabaya's water condition, with garbage, my children growing in dirty space, not healthy… I want to enhance people but I got scolded, insulted, but I never give up, moreover, I was supported by the local government… we were giving training, I can share with the community on how to live cleanly and healthily… we work together. That's how we reach success. All small organizations work together to build a successful Surabaya." (CM 5.5, translated)

The number of environmental cadres who are willing to encourage community participation and spread knowledge in their area keeps growing each year (Figure 5.4). The efforts of environmental cadres in raising the awareness of keeping a green and clean environment is also recognised by the city government (City Government of Surabaya, 2016c). The impact of the SGC in the community through the environmental cadre is expressed by an interviewee as:

> "So, the one who feels the impact of SGC is the community...but this is pushed by the environmental cadre. Prior to joining SGC, their kampung is dirty and not good enough, from the aesthetic aspect, etc. But when we asked them to join SGC, to become a volunteer, they feel the good impact from it. For example, from the community aspect, they become more solid, because they meet each other often and there's communication between them. Second, physically the kampung becomes cleaner and more beautiful. When the kampung is clean, then the community becomes healthier, people rarely get sick, etc. So Green and Clean give good impact to the community, the environmental cadre facilitates this, makes them happy, proud... the community feels it." (GO 4.1, translated)

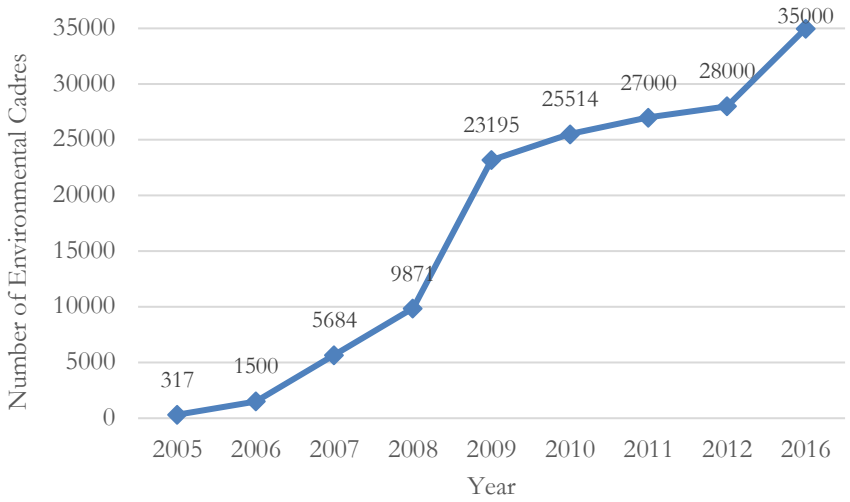

Figure 5.4 Number of environmental cadres per year from 2005 to 2012 (City Government of Surabaya, 2012) and 2016 (City Government of Surabaya, 2016c)

Surabaya, for a healthier life, was the theme chosen for SGC 2016. The aim was to extend the vision of a clean, healthy and independent environment by generating caring citizens who have basic knowledge and

technical skills. Kampung Candirejo Genteng from district Genteng was an example of this, winning the best of the best category. This kampung, which was previously considered one of the informal settlements along the Kali Mas River in 2011 (S. Shirleyana and Sari, 2012), was able to rapidly transform into the sustainable community it currently is. This was mainly achieved through the actions of the community leader (RT head), whose on-ground work contributed to the capacity building of the residents, technology transfer between different actors, and partnerships with private companies and academia.

Whilst some interviewees recognised that some green and clean activities were done in 2007, an environmental facilitator and cadre of the kampung attributes the biggest changes in 2012, under the lead of the community leader. In partnership with Telkom, the community allocated space to build a library, including books, computers, access to the internet, and a playing area. In collaboration with ITS, the kampung also uses a wastewater recycling system, the PANDORA-L. Other actions include a greenhouse, urban farming produce, waste sorting, 3R activities, composting bins, and environmental training courses for kids and adults. In 2015, the kampung cadres introduced a seven-pillar program, aiming to improve the environment, nutrition, economy, sanitation, information technology, education, safe and comfortable living conditions. These sustainable attributes were showcased as one of the points of reference for participants of the Preparatory Committee of UN-Habitat III[32]. The green and clean transformation of this kampung exemplifies the process of a rapid transition as a result of learning from the experiences of other kampungs and directly implementing sustainable practices.

Another practice introduced to kampungs was aquaponics and hydroponics systems by the Department of Agriculture. It is important to highlight this collaboration, as previously, DKP was the only department involved in the SGC. In a broader context, the reason behind these intra-organisational collaborations is due to Bu Risma's inclusive and collaborative interaction with government officials (Prabowo *et al.*, 2018). Many government officials have also acknowledged that under her lead, there is more collaboration between the different governmental departments and external organisations, such as NGOs, academia and the private sector.

SGC 2017 was launched with the theme Eco-Friendly Living. The government aimed to provide a healthier, more comfortable and environmentally friendly life in Surabaya. The champion of the best of the best category was granted to kampung Jambangan RT 2 RW 1 from Jambangan district for focusing on independent environment and economy management. This was emphasised through the kampung's promotion of agro-tourism and gallery exhibition. Kampung Jambangan allocated 360 m^2 of land for a community vegetable garden. The garden produces different vegetables, fruits and medicinal plants, such as eggplant, cabbage, onion, chilli, dragon fruit, and ginger, labelled with their scientific names and beneficial descriptions. The community compost bins provide fertilisers for the soil, and water comes from tanks in the garden area that collects rainwater. In addition, the vegetable garden is used as a tourist attraction (agro-

[32] The third session of the Preparatory Committee of UN-Habitat III was held in Surabaya, Indonesia, from the 25th until the 27th of July, 2016.

tourism) to promote urban agriculture and environmental awareness. According to a member of the community, the visitors are generally interested in learning these practices to apply them in their kampung (Interview CM 5.7, translated). The gallery exhibits, the UKM products made in the kampung, including clothes, bags made out of recycled waste, and food products. Other green and clean initiatives include waste banks, a wastewater treatment device (APAL) in each RT, hydroponic and aquaponics systems, and environmental awareness campaigns.

Kampung Gading RT 3 RW 8 from Tambaksari district was also awarded winner of the best of the best category at the SGC 2017. The green and clean practices include: vacating land for community vegetable gardens, environmental libraries, and waste banks; community service to paint roads and plant trees and vegetables; sorting and management of waste; community awareness through special singing rhymes with recycled costumes to encourage minimal use of plastic; weekly maintenance of the sanitation facilities (septic tanks) to reduce health-related problems; and the establishment of Gading as an 'education kampung' to raise green and clean awareness, a program led by women. Led by the community, kampung Gading started the leap process in 2015 with the support of the environmental network of already green and clean developed areas of the same district (Tambaksari and Dukuh Setro).

The 2017 competition also represented the growing influence of the program outside of Surabaya. Representatives from the cities of Bogor and Singkawang attended the 2017 SGC award ceremony. This helped strengthen relationships between the cities and assisted in the replication of the SGC in their regions. In particular, government officials from the city of Bogor visited some of the awarded kampungs, such as Jambangan, to learn about the environmental management initiatives. Whilst the process of replication between the cities was not the focus of this research, it is important to highlight the benefits of the partnership. As one of the interviewees noted, it helped with the rapid transformation of greener and cleaner sub-districts:

> "We have seen Surabaya has good environmental management. Two years ago, we came here and asked the government to come to Bogor Regency to provide motivation related to the environment. Bogor Regency has been doing this activity for two years, mimicking Surabaya [environmental initiatives]. In 2017, we held Cibinong Green and Clean, which only consisted of 6 sub-districts… Growing rapidly, in 2018 this activity has been transformed into Bogor Green and Clean district which consists of 40 sub-districts." (Interview GO 4.4).

In its long 13 years journey, the SGC has gone through different themes, partnerships, and general changes that have contributed to the success of the program and, to some extent, to the sustainable development of the city. The overall results of the program show that communities can learn socialisation strategies and generate environmental awareness (Gilby *et al.*, 2017). While the SGC competition gave parameters to guide the green and clean vision, each community had a different approach towards achieving eco-friendly and, in some cases, sustainable living.

5.3 Acceleration factors

As described in Section 5.2, the first two phases of the SGC program have been highly effective as they led to a rapid and significant change towards SKE in certain pockets of the city. As the case study demonstrates, many areas were able to learn from the experience of others and skip years of experimental implementation to implement sustainable practices directly. As asserted by Perkins (2003), strategies that accelerate innovation and the diffusion of economic development and environmental protection while addressing the limited capabilities of developing countries are needed for leapfrogging. Therefore, this section is focused on determining the key factors that activated the leapfrogging process during Surabaya's acceleration phase.

The framework developed in Chapter 2 has identified seven overarching factors (supportive policies, financial resources, technological capabilities, incentives, clear goals and targets, market opportunities and tailored to local context) that contribute to a successful technological leapfrogging pathway. These factors provide a helpful analytical lens to explore the enabling context of leapfrogging, particularly given the limited research around evidence that advances approaches to leapfrogging. However, in analysing the Surabaya case study, it became evident that many other factors were contributing to leapfrogging within kampungs, and that these factors could be understood as either accelerating processes of change, or as foundational elements supporting change. The descriptive account of Surabaya's acceleration phase and the development of the SGC program reveals nine key acceleration factors that catalysed leapfrogging in certain pockets of Surabaya. These are: political leadership and trust (AF1), community champions (AF2), women's empowerment (AF3), grassroots innovation and participation (AF4), prioritizing the vulnerable (AF5), capability building (AF6), targeted incentives (AF7), strategic financial resources and CSR programs (AF8), and market opportunities (AF9).

AF1) Political leadership and trust: The case study revealed that active political leadership has significantly influenced an accelerated change towards SKE. The Surabaya government provided strong leadership that created a space of trust and shared vision to foster and sustain stakeholder commitment, guiding the path towards SKE. Whilst momentum for environmental concerns was influenced through different changes in Surabaya's political leadership heads (e.g. Sunarto S. and Bambang D.H.), radical changes led by Bu Risma took place during the acceleration phase. These changes involved strategies such as on-ground actions, dedicated leadership and active political lobbying and engagement with actors at different levels, leading to a mainstreaming and embedding of new practices across Surabaya.

Despite a legal anchoring for the urban greening policy being formulated in the mid-1980s, significant shifts that influenced the diffusion and effectiveness of these can be correlated to changes in the political leadership of Surabaya. The current mayor (Bu Risma) has played a particularly prominent role in motivating the masses, embedding mechanisms to transform the city, developing trust among partners and facilitating effective coordination among stakeholders. Risma's lead-by-example approach gained her a street-level leadership reputation and public legitimacy. These local credentials allowed her to build social capital, facilitating popular support and on-ground implementation of programs, such as the SGC. An important aspect of Risma's

government was transparency and trust (Budiharso, 2014; Maichal and Urbanus, 2014; Tuti and Adawiyah, 2020), among intra-organisational and inter-organisational actors. The latter was facilitated through strategies such as the Government Resources Management System (GRMS) and securing market opportunities for private sector partners. As one interviewee noted: "We can't do it without trust, so the private sector trust in the government and then also citizen trust in the government, so the program can work" (GO 4.1, translated). Among Bu Risma's leadership characteristics, the interviewees highlighted passion, commitment and care, hard-working, strong character, disciplined, inclusive, and integrity.

Active political leadership, whose agency sustained and legitimated on-ground action, was key to fostering community participation and maintaining the commitment of key stakeholders. The presence, interaction and willingness of high-level representatives (e.g. mayor or head of district) to participate in and contribute to the SGC events and kampungs worked as an incentive for the community to take actions towards amending SKE practices into their areas, mobilising, and aligning local champions in the diffusion of the vision. Creating trust among different actors (government-private sector-community) was also key to strengthening the actor-network and building and maintaining receptivity, collaboration and commitment to SKE. As one interviewee stated: "Stakeholder relationship has improved because they see the leadership, if it's good they will coordinate, work together" (AR 3.4).

Steering mechanisms such as leadership is usually identified in the literature as a key component to enabling change (Brown and Clarke, 2007; Ferguson, Brown, Frantzeskaki, *et al.*, 2013; Muchadenyika and Waiswa, 2018); social learning (Bos *et al.*, 2013; Wolfram, 2016) and shaping urban transformation through a street-level approach (Gore, 2018). Similarly, legitimacy, trust and transparency have been found to play an important socio-institutional role in a process of change (Walker *et al.*, 2010; Vandevyvere and Nevens, 2015; Mazepus, 2017). In the case of Surabaya, the role that the political leader played in seeding environmental values, steering strategic networks and action through a dedicated street-level on-ground leadership approach, and high levels of trust within the actor-network, facilitated the rapid diffusion and dissemination of SKE.

AF2) Community champions: The case study findings identified a group of champions[33] who have been pivotal in accelerating the transition of SKEs. These champions played a critical role in providing connectivity amongst actors and helping to institutionalise practices supporting SKEs. These champions emerged from the community after local NGOs triggered their participation in improving their local environments through the creation of environmental cadres. Other kampung community members employed by the government, private sector and NGOs moved beyond their formal responsibilities to lead on-ground action. Consequently, these champions are portrayed as key individuals promoting and leading local environmental practices to

[33] Key individuals that supported the leapfrogging process within kampungs have been referred to as champions. As reviewed by Taylor et al. (2011), champions are referred in literature as 'emergent leaders' who are centrally involved in driving the process of change. These champions are driven by their personal commitment to promoting their ideas and values with conviction, and intrinsic motivation rather than their formal role responsibility (Howell and Boies, 2004), a description that fits the 'emergent leaders' found in the case study.

achieve SKE. The characteristics of these local champions included: committed and motivated, strong environmental and cultural values, adept at influencing others to adopt sustainable practices through 'learning by doing' approaches and innovation. As one champion stated:

> "…my father said to continue the fight, you have to take care of the environment. That's why I became a cadre. That's what I shared with the community my values from my parents... I was very concerned, there was a lot of garbage in the water... I want to clean it, how to live clean, healthy. In order to have good future generation, not dumb, smart, we need to find out how, then I learn and show the community how." (CM 5.5, translated)

Community champions became key for the engagement and participation of the community in the SGC. They helped in initiate on-ground action through a combination of education, leading-by-example, and incentives to encourage other community members to participate. Some of the actions included displaying sustainability practices at their household, assigning roles to different members of the communities, stimulating engagement by providing access to resources like plants. Most significantly, they transferred knowledge from the training on sustainable practices and made it available and understandable to community members of their kampung and beyond.

Community champions played an important role in maintaining the momentum within the transition process to SKE, by facilitating connectivity and collaboration amongst different groups and levels. For instance, community champions facilitated information with familiar interpretation to the district government by advising the head of the district (*camat*) about the best strategies that worked in their kampungs. These champions also collaborated with emerging champions of latecomer kampungs by supporting them with the implementation of the best strategies in their neighbours.

The case study has portrayed how the actions of these community champions directly supported the acceleration of the transition towards SKEs. This reinforces previous literature where champions have been recognised as drivers for enabling change, as they provide on-ground guidance and play a crucial role in leading change (Howell and Boies, 2004; Taylor, 2009; Taylor *et al.*, 2011; Bos and Brown, 2012; Lindsay *et al.*, 2019). Similarly, the role of the champions identified within the Surabaya case study also shares characteristics with " knowledge brokers", who have been identified in previous studies as individuals who bridge the gap between practitioners and the community (Van De Kerkhof and Wieczorek, 2005; Lindsay *et al.*, 2019); and "boundary spanners", who are individuals that able to use their knowledge and skills to mobilise networks of actor across system boundaries (Williams, 2010; Brodnik and Brown, 2017).

The community champions in Surabaya—with key characteristics, including their personal connection to their kampungs and the people, and ongoing commitment to spread the vision—catalysed community participation, significantly influencing the speed and direction of change. Also, by drawing on their skills (and exercising the role of "knowledge broker" and "boundary spanner"), actively sharing knowledge, and supporting a replication process, the community champions connected with laggard kampungs and supported their jump directly to SKEs.

AF3) Women's empowerment: As identified through the case study analysis, the empowerment of women has significantly influenced the transition of SKEs. What transpired over time is that women become more financially independent and confident to move out of household roles to take a leading role in community care as environmental cadres, helping to promote and diffuse knowledge and practices for SKEs. A set of strategies aimed to create economic opportunities and education for women and foster their role as decision-makers in community management. The role of a strong female mayor was critical to guiding this change. Bu Risma's involvement in empowering women is captured by one interviewee:

> "No one has ever dared except her [Bu Risma] to break down the prostitution in Jarak [ex-Gang Dolly]. Now those women have become better women, they were trained, Bu Risma was so daring at that time. Now it becomes economy. They were trained to create handicrafts from scraps that can be sold. They are good to society now." (CM 5.3, translated)

The strong female leadership of Surabaya's main leading political figure Bu Risma represented a minority group in power and supported a gender equality agenda. Women are insufficiently represented in leadership and decision-making decisions globally, and women's leadership has been found to be a priority focus area to ensure women's equal participation (UN Women, 2018b). Bu Risma's advocacy to ensure agency and participation of women at different levels has been evident through her policy and planning strategies, including developing skills, and establishing a gender-responsive governance structure. For instance, the city's profile portrays women's role as central for the development of the city, enabling them to actively contribute within the society and move outside their roles in domestic household affairs (City Government of Surabaya, 2016c). The city's mayor has been recognised for her political commitment to ensure gender equality and empowerment of women, as displayed by several awards, including 10 Most Inspiring Women 2013 by Forbes Indonesia and Ideal Mother Award 2016 by Islamic Educational Scientific and Cultural Organization (ISESCO). Most importantly, Bu Risma, considered the 'mother of the city', has been an inspiration for women across Surabaya, influencing an accelerated process of change within civil society and shifting perceptions of the value of women's participation across different levels (e.g. Surabaya Gender award). Research on female leadership supports the impact of women leaders as role models in girls' educational attainment in developing contexts (Beaman *et al.*, 2012; Duflo *et al.*, 2012).

Similarly, the government's action to increase women empowerment included fostering the participation of women in decision-making within their local communities. For example, women were encouraged to participate in community meetings such as the *musrenbang*, to support the decision-making process. The network of community volunteers (environmental cadres) is largely formed by women, promoting environmental awareness and technical capacity to their community. The participation of women in their communities has also influenced active participation by children and youth in events like the SGC competition. As a report of Oxfam suggests, "women's collective action is most effective when women's rights advocates in grassroots and civil society organizations" (2017, p. 34); these strategies may have been effective in increasing women's empowerment as they were targets within local communities.

Women's economic empowerment was achieved through programs such as the Economy Hero and UKM, which supported women to acquire new skills and knowledge, and start businesses, which ultimately led to increases in household incomes and self-sufficiency, which supported the transition of SKEs. The government's strategy for the rapid diffusion and implementation of women's empowerment programs included capacity building and resources, less burdensome regulatory requirements and processes, motivational speeches, and partnerships with different actors. The government provided free training and mentorship services across different areas (e.g. food production, handicraft) in collaboration with educational organisations; knowledge on business management (e.g. marketing, quality services); provision of resources, including primary resources (e.g. seeds) and infrastructure for business operations; and facilitated the administrative process of small and medium business and product registration. Financially, the government approved loan guarantee programmes in partnership with the private sector. As a result, financial inclusion, entrepreneurship, and productive capacity for women in kampungs grew. As the Financial Services Authority report (2017) states, in Surabaya, the Economy Hero program, comprises 200,000 members. Given that women have an essential decision-making role at the household level in terms of financial management and community care, the programs helped promote women's empowerment as essential for community empowerment. Ultimately, the creation of economic sources and the advantage of having additional new skills and knowledge for women improved the economic activity in the kampungs and contributed to the macro-economy of Surabaya.

The Surabaya case study showed that women's empowerment increased the capability of women to influence the rapid process of change, setting in motion initiatives to advance inclusion and equitable social, economic and environmental development. This is in line with global policy in achieving gender equality and women empowerment as a pivotal contribution to the SDGs. The inclusion of women in development strategies is key to achieve sustainable development (UN Women, 2018a), economic development (Bordat *et al.*, 2010; Elson and Seth, 2019), and successful catch-up development (Braunstein, 2019), among others. Critical to the Surabaya case were a set of strategies that supported women's role in leadership and their economic empowerment, thereby providing both the financial independence to pursue sustainability initiatives (such as the SGC) and the governance structures for many of these ideas to spread across female co-operatives (such as the environmental cadres' groups led by women).

AF4) Grassroots innovation and participation: Grassroots innovation[34] supported by a strong community participation, have been essential in shaping the pathway to SKE. The analysis indicates that the SGC has been successful in stimulating strong grassroots participation through different strategies such as media campaigns and incentives from the government. Local NGOs and the private sector have also helped train and educate grassroots leaders (champions), which have helped to foster bottom-up innovations that

[34] This research follows Seyfang and Smith's (2007, p. 585) grassroots innovation definition as: "networks of activists and organisations generating novel bottom–up solutions for sustainable development; solutions that respond to the local situation and the interests and values of the communities involved".

responded to local situations or needs. Network building activities based on cultural beliefs have also helped to create community momentum and sustain on-ground implementation of the program.

In Surabaya, grassroots innovations have been taking place since the 2000s, their impact peaked during the acceleration phase, as their role and impact evolved to successfully enable the rapid diffusion of SKE practices. While strategic and targeted community-based initiatives led by the government to improve kampungs have been present since the first KIP started in 1969, community efforts to clean up kampungs emerged from the grassroots as no alternatives were being implemented. The government was in no economic position to provide human resources to improve the kampungs, so relying on the community was the only option. Fortuitously, this early reliance on communities to provide the human resources for kampung improvement created the foundation for accelerating sustainable practices within kampungs during the SGC program. Social networks for community action had been established, and the community had developed a sense of independence, supporting a broader learning process of sustainable practices. Community actions have been a vital strand for change in kampungs, as one interviewee noted:

> "Grassroots are important… Sometimes people want to change, demonstrated just a little dare not step, but people from community yes, [they] have willingness and courage. Hence the ability to change must exist in all the steps of the ladder." (GO 4.14, translated)

Combining kampung social networks, community leaders and collaboration with non-community actors (e.g. NGO, private sector), grassroots innovation resulted in a community network with strong environmental values that improved social capital and reconfigured the role of the community to achieve SKEs. Grassroots innovation also enabled the SKE niche to grow in scale and attract more kampungs. Among the strategies within the SGC program targeted at increasing community participation was the direct involvement of grassroots groups to support an informal multi-scale governance structure, where local groups were responsible for creating and managing SKE practices within their kampungs. This also generated bottom-up actions and tangible changes that responded to the local situations or needs of their kampung. For example, they actively sought support from academics to tackle a kampung issue (wastewater), leading to collaboration between the community and academia to create the APAL (wastewater treatment device). This type of grassroots network building also created community momentum and sustained on-ground implementation of the SGC program by driving knowledge dissemination processes. This is in line with existing indicators of the success of grassroots innovation (Hossain, 2016; Seyfang and Longhurst, 2016), grassroots activism (Padawangi, 2014), and evidence of the important role that grassroots action play in supporting sustainability (Seyfang and Smith, 2007; Gupta, 2010; Hossain, 2016; Seyfang and Longhurst, 2016; Wolfram, 2018).

AF5) Prioritizing the vulnerable: As evidenced through the case study, prioritizing vulnerable[35] groups has been critical to engage and mobilise the community, which contributed to scaling up support and action from different actors through broad and inclusive participation, and ultimately supported the change towards SKE. Similarly, prioritizing vulnerable areas within Surabaya has been pivotal for a rapid SKE transformation of priority areas, as they provided a focus for significant investment to improve living conditions by replicating of successful strategies in forerunner kampungs.

The prioritization of vulnerable groups was facilitated by the civil organisation PWSS through community-based targeting mechanisms. This grassroots organisation helped to leverage a contextual understanding of the community living along the Strenkali riverbank. The situation reflected residents living in extreme poverty in precarious settlements, of which a majority lacked a resident card, without which migrants cannot access basic services (e.g. water supply, education, health). Despite these challenges, the PWSS worked towards motivating community participation and mobilising local power dynamics to transform their kampungs through an autonomous process. This means providing the skills and capacity to the community to learn-by-doing and learn from each other, mobilise and organise resources, and the ability to change and adapt their local conditions (Taylor, 2015). In coordination with PWSS, Bu Risma's administration also contributed to the official recognition and provision of residency cards to squatter communities. Additional government led initiatives also helped reduce the vulnerability of children by encouraging their participation in educational programs. A range of programs offered education services, not only in environmental matters but also concerning health and welfare. For example, the government closely worked with educational centres (schools) to implement a whole-school system approach to strengthen existing environmental and health initiatives, including an award system.

Similarly, the government enacted Decree No. 188.45/143/436.1.2/2015 contributed to the national government target of zero slum areas by prioritizing vulnerable areas in need of housing and settlements improvement. The houses and settlements in these areas do not meet the local infrastructure quality requirements (Chapter 4, Table 4.2). In 2015 they were considered the most disadvantaged kampungs of Surabaya (Ambar and Meirinawati, 2018), and a considerable number of residents lack a resident card. Different socio-economical resources were dedicated to achieving a rapid transformation of these areas. For instance, champions from forerunner kampungs facilitated knowledge dissemination amongst the community, the government allocated a specific budget for the construction of small-scale infrastructure, and the private sector collaborated with financial resources to support environmental practices. As one interviewee stated:

> "There are some [immigrants] that maybe still don't have KTP [residency cards] but they still get help from the government. I believe they are included through different programs. The Surabaya

[35] For the purpose of this research, vulnerable refers to areas that are the most affected by social determinants of health, such as slums and to demographic groups with a higher risk of social exclusion, such as women, children or illegal immigrants (WHO, 2005; UN-HABITAT, 2017).

> Green and Clean for example, this kampung improvement program is comprehensive, it's not just done in the physical aspect but there's also socio-economy empowerment that then caused an acceleration for kampung betterment." (AR 2.2 translated)

The prioritization of vulnerable groups and areas has been critical for the dissemination of SKE, which reached thousands of people who live in disadvantaged areas without access to basic services and would otherwise have been left behind. The well-being improvement of vulnerable groups and areas has been found in the literature to be at the core of transformations towards sustainability (WHO, 2005; UN-HABITAT, 2017; United Nations, 2019a). The prioritization of vulnerable areas of the community required many of the other enabling factors (e.g. financial resources – AF8 and community champions – AF2). However, the specific targeting of vulnerable communities is at the core of the observed leapfrogging trajectory, as many of these communities experienced the most marked changes in their living conditions. The creative solutions developed by the Surabaya government and the communities to support these areas provided them with the self-confidence and capacity to transform their living conditions, their reputation, and with this, the sustainability of their kampungs.

AF6) Capability building: The case study revealed the importance of advancing the capabilities of people as central to driving the change towards SKE. The focus was on building human resource capabilities to empower individuals and equip them with the ability to generate individual and collective change. While efforts to improve the capabilities of the community can be traced back to Surabaya's take-off phase of transition, particular actions to strengthen human resource capabilities took place during the acceleration. These capability building actions drove behaviour change and were used for rapid knowledge dissemination and practice diffusion, ultimately supporting the transition towards SKE.

Firstly, the government's long-term relationship with the local university (Institut Teknologi Sepuluh Nopember, ITS) led to ITS facilitating training for official employees to effectively implement its vision. The training workshops equipped officials with skills, knowledge and professional competencies on environmental dimensions and program development phases (e.g. implementation and monitoring). Interviewed officials also acknowledged that they had access to international education through governmental scholarships to strengthen government human resource capacity. The government also provided educational programs for empowerment and awareness-raising of sustainability issues and practices, targeting different groups (e.g. children and women) at the grassroots level. For instance, the implementation of early environmental education for children was promoted through programs, such as the Surabaya *Adiwiyata* green school and Eco-School program. Training for older people was also included in projects such as composting centres, waste banks and UKM.

Strengthening capabilities of the kampung community was also promoted by other actors who collaborated with the government. Local NGOs facilitated training and awareness creation at the community level, whilst the private sector and research institutions assisted with the provision and development of knowledge and resources. These organisational actors also contributed to the capability building of key individuals (e.g.

champions) who were instrumental in the process of change, as they facilitated the rapid diffusion of knowledge and skills among neighbours in kampungs.

Capability building enabled important social learning across different kampungs through the SGC, raised awareness on health and environmental issues, and contributed to reducing inequality. As one interviewee highlighted:

> "…I think being poor is a blessing. If you are rich you depend always on someone doing something for you because you can pay. Once you can't pay then you need to do things, learn... We always develop new capacity, target to poor people…capacity it's there. Once it's there, it's always there to support." (AR 2.1)

The Surabaya case is in line with previous scholarship that found the provision of mechanisms to improve the capacity-building (Rockstr *et al.*, 2007; Farrelly and Brown, 2011) and the absorptive capacity (Steinmueller, 2001; Sauter and Watson, 2008) of government and industry, and grassroots (Hossain, 2016), was instrumental to supporting a transformation process. This research highlights the diversity of actors that supported capability building within the kampungs from both a top-down and bottom-up trajectory. Critical to the Surabaya case was also the willingness of the community to seek out opportunities for capability building from external actors and thereby support the improvement of their individual kampungs.

AF7) Targeted incentives: As evidenced in the case study, the deployment of targeted incentives has been critical for the rapid uptake of SKE. The provision of economic, social and moral incentives was used as a key strategy at different levels to mobilise and motivate various actors to take individual and collective local action and generate change. The data analysis identified an incentive structure that encouraged community participation; improved the performance of government officials; provided resources to promote innovation; and contributed to the cooperation among actors and the diffusion and mainstreaming of the SKE vision.

This incentive structure is associated with different actors involved in the provision of specific incentives, which were particularly visible during the acceleration phase. The government's approach was through actor-targeted incentives. To start with, moral incentives were introduced to reverse corrupt practices (Prabowo *et al.*, 2018); government employees' good performance was incentivised through recognition and awards. Economic incentives (e.g. monetary prizes), provided through partnerships with private companies, helped attract and support community participation in the SGC and encourage key actors (e.g. community champions) to continue driving change in their local kampungs. Whilst the monetary incentives were useful, many of the interviewees revealed that the underlying incentive was social. This means that a significant driver towards behaviour change was done through social incentives. The SGC competition gave a platform for the community to develop a sense of prestige to belong to a kampung with the reputation of a champion kampung. The government demonstrated an awareness of this by continually adapting the SGC program as it evolved to maintain accessible levels of awards for a broad spectrum of participating kampungs. Social incentives were not always portrayed as rewards but sanctions; however, either way, they proved to spur social engagement in the community. Like one interviewee stated:

> "The community weren't supportive. But our RT leader was also smart, those who don't support [the program] will have like a social sanction… when they need to apply for ID card, they will have to deal with the Pak [leader] RT, he would make it difficult for them..." (CM 5.4, translated)

At the grassroots level, environmental cadres used incentives (e.g. plants, seeds) to increase the enthusiasm of the community and support change in their kampungs. Also, beyond the collaboration with the government, the private sector directly provided incentives to the community, such as the provision of IT equipment, to promote innovation within kampungs. Similarly, creating an environmental library, which included access to the internet, supported environmental awareness and fostered environmental research practices to be implemented by young people.

The Surabaya case study coincides with findings in the literature that place incentives as a key strategy to enable a sustainable change; these includes incentives to encourage experimentation (Kemp *et al.*, 1998; Farrelly and Brown, 2011); research and development (Sharif, 1992; Lee *et al.*, 2014; Sarabhai and Vyas, 2017); foreign investment (Lee *et al.*, 2014); and adoption of clean technologies (Perkins, 2003; Binz *et al.*, 2012). The use of incentives within the SGC program not only provided the initial momentum for community involvement, but the continual evolution of the judging criteria and broadening of the award categories played a pivotal role in maintaining momentum during the transformation and facilitating leapfrogging within individual kampungs. The division of the award categories into four different levels in 2012 formalised a hierarchy of SKEs and provided a target for beginner kampungs to leapfrog towards (champion kampungs).

AF8) Strategic financial resources and CSR programs: As identified through the case study analysis, additional financial resources have been essential for supporting dedicated activities directed towards SKE change. Different strategies at different levels paved the way for structural financing to support SKE, including partnerships, targeting financing, and CSR programs.

Increasing government awareness of environmental responsibilities led to the development of a government agency (cleaning and landscaping agency in 2005) to improve the city's overall green and clean performance. This agency then provided an avenue for government funding to support environmental initiatives and the development of several government programs (e.g. waste banks, SGC). However, this government funding was limited and only able to provide a basic level of community programs, and further funding was needed to support the wide range of initiatives observed within the acceleration phase. Through a relationship built on mutual trust and reciprocal benefits, the government partnered with the private sector to collect extra financial means to support strategic initiatives (e.g. awards), which were necessary to maintain the momentum that the SGC was achieving.

Indonesia's CSR policy was in force since 1991, yet it was not until 2005 when CSR was focused on supporting the revitalisation of kampungs in Surabaya. Whilst CSR is mandatory, the important level of trust the government built in the relationship with the private sector helped expedite CSR's aim. The case study revealed that CSR in Surabaya is characterised as less embedded in corporate strategies and more focused on community development. As one interviewee expressed:

> "So we are a developer, I think a city developer, not just a building developer. So it's about people, it's about community, not just developing from economic perspective, but from a social perspective… we are always trying to synchronise ourselves with the local government's agenda and to do what we can actually help them" (PS 7.3).

The role of the private sector was significant for improving grassroots capital, as it contributed to community empowerment, capacity building, technology transfer and environmental preservation. The commitment of the private sector to improving community well-being was also visible through direct partnerships with communities beyond their CSR commitments. An example of this is the extensive work media outlets have done in promoting, stimulating and guiding the SGC program across kampungs. As one interviewee stated:

> "We train people to do 3R with their garbage. And what you see in Surabaya right now, it's the result of SGC for 13 years… It lasts for 13 years so that's sustainable, you can see the difference. And all I can say Surabaya is greener and cleaner now." (PS 7.5, translated)

Strategic funding resources were instrumental in getting things going locally while accelerating the diffusion and expansion of SKE by contributing to maintaining the momentum around taking sustainability actions in kampungs and improving the socio-environmental capital. Not only did key actors manage to get and/or direct additional monetary resources, but the community was also provided with skills to manage the operational costs and resources to transform their kampungs. Strategic funding resources is recognised in the literature as an important enabling factor. Studies have found that a monetary injection enabled significant support for research through governmental grants (Brown and Clarke, 2007), the development of new technologies by private investment (Lee and Lim, 2001; Perkins, 2003), and to mobilise resources through CSR (Malovics *et al.*, 2008; Hidayati, 2011; Mustofa *et al.*, 2016; Nurul, 2016). Whilst Surabaya's transformation was aided by the financial support of private companies, as stated above, critical to the success of the Surabaya case study was the level of commitment to community development that the companies showed outside of their corporate strategies. The analysis of the case study data indicates that this is a result of two factors: the political trust in Bu Risma's government (highlighted here and in AF3 and AF1) and the potential market opportunities that companies gained from their positive community exposure (AF9).

AF9) Market opportunities: The case study revealed the importance of creating market opportunities to support the achievement of SKE. Markets opportunities provided an economic benefit for the private sector and community from engaging in SGC initiatives motivating those actors to support and influence change. The government played a major role in providing quick access for community businesses to enter the domestic market and creating market spaces for the private sector.

Market opportunities for the community were facilitated as part of the UKM program strategy. The government provided competitive market skills to community members motivated by this financial mechanism to support different actions in their kampung, such as growing and caring for fruit trees. Through the SGC roadshow that showcased kampung results, the government strategically strengthened relationships with the private sector by fostering an expected economic benefit for private developers by providing market

space in which direct engagement between the seller (private company) and the buyer (community) can take place. This strategy proved to be successful, as one interviewee stated:

> "…I did a showcase for Economy Heroes from all over Surabaya, others are held in kampungs, in the Surabaya green and clean… At that time [the business's] market share was 40%, now almost 90%." (PS 7.1, translated)

The government's integrated business strategy not only reinforced the private sector's CSR commitment (AF6) and trust-relationship, it also influenced the sector's financial support towards a range of initiatives. For example, financial support for the awards of champion's kampungs and subsidy of community environmental projects. A side benefit of this financial mechanism was that environmental awareness was raised amongst the finance sector. The co-production processes between community, government and the private sector to deliver SKE influenced a sense of collective responsibility for helping others actively engage in the process. As one interviewee highlighted: "We can't expect that only a few take care of our city, we all have a role to play" (PS 7.2).

These findings are in line with insights from literature, where market-based approaches are considered an influential factor to guide a sustainable change, particularly to support the adoption of more sustainable technology or practices (Elzen and Wieczorek, 2005; Watson and Sauter, 2011). Mechanisms to encourage investment in innovative technology include: economy policy reform (Perkins, 2003); market receptivity (Brown and Clarke, 2007; Ferguson, Brown, Frantzeskaki, *et al.*, 2013); and supporting networks (Unruh and Einstein, 2000; Abeysuriya *et al.*, 2007). The Surabaya case study highlights the important role of market-based approaches and provides insights into the relationship between the success of these approaches and the role of strong government leadership and community initiatives.

5.4 Brief reflection

Surabaya's kampungs have experienced the burden of wars, evictions and the standard challenges of contemporary urban processes. Yet, they have not lost their *arek* (Surabayan term, used to refer to the spirit of egalitarian) or their unique cultural characteristic (Silas *et al.*, 2012). They have gained recognition as sustainable living environments as opposed to slum areas. Nonetheless, the increasing level of improvement in kampungs has occurred as a result of different socio-institutional changes marked by the key strategies highlighted in Chapter 4. This chapter has examined the contribution of the SGC program to the acceleration of Surabaya's transition towards SKEs and identified nine enabling factors that were critical for the leapfrogging that occurred within the kampungs over the period 2005 to 2015. Expanding community networks, connecting ideas, and action-driven champions within the communities helped shape an increasing sense of independence within the kampungs. This led to a growing belief in the community ability to shape the future of their kampungs and allowed the initiatives of the SGC to take root and flourish.

The analysis highlights the important role of specific actors within Surabaya's transition in establishing several key enabling factors. Political leadership and trust (AF1), community champions (AF2), women's empowerment (AF3), and grassroots initiatives and participation (AF4) represent important actor-driven processes with both a top-down influence (in the case of Bu Risma's leadership and contribution to AF3 and AF1) and a bottom-up influence (in the case of environmental cadres and civil organisations at the sustainability initiatives developed within the kampungs). However, the analysis of the SGC program also reveals the interconnected nature of many of the enabling factors. For example, the political leadership and trust (AF1) developed under Bu Risma's government was critical for developing the strategic financial resources and CSR sponsorship (AF8) of private companies. Similarly, whilst they were initiated and fostered independently, the development of community champions (AF2), grassroots initiatives (AF4) and prioritization of the vulnerable (AF5) was further supported by incentives (AF7) from the local government through strategies like building the skills and knowledge of the community (AF6).

Comparing the enabling factors for Surabaya's SGC leapfrogging process, identified and explained within this chapter, with those contained with the technological leapfrogging literature (see Chapter 2), highlights some clear parallels (e.g. capabilities, market opportunities and financial resources). However, the analysis has revealed important nuances, refinements and expansions of our understanding of key enabling factors for leapfrogging within a developing urban environment. It has also unpacked the interconnected nature of these enabling factors within and across time, which has been largely undocumented to date. For example, as mentioned at the start of this chapter, many of the foundations for the SGC program had, in fact, been laid much earlier in Surabaya's history (see Chapter 4). The following chapter builds on the analysis in Chapters 4 and 5 to situate the nine enabling factors presented in this chapter against the broader historical context of Surabaya's transition.

Chapter 6

Socio-technical leapfrogging dynamics by Surabaya's kampungs

6.1 Introduction

The previous chapter has demonstrated the key enabling factors that led to the acceleration of SKEs (sustainable kampung environments) within Surabaya through the SGC program. Drawing on a detailed analysis of the SGC program, nine factors were identified from 2005 to 2015 that significantly supported the uptake of SKEs and supported leapfrogging within individual kampungs. However, what is evident from this analysis, presented in Chapter 4, is that these *acceleration factors* did not emerge from nothing. There was a long history of changes that had built up to shape the socio-institutional conditions that allowed leapfrogging to occur. As Chapter 2 explained, leapfrogging requires a set of socio-institutional conditions to be in place to be successful. In essence, as Frosch argues, "in order to leapfrog, you have to have to be a frog, not a tadpole" (2002 cited in Gallagher, 2006, p. 391). This provides a valuable analogy for understanding the significance of historical initiatives in supporting SKEs. However, understanding the dynamics underlying a leapfrogging process and the significance of leapfrogging to sustainability transitions and their acceleration remains unclear in the existing literature.

This chapter contributes to this critical gap by addressing objective three: to identify and characterise the enabling factors and actor strategies that have driven Surabaya's sustainability transition and examine how they influenced parts of Surabaya to accelerate change through leapfrogging. Section 6.2 begins by identifying seven *foundational factors* and analyses how they supported the development of the nine acceleration factors (Chapter 5). Following this, all sixteen enabling factors (Chapter 5 and 6) are presented together in Section 6.3 with an analysis of how each factor enabled transformative change and the key strategies that were used to help implement them. Section 6.4 then focuses on understanding the shifting significance of the enabling factors across Surabaya's transition by mapping the relative influence of each factor during each of the transition phases discussed in Chapter 4.

6.2 Foundational factors

Fundamental mainstreaming of SKE approaches in Surabaya were built upon a 70-year development pathway, starting in 1945. A set of socio-institutional conditions that come from this long history of transformative change were key shapers of the networks and institutional settings needed to enable leapfrogging to occur. This section distils the factors that provided an ongoing catalyst and foundation for the acceleration factors (Chapter 5) and the overall transition to SKEs. The foundational factors discussed in this section are: clear vision, goals and indicators (FF1), supportive policy and regulations (FF2), stronger law-enforcement (FF3), intra and inter-sector collaboration (FF4), and cultural beliefs and environmental values (FF5), resources tailored to local conditions (FF6), and best practice recognition (FF7).

FF1) Clear vision, goals and indicators: As evidenced in the case study, the formulation of a vision, goals and measurable indicators within and across different actor levels was important to shape and steer the path towards SKE. The envisioning process to transform kampungs into sustainable areas has evolved from the

initial vision (kampungs as a viable living environment) in the late 1960s into an agenda with specific goals and indicators to help guide multiple strategies (including the acceleration factors) supporting SKEs.

The vision and goals developed within Surabaya responded to the needs of the community and provided the foundation for many of the acceleration factors. For example, a clear vision of stakeholder engagement supported the development of strategic partnerships with the private sector through endorsing a formal commitment to provide united action in delivering CSR programs (AF8). Similarly, clear goals and indicators provided a foundation for community champions (AF2) to express and reflect their knowledge with clarity; and provided their messaging with a sense of legitimacy through its alignment with the government's direction. Through a collaborative process with community champions, the government's goals and indicators were improved and reframed accordingly to the kampungs challenges, needs and expectations.

The initial framing of the vision and agenda for Surabaya's kampungs was highly influenced by close cooperation between key actors from the government and academia in 1969, led by Prof. Johan Silas, a prominent urban planner from ITS university (Chapter 4). According to Silas, the vision for kampungs at the time was to: "put the kampung as an integral part of the old city…a reintroduction. The mission was to bring development to the front door of the poor. That was how kampung improvement was initiated" (Colombijn, 2016, p. 18). This vision was formulated in the broader legislative and strategic planning context of Surabaya (Das, 2017) and was implemented through programs like the KIPs and C-KIP. Over time, with changes in the political dimension, knowledge and experience across community and government, the vision co-evolved from small-scale home improvement to sustainable planning. This co-evolution was fundamental for the development of political leadership and trust (AF1). Silas also provided his perspective on the contemporary vision for Surabaya: "[Bu Risma] wants to do the best for the people… The vision of Surabaya is a smart city, a humane city, a civilized city, and an ecological city…the smart city can only be achieved if you have smart [educated] people" (Colombijn, 2016, p. 22).

The government's vision provided collective guidance to facilitate the development and diffusion of sustainable practices in kampungs through a specific set of goals with measurable indicators. For instance, national Law No. 26/2007 stipulated a coverage of 30 per cent green open space. Indicators such as the number of RTs participating in the SGC, which can be converted to measurements of green open space areas, provided information to the local government as to what targeted actions were needed to achieve the goal. Having a clear set of goals and indicators also contributed to a better and more rapid coordination of actions between actors at different levels, as evidenced in the initiatives taken across agencies and the community. As one interviewee mentioned, "We faced all challenges until we found what goals we wanted to cover. At first, SGC competition consisted of 4 RTs in a team, you can imagine how hard it was to coordinate 4 RTs. They need to have the same vision, to be united" (CM 5.4, translated).

This research highlights the importance of a social process of visioning informed by indicators which helped concrete and accelerate the progress of initiatives, such as capability building (AF6) and market opportunities (AF9), which ultimately shaped the SKE. Through this process, the Surabaya government was able to learn

about the societal context (e.g. needs) of kampung communities and allowed targeted management of strategies. Similarly, rather than developing a vision in isolation, the government pursued a cooperative-common vision, that is: "environmental protection as the life guidance, where the living environment is central to sustainable development" (City Government of Surabaya, 2016c, p. 142). The Surabaya case is in line with previous scholarship that found the notion of a shared vision to achieve particular goals as an important strategy to mobilise action (Ferguson et al., 2013; Kemp and Loorbach, 2007; Loorbach and Rotmans, 2010; Voß et al., 2009); and determine the direction of a sustainability pathway (Stirling, 2011; Binz *et al.*, 2012).

FF2) Supportive policy and regulations: As identified through the case study, a supportive environmental policy and regulatory framework were essential for enabling the SKE change. Since the 1950s urban revitalisation and environmental management (1980s) have been incorporated into Surabaya's policy development (Table 4.1, Chapter 4). Nevertheless, as Novalia *et al.* (2020) argued, whilst the green agenda was included in these early policies, it was not adopted into broader socio-institutional practices. The waste crisis in 2000 was a defining moment for the city government in redesigning its environmental and planning policy. This reform favoured the development of policy instruments seeking to stimulate sustainable development in poorer areas through collaboration with different national and international actors, including academia, the private sector and foreign governments[36]. In response, new policy instruments were formulated and upgraded the following year, including the 2002 master plan; regulations on urban green space and waste management (e.g. Regulation No. 7/2002); and international cooperation (e.g. with the city of Kitakyushu). This green-policy direction was continued and improved during Bu Risma's government by pushing a policy and regulatory framework to prioritise vulnerable slum areas and urban ecosystems. These policy changes and improvements helped build the foundations for inclusive participation, particularly of underrepresented actors (community champions - AF2 and women's empowerment - AF3), whose actions were key for the acceleration process (Chapter 4).

The government also enhanced the internal policy-making capabilities of private companies by formalising partnerships with the private sector. A participatory policy and planning process not only reduced opposition to environmental policies but invoked a more sustainable corporate response, supporting the acceleration of strategic financial resources and CSR programs (AF8). As one interviewee from the private sector stated: "These are challenging times, to answer them the company has resharpened its policy… We want to accelerate the development of… that is sustainable, economical and accessible to all people" (P.S. 7.4, translated). By formalising government partnerships with the private sector, the Surabaya government was able to leverage the capacity of private companies to provide funding and resources that supported SKEs and some of the acceleration factors, including capability building (AF6), targeted incentives (AF7), and market opportunities (AF9).

[36] The city-to-city level cooperation agreement with the Japanese city of Kitakyushu (Chapter 4).

The Surabaya case shows that both the national and local government provided a legislative framework that ensured environmental protection and slum upgrade, and links most of the sustainability goals to development plans and programs (e.g. 100-0-100 program - 100 per cent access to drinking water, 0 per cent urban slums and 100 per cent access to sanitation). This factor coincides with literature, where ongoing development of policy frameworks and regulations that support broader diffusion of sustainable practices are considered a key instrument to enable change (Kemp *et al.*, 1998; Tukker, 2005; Schot and Geels, 2008; Kern and Rogge, 2018). This research highlights that cooperative policy enabled the Surabaya government to facilitate a clear understanding of the sustainable regulations; and promote and mainstream sustainable practices through collective action, rather than simply enforcing policy rules. The case study demonstrates the importance of active sustainability policy for providing the foundation for future initiatives. These earlier policy and regulatory reforms were critical to creating an environment that allowed initiatives such as the prioritization of vulnerable areas (AF5) and grassroots participation (AF4) to unfold.

FF3) Stronger law enforcement: The case study revealed that enforcement mechanisms (such as transparency and anti-corruption strategies) contributed to the implementation of SKE practices. According to Kurniawan *et al.* (2013), prior to Surabaya's urban renewal, the lack of law enforcement impacted the city's ability to control detrimental impacts on the environment and effectively implement strategies. In response, Bambang's government focused on strengthening the police enforcement agency as a first step to create a green culture among the community. During this period, the number of police deployed along the streets to enforce waste management regulations doubled to 7000 (Peters, 2013). As one interviewee noted: "Pak Bambang called the head of Satpol PP (municipal police). He asked for at least two arrests per day to arrest people who throw waste [into rivers and streets]. To catch the people and take their KTP (residency cards) … he received regular reports" (GO 4.14, translated). This shift towards effective law enforcement served as a foundation to build the necessary credibility for effective advocacy, political leadership and trust (AF1).

The government also enhanced law enforcement by tackling strategic areas, such as corruption prevention, transparency, and public education. For instance, the e-government platform GRMaS (Government Resources Management System) was initiated to promote transparency and accountability in delivering public services, including public access to data and evaluation of government officials (Chapter 4). This anti-corruption strategy helped raise awareness about the extent of corruption by gauging people's perception and effectively controlling and monitoring government employees. Strategies like this provided a foundation for targeted actions and supported acceleration factors such as capability building (AF6) and targeted incentives (AF7). As one interviewee highlighted:

> "For example, incentives for performance improvement. We also have a report for our activities, just like schoolchildren, so every three months, we get a grade and we can exchange it for money. The supervisor approves and is financed by the Regional Government Budget. It's all done to push the anti-CCN (corruption, collusion, nepotism) agenda" (GO 4.11, translated).

These strategies proved successful in effectively enforcing and rapidly implementing regulations and projects that contributed to SKE. These anti-corruption initiatives were also recognised by the national government who awarded the Surabaya government the Commission of Corruption Eradication of Indonesia in 2011. This factor is supported in literature as key in creating an effective space implementing public laws and improving good governance practices (Gal, 2004; Berglöf and Claessens, 2006; UNDP, 2014a). The Surabaya case study highlights that whilst law enforcement is particularly challenging in developing countries (Daniels and Trebilcock, 2004; Waddell, 2004; Clark, 2005), it can be effective if systemic approaches for enforcement are implemented. In Surabaya, strong law enforcement was supported by the two previous factors: a clear vision and indicators (FF1), and strong policy and regulatory framework (FF2).

FF4) Intra and inter-sector collaboration: As evidenced through the case study, multi-actor collaboration laterally and vertically across different networks (government officials, private companies, researchers, and community members) has been central to driving the change towards SKE. Political support, long-term government-academic relationships, and collective value[37] facilitated strong network building, cooperation and coordination. One interviewee attributed the success of the SGC as the result of this cross-sector collaboration:

> "The key to success of the SGC was public socialization, community involvement, collaboration. We formed environmental cadres, we gathered the people who care about the environment and taught them, collaborating with universities, NGOs, they gave suggestions… Then the competition started. The City Council collaborated with Jawa Pos, Unilever, Emco paint, etc. through CSR and MOU… the cooperation worked because we valued them, being appreciated like that makes people happy… Green and Clean is a collaboration work of Cleanliness Agency, Environmental Agency, Agriculture Agency, Health Agency, Jawa Pos, other business, NGOs and the community" (GO 4.11, translated)

The historical analysis (Chapter 4) revealed that the network building process in Surabaya started in the late 1960s and was initiated by state actors. A collaborative process between the Surabaya government and academics resulted in the co-production of the first program to improve kampungs in 1969. This ongoing collaboration and the subsequent kampung improvement programs (including the SGC) also fostered a closer relationship between the government, academia and the kampung communities. The multi actor-network was further strengthened by NGOs, which encouraged the active involvement of community participation and helped implement specific programs (e.g. solid waste management program). Similarly, based on their cultural beliefs (FF5), the kampung networks introduced positive spill-over effects through interactions with individuals who were not engaged in the government programs. The growth of relationships and increased collaboration among actors provided an existing network that government officials, community champions

[37] Collective value is an appreciative collaborative approach that aims to ensure balance of power and influence, and integrate all stakeholders in the collaboration process (Kuenkel, 2019).

(AF2) and grassroots initiatives (AF4) could leverage to accelerate the diffusion of SKE practices (Chapter 5) and supported the prioritization of vulnerable areas (AF5).

A combination of regulations, formalisation of partnerships, mutual understanding, trust and integration strengthened the relationship between the government and private sector (Chapter 4). As a representative from the private sector mentioned: "It's a good synergy with the government… My work all this time is valued. I wasn't working all by myself, I was part of a team. The response is beautiful, green and clean environments [kampungs] located in the middle of the city" (PS 7.4, translated). This partnership platform also enabled a direct collaboration between the kampung community and private organisations. This resulted in more holistic cooperation across all three sectors, strengthening the collaboration with the government. This laid the cornerstone for effective strategies underlying acceleration factors such as targeted incentives (AF7) and market opportunities (AF9).

The local government was also able to strengthen their intra-sector capacity by improving the coordination between agencies through mentoring of high-level actors (e.g. city mayor) to government officials (Chapter 5), changes of government structure (Chapter 4) and internal regulations (FF2). This 'quality engagement' helped create an accountable and reliable space inside government, and guidance of a clear vision (FF1), ultimately underpinning intra-agency communication and coordination. These institutional changes provided a foundation for political leaders (AF1) to maintain and accelerate the collaborative process within government staff and cross-sectoral collaboration. As one interviewee indicated, "Each department helps each other a lot. Collaboration between departments is easy, challenges have been minimised…strong leadership and commitment supported this." (GO 4.13, translated).

These established partnerships (e.g. government – private sector) and locally embedded networks (e.g. kampung community - NGOs) produced a higher degree of intra and inter-connectedness and coordination while building, replicating and enabling a SKE change. This aligns with what is highlighted in the literature as a key ingredient for stewarding change is collaboration at all levels and across all actors (Spekkink and Boons, 2016; Kuenkel, 2019). This is seen to help establish partnerships that allow collective (top-down and bottom-up) initiatives (Koontz and Newig, 2014; Eckerberg *et al.*, 2015), and respond to social inequality (Devolder and Block, 2015). The Surabaya case highlights that coordination and collaboration within governmental agencies and across networks of actors shaped many of the acceleration factors (e.g. political leadership and trust (AF1) and strategic financial resources (AF7)). Moreover, Surabaya's constructive and inclusive multi-actor collaboration enabled community champions (AF2), women's networks (AF3), and grassroots innovations (AF4) the promotion of shared and collective value and the rapid uptake of more SKE practices.

FF5) Cultural beliefs and environmental values: The case study identified culture and societal values associated with the natural and built environment as two major forces driving change towards SKE. The rich history and cultural heritage that is embedded within kampungs remain strong as the cradle of the *arek* culture (Chapter 3). This spirit of braveness, resistance and egalitarianism is not only embedded in the lifestyle of the

kampung community (Damayanti, 2015) but has also guided the government's decision-making in regards to kampung improvement visions (FF1) and policy (FF2). For instance, the 'problem' of slums in the late 1960s had two solutions, upgrade or demolition (Chapter 4). As one interviewee noted, the government decided on the former solution: "We said: let's keep the kampung as it is. Our history, cultural heritage and characteristics, they are all in the kampungs, so we have to preserve it" (AR 2.1).

Similarly, the spirit of community *gotong royong* (mutual cooperation), which is an important characteristic of Indonesia's indigenous culture (Chapter 3), has influenced the willingness of the community to collectively cooperate and participate (AF4), contributing to the rapid dissemination of SKE activities. An example of such powerful mutual assistance is the SGC program, where the local bonding within kampung communities proved to be successful. As Gervasi (2011) states about the SGC competition, the kampung community joined forces (*goton royong*) to protect their area from health endangerments through the cultural spirit of *arek Suroboyo*. This argument was supported by an interviewee, who affirmed that "Surabaya is known as the Heroes City, so the people is known for its heroism. So, there is already a strong foundation, based on *arek*… We can touch hero values by working together (*gotong royong*) to protect the environment in our kampungs" (NGO 6.2, translated).

In addition to culture, environmental values have structured the participation, practices and decisions of different actors to change the natural and built environments of kampungs. The experience of the 'waste disaster' in 2000 drove a major communitarian redemption aimed at making the city clean again (Dhokhikah *et al.*, 2015; Bercegol *et al.*, 2017). This fostered a new set of values relating to environmental protection to ensure public health was central in the city's governance. There was also a mind-shift towards protection within communities facilitated by an educational approach focused on building awareness, improving knowledge and providing resources (Chapter 4 and 5). As one interviewee highlighted: "We also need to have public campaigns in terms of social aspect. Respect to the environmental values, that kind of social engineering was the first stage of the project implementation... So, we have to establish this kind of value" (AR 3.1). This shift to stronger environmental values influenced sustainable agendas of different actors such as community champions (AF2), women's groups (AF3), and the private sector (through strategic finance and CSR) (AF8), who played a key role in accelerating a path towards SKE.

This research highlights that the diffusion and mainstream of SKE practices were largely underpinned by cultural beliefs that emphasise a sense of identity (*arek Suroboyo*), mutual cooperation (*gotong royong*), and strong environmental protection values. Although existing literature supports the inclusion of culture as an integral part of sustainable development (UNESCO, 2012; Astara, 2014; Isar, 2017), this research highlights the important role that culture and values played within a process of change. Some authors also contend that a change towards sustainable practices requires a shift in values relating to environmental protection (Brown and Clarke, 2007; Frantzeskaki and de Haan, 2009; Tadaki *et al.*, 2017). Critical to the Surabaya case study was the continuous promotion associated with the cultural heritage and educational value from both top-down and bottom-up processes. The government recognised the intrinsic value of cultural heritage by including it in the vision process (FF1) and policies towards kampung development (FF2). While the community

(through community champions – AF2, women's role – AF3, and grassroots organisations – AF4) reinforced the dialogue and practices as a collective strategy to support SKE, becoming a cornerstone for rapidly mobilising resources (as experienced in capability building (AF6) and incentives (AF7)).

FF6) Resources tailored to local conditions: As evidenced in the case study, resources tailored to local conditions have been critical in shaping the pathway to SKE. Whether this was domestic or international action, in partnerships with local actors, the provision of financial, knowledge and expertise input from other sectors or organisations stimulated local capacity and the development of local actors to steer the implementation of SKE practices. This supported a platform for the empowerment of local actors such as community champions (AF2) and grassroots organisations (AF4) to take actions like capability building (AF6) and strategic funding (AF8) to accelerate the SKE process. It also provided a space for local actors to tailor new knowledge and practices to their local conditions, through sharing contextual solutions, local wisdom and cultural beliefs (FF5). As one interviewee stated: "…if the multi-lateral organisation think they have all the instruments they want to install in Surabaya without taking care of local wisdom in Surabaya, it won't be a good project" (GO 4.4, translated).

Foreign economic assistance has played an important role in sustaining kampung improvement programs, particularly during Surabaya's urban improvement period 1965-1999 (Chapter 4). Funding from international donors allowed programs such as the KIP to be scaled up and mainstreamed. However, the success of the programs came after important lessons (e.g. local partnerships, technical scale, monitoring) were learnt from the gradual implementation of the programs (i.e. KIP II, III, V). Local partnerships between different actor groups (e.g. research institutions and local NGOs) throughout the whole project (including planning, design, implementation and monitoring) was a key ingredient for resource mobilization and helped to achieve shared goals between different actor networks (e.g. the local government and the donors, or academic researchers and the community) (Chapter 4). As one interviewee mentioned: "We hope to make a change in Surabaya…not only the community, but all the stakeholders feel assisted by the existence of our programs. We improve the institutions capacity, performance by holding workshops, training, etc …generally, they receive us warmly…" (BDO 1.2, translated).

Knowledge transfer and expertise input has also influenced the transition to SKEs by strengthening local capabilities. This process has been facilitated through partnerships between different actors and at different levels. For example, the successful implementation of the solid waste management program was significantly influenced by the cooperation of the government with the city of Kitakyushu (Japan), which provided knowledge and technical assistance (e.g. for the Takakura compost bin) (Chapters 4 and 5). Similarly, this program benefited from Surabaya's long-term multi-actor collaboration (FF4) and increased the efficacy of partnerships with local actors, NGOs and research institutes. Who in turn, also provide resources tailored to the actor group they were working with. These collaborations also strengthened and enabled actors such as community champions (AF2) to act as bridging agents with the community, helping with the rapid diffusion of new knowledge and practices (capability building - AF6), as well as providing feedback to adapt the

technology to local conditions (e.g. designing Takakura compost bins with longer-lasting materials). A trusted and reliable transferring space was key for the success of the programs. This was facilitated by the government through MOUs and bridging agents (who provided a support actor-network).

Perhaps unsurprisingly, the Surabaya case study highlights that resources tailored to local conditions supported a foundational path towards SKE by strengthening local capabilities and supporting the empowerment of key actors in their role as frontrunners and leading to strategic actions to stimulate change. This aligns particularly with literature, which suggests that appropriate support is mostly effective: when the development assistance fits local conditions (Quibria, 2014; Elayah, 2016; Moyo and Mafuso, 2017; Pospieszna, 2018); is in partnership with local organisations (World Bank, 2016b; Pospieszna, 2018); and there are mechanisms in place ensuring reform is not imposed by outsiders and is instead internalised by the local government (Moyo and Mafuso, 2017).

FF7) Best practice recognition: The case study revealed that best practice recognition[38] of exemplary programs and projects on sustainable habitat practices contributed to the dissemination of SKE practices. Obtaining credibility for the city's sustainable progress has inspired a sense of responsibility to share and transfer SKE knowledge and experience across cities, whilst also contributing to acceleration factors such as political leadership (AF1) and incentives (AF7). As one interviewee highlighted: "It becomes the benchmark of Surabaya's performance. This attention brings a lot of guests, from mayors of international cities to organisations, like United Nations" (AR 3.4). This recognition has also provided the city of Surabaya opportunities for international and domestic exposure, helping to build networks and attract international organisations for additional resources (FF6). As one interviewee said: "With the limited budget allocated to Surabaya, the city government is unable to finance every environmental project in the city. We take these opportunities [international network events] to invite other stakeholders to work with us…but other stakeholders have more opportunity, I know academics have international collaborations too." (GO 4.2, translated).

Surabaya's approach to improving the housing needs of the urban poor (Kampung Improvement Program - KIP) has often been used as a successful example for transforming high-density neighbourhoods whilst preserving cultural heritage. The KIP (1976 - 1990) has been awarded for its impact on the living conditions of its habitants through a low-cost, innovative and community-based approach (Chapter 4). Awards include national Adipura award in 1988; the Aga Khan Award for Architecture in 1980, 1986; and World Habitat Award in 1992. These recognitions helped promote the program and encouraged organisations like the World Bank to support the scaling up of the KIP, resulting in a neighbourhood community empowerment program, the C-KIP in 1998 (Chapter 4). C-KIP became the foundation for a participatory planning approach, enabling

[38] This form of recognition has usually been presented as an award, in addition to a monetary prize for the actor sector (e.g. city's government to support further projects); and has been granted by different types of organisations (international and national) and foundations, including private, multi-lateral associations, non-denominational development, non-governmental, and not-for-profit groups.

the participation of women at community meetings (AF3). Similarly, programs like the SGC received international attention for its green and clean initiatives and improvement of the city's urban environment. Awards include the national Adipura award in 2006-2014; Indonesia's best smart eco-city in 2015; Dubai International award for best practices in 2008; ASEAN Environmentally Sustainable City Award in 2011; and Global Green City award in 2017. These best practice recognitions positioned Surabaya in the global and national spectrum of green cities, encouraging the city government to keep setting a course of lessons for sustainable slum upgrading. In addition, host-kampungs (champion kampungs that served as an SKE example) benefited from the financial opportunity that visitors brought to their community, creating an increase in participation (AF4) in the program. As one interviewee highlighted, "...if there's a lot of guests coming, it would help the local community's economy…. Other kampungs see this, and they wanted the same for their kampung" (CM 5.1, translated).

Best practice recognition has contributed to building the credibility of Surabaya's SKE practices domestically and internationally. This helped to further promote the local adoption of SKE practices and influence international development practices. The recognition of best sustainable practices has been found in literature as a strategy to raise awareness of decision-makers and practitioners, and the dissemination of practical experience and knowledge (Withycombe Keeler *et al.*, 2016; UN-HABITAT, 2018).

6.3 Key enabling factors supporting leapfrogging within a transition

The first half of this chapter has identified seven foundational factors and outlined the key role in creating the conditions that enabled leapfrogging to occur during the acceleration phase of Surabaya's transition. Table 6.1 brings together and summarises the seven foundational factors (FF) and nine acceleration factors (AF) from Chapter 5. The summarised information outlines the factors and provides a brief description of how each factor supported the creation of the enabling context. The strategic actions that were used to create and maintain the enabling factor are presented, covering both the activities of actor groups and supporting policy and regulatory actions. Each factor is supported by several quotes from the qualitative interview data. Combined, these factors show the importance of strong policies, leadership, collaboration across and within multiple actor networks; and the ability to strategically leverage available resources to support an overall vision.

Table 6.1 Key factors that enabled the leapfrogging towards sustainable kampungs environments

Enabling factor		How the factor created the enabling context	Strategic actions	Exemplary interview quotes
Foundational factors				
FF1	Clear vision, goals and indicators	Long-term vision and clear and measurable targets that prioritized a sustainability change and stimulated action	- Cooperation between key actors and engagement by knowledgeable advocates for change - Visioning process that involves community (common vision) - Setting explicit goals and informed indicators	- "Our sector [private], the government and people have one vision to make Surabaya greener and cleaner… and this has to continue for our future generations" (PS 7.2) - "…every month we will *kerja bakti* (work together) …this is done so all the RTs become united, so all the kampungs have the same vision." (CM 5.4, translated) - "The central government has a target; we have to work hard to achieve it. That's our target... our program scope, that helps us with planning" (GO 4.6, translated)
FF2	Supportive policy and regulations	Additional legislative framework that ensured adequate environmental protection and sustainable development	- Development (or upgrade) of policy instruments facilitated by a multi-actor collaborative process - A participatory and inclusive legislative framework, aiming to prioritized vulnerable groups and areas, and formalised partnerships	- "…the government needs to provide many regulations that envision or support adaptive infrastructure for a sustainable city" (GO 4.5, translated) - "Private sector claims itself as an industry that puts sustainability at the forefront of their policy. So, we are not too afraid to include them in the CSR, because the sector is quite concerned about environmental issue" (GO 4.14, translated) - "The process needs to be more streamlined and the regulations clearer so at least for us, as private developers, we know clearly what to do and what not to do" (PS 7.3)
FF3	Stronger law enforcement	Strong and positive enforcement mechanisms encouraged the compliance of the legislation and secured a fast-paced implementation	- More human resources for on-ground control, supported by a clear vision and strong policies - Anti-corruption strategies, including formal incentives, evaluation and action learning, and control and monitor of employees - Transparency and accountability between and among actors	- "The regulation is good, but it won't function if the leader has not implemented, regulation has to be implemented and then, the community will feel the transformation." (NGO 6.1, translated) - "The government can push the regulations. It's effective with strong leadership… now developers, community put more respect to the government, and respect the regulations" (AR 3.1) - "In Surabaya, there is a policy to make civil servants not to accept bribes… Mrs Mayor asks us not to accept anything in the field… if someone if fooling around, we monitor better" (GO 4.8, translated)
FF4	Intra and inter-sector collaboration	Strong organisational collaboration within and across a large number of private and public actors supported and facilitated the vision and targets of the broader network	- Political support and commitment that strives and guides a trustful collaborative process - Long-term academy-government relationships guiding network building and formalised partnerships with other actors	- "The government can't do it alone, stakeholders will need to be involved too, community and private-sector" (NGO 6.2, translated) - "If we didn't unify, the cause would fail. Once we got unified is the real result… but kampungs can't do it all by themselves. They need the support from everybody, and the support is there" (CM 5.7, translated) - "If they [other organisations] need help, we can help them. Whatever they need, we will support them. We would collaborate with other agencies to solve problems. This is part of the vision, to coordinate with other institutions... everything works smoothly, our cooperation… Basically, we work together" (GO 4.9, translated)

Enabling factor		How the factor created the enabling context	Strategic actions	Exemplary interview quotes
			- Collective value engagement, ensuring and inclusive and integrative collaborative process amongst all actors	
FF5	Cultural beliefs and environmental values	Strong cultural beliefs and environmental values ensured the success of interventions to achieve the protection of the local identity and environment	- Institutional context that integrates and adopts culture and values into their systems, including governance structures, operational responses, management, etc. - Promotion associated with the cultural heritage and educational value from both, the top-down and bottom-up orientation - Educational model focused on building awareness, improving knowledge and providing resources	- "…in trying to educate about green and clean, we start by explaining our identity, Surabaya identity, we still use kampung as our motto, as our identity in some of our social-cultural program, we emphasise on *gotong royong* [mutual cooperation]. Less individually living" (GO 4.5, translated) - "…kampung is important to keep, to improve, to clean and green, because kampung is identity…if we live in the kampung, we know each other, we embedded each other and our relation is good, kampung have been developed with *arek* [spirit of egalitarian] culture, cooperation, and good communication. So we need to take care of kampung to not lose our identity" (NGO 6.1, translated) - "I love clean, beautiful environment… as a parent I educate my kids to protect the environment... I planted a tree when my child was born, to make a mark so that he is aware that he needs to love nature" (CM 5.3, translated)
FF6	Resources tailored to local conditions	Accessible and reliable demonstration of new knowledge tailored to the requirements of the end-user in partnership with local actors and accompanied by funding to support the adoption and diffusion of foreign initiatives	- Provision of financial, knowledge and expertise input in partnership with local actors, including government, NGOs and community - Jointly development of programs with local actors, under a trusted and reliable space, with room for feedback and local adaptation	- "We work together with locals. So, they support in some field, like if we work with NGO, they engage with community, and we support the other field, like technical assistance… because alone we can't give the assistance" (BDO 1.2, translated) - "…it's a matter of understanding the terrain, so not necessarily what is official, but also what is real…" (GO 4.6) - "…[If] we want to jump, to leapfrog the development, so we need the networking...we need opportunities to have international, national, regional collaboration…to learn from other situations…" (AR 3.1)
FF7	Best practice recognition	Increasing global and local recognition of best environmental practices fostered the development of best practice thinking of awarded cities and communities; motivates local government and	- Submission of entries to international and domestic awards, detailing successful local programs - Leveraging international and domestic network to build credibility for the city's sustainable progress - Domestic and international promotion of awards through media releases, conferences and public events	- "Surabaya is to be a global city so we need best human development to compete with other countries, it becomes the benchmark of our performance" (GO 4.1, translated) - "…we are glad to have guests from all over Asia, even UN [United Nations] …our kampung features in the newspaper, then other kampung want the same, my task is to educate them, I'm so happy, touched and moved when they listen to me" (CM 5.6, translated) - "…the government talks about the program [SGC] to many countries, Bu Risma went to some summit abroad, always deliver this program to other countries and to other Indonesian cities, to promote Surabaya" (PS 7.5, translated)

Enabling factor		How the factor created the enabling context	Strategic actions	Exemplary interview quotes
		communities to maintain momentum		
Acceleration Factors				
AF1	Political leadership and trust	Proactive political leadership that guides socio-political capital, mobilises resources, and engages with the masses to motivate change, engenders a sense of shared responsibility and helps to create a space of trust which fosters commitment among all actors	- Street-level leadership supported by on-ground actions - Lead-by-example approach, supported by recognitions and awards, legitimising the leader - Proactive lobbying and engagement with various actors at different levels, facilitating high-levels of trust and effective coordination within the actor-network	- "…leadership I think is key in governmental aspect… I think the difference between Surabaya and other city's government is in the leadership" (AR 2.1) - "Leadership is one important thing in the social capital, trust, and linking good relations to work... then the city will be transformed to be a better city and more sustain… good leadership has been the foundation to build Surabaya Eco-City." (NGO 6.1, translated) - "Ms. Mayor always supported us… Usually, she comes to every workshop in the kampungs, she is very active. Bu Risma is very famous, people trust her, we trust her… sometimes we use Bu Risma to make the program as an incentive. We say that Bu Risma will come then people will come to the venue, just to see her, to listen to what she has to say" (PS 7.5, translated)
AF2	Community champions	A network of local champions had strong environmental and cultural values and were committed to the process by constantly creating opportunities to motivate and share knowledge with others	- On-ground action through a combination of education, leading-by-example, incentives to encourage other community participation, and learning-by-doing approach stimulated innovation and creativity - Direct communication with community and government officials, informing and connecting top with bottom	- "…champions need to be people who are committed but don't necessarily have much authority, and help build up …sort of the longer term commitment" (BDO 1.1) - "Environmental cadres are like the key factor for the kampungs to be successful. The head of RT & RW is also very important… to keep the kampung motivated" (AR 3.2) - "The kampung that is leading is the one where the cadres or the RT head is very good and very motivated for the development of the kampung. The one which is not having that kind of manager, they don't improve" (AR 3.3)
AF3	Women's empowerment	Dedicated programs equipped and allowed women participation in decision-making processes at all levels of political, economic and public life	- Policy and planning strategies that are gender-responsive - Creation of economic opportunities that adapt and are flexible to women's caregiver role - Education and training targeted to women - Encouragement of their role as decision-makers in community management - Female leaders as role models	- "If we want to change our kampung, we have to ask them [women], how about this? We don't have a lot of money, we start micro businesses, so women can work independently from home and help with the family economy" (CM 5.1, translated) - "…men are working outside and children are with the mothers at home… So, women are the ones that should be educated first, we give the mothers training to make the children successful. Because successful doesn't mean only men but everyone" (CM 5.5, translated) - "…talking to women is very good, when you try to empower community you have to empower women… Women are very innovative, very active… Men is talking with almost no action but women, they basically keep quiet but in one or three days after

Enabling factor		How the factor created the enabling context	Strategic actions	Exemplary interview quotes
				the discussion, they will ring my phone and ask me where can we get this technology? …I think to involve women is very important" (AR 3.2)
AF4	Grassroots innovation and participation	Dedicated strategies fostered diverse community participation, and valued the effectiveness of community action in the diffusion and innovation of sustainable practices	- Kampung network building based on cultural beliefs and values - Education and training targeted to grassroots leaders - Collaboration with non-community actors (e.g. NGO, private sector) for the promotion of community innovation and participation through media campaigns and incentives	- "A key actor in changing the city was the community, their participation played an effective role... So, then people say: 'this is my city. I own this city. I take care of my city' and that's what they did" (AR 2.1) - "…government can't provide for the operational cost, we've supplied them [community] with the infrastructure and training, but the community has to manage it by themselves…this triggers community behaviour and innovation so they can be independent… the community is very creative" (GO 4.6, translated) - "… the SGC really push community innovation, they got creative to win… The government can't do it alone, we need the help of community, they need to be involved in improving their kampung" (GO 4.9, translated)
AF5	Prioritizing the vulnerable	Dedicated strategies empowered vulnerable groups through a community collective ownership to mobilise local power dynamics and transform their well-being and living conditions	- Policies and planning strategies that prioritized vulnerable areas and groups, including official recognition of their socio-environmental conditions - On-ground action through education and training targeted to vulnerable groups (squatter communities) led by civil organisations, and supported by multiple actors (e.g. government, NGOs)	- "Slum areas is known for criminality, and low education, we try to make their situation better, to be equal…Their economy and education is growing, and the quality of environment is better than before, their condition is now equal" (GO 4.1, translated) - "…as an environmental cadre I move my resources quickly, I contact the lurah [sub-district head]… So, when there's a *kawasan liar* [wild/poor community] living along the river in slum areas, we help them first" (CM 5.6, translated) - "Surabaya is mixed, there are people with the stagnant economy condition and those middle-class... But, everyone gets a piece of cake [with programs]. One of them was to improve the conditions of kampung community, to be healthier, empowerment for stay-at-home moms, their economy, so that they weren't idle at home. Also, for those living along river or in more middle-class kampungs" (AR 2.2, translated)
AF6	Capability building	Accessibility and reliability to knowledge, sustainable practices and technology allowed the diffusion of lessons	- Long-term academy-government relationships facilitated training for official employees - Access to international education through governmental scholarships - Government educational programs and training targeting different groups (e.g. children), supported by a multi-actor collaboration	- "…we always encourage them to spread their knowledge to others because our hope is that a lot of people will make use of this recycled stuff to create good and useful products according to their own creations…and exhibit their products in events" (GO 4.10, translated) - "…the government and private companies give socialisation, training, seminars, workshops… then facilitators would spread their knowledge to the environmental cadres. The cadres who then educate the community" (CM 5.3, translated) - "We have many programs for community development, to increase capacity of the people, the skills, the knowledge of people that live in the city" (NGO 6.1, translated)
AF7	Targeted incentives	Strong incentives promoted innovation	- Actor-targeted incentives, including economic, social and moral incentives,	- "Incentives for performance improvement…" (GO 4.8, translated)

Enabling factor		How the factor created the enabling context	Strategic actions	Exemplary interview quotes
		and supported the achievement of desired outcomes	with support of formal partnerships with academia and private sector - Continuous adaptation of incentives to maintain momentum and interest for new participating kampungs, supported by feedback of community champions	- "It's not easy to ask them to come to this event. So sometimes we have to attract them by giving incentives. Or we give them competition, we give them prizes or we put their picture in the newspaper for recognition" (PS 7.3) - "In my kampung I'll give the ladies incentives, like flowers, seeds, until they have their own initiatives to buy them by themselves... There is also the '*Minggu Pertanian*' [Farming Week], it is a place where community can sell their produce like marmalades and juices, all grown in our kampung." (CM 5.5, translated)
AF8	Strategic financial resources and CSR programs	Additional financial resources, including sponsorships, promoted innovation and the development of new sustainable practices	- Creation of specific agencies with dedicated funding towards green and clean performance of the city - Conducive policies that support the interests of all actors - Formal partnerships between the government and private sector, supported by a trustful relationship and commitment	- "Usually, kampungs have difficulties regarding funding, but then when they find someone who's able to help them, they get motivated again… so community would ask sponsor, from the government or get some CSR from other institutions to make the kampung better" (GO 4.10, translated) - "They want to be innovative but most importantly they need funding. Yes, they have motivation. That's how champions go, that's how the APAL was done… but they find difficulty in the funding, then they become down…" (GO 4.4, translated) - "We used to coordinate a lot with private sectors as sponsors… they will pay for bins, paintings, seeds…through their CSR" (CM 5.2, translated)
AF9	Market opportunities	Substantial market opportunities provided economic mechanisms that motivated and supported the achievement of desired outcomes	- Market-based approach as an economic incentive for sustainable kampung development, supported by dedicated industry training. - Government's integrated business strategy to enable economic benefits for private developers through the provision of market exposure	- "…make sure they [private sector, community] are doing good business or getting benefit, and then they will help, share some of that profit with others, then you can push them to implement maybe, more environmental ideas" (AR 2.1) - "…market trends dictate also the demand… there's a paradigm shift in the last 10 years, green is the new sexy. So that means a lot more people will expect to catch up on this or they [private developers] will be losing up" (PS 7.3) - "We did every activity in kampung…then we promote with other organisations, we held markets in kampungs…our share went double…" (PS 7.1, translated)

6.4 Mapping the enabling factors across a transition

Having identified and collated the sixteen enabling factors, this section draws on the detailed analysis of Surabaya's transition phases in Section 4.3, to briefly re-examine each transition phase to analyse how these enabling factors have contributed to Surabaya's transition. It examines how the sixteen enabling factors have influenced the growth of the SKE niche during Surabaya's phases of transition, under the influence of landscape drivers following Indonesia's independence and in the face of post-colonial regime structures with minimal regard for blue-green services management within kampungs. In doing so, the section develops a greater understanding of the impact of the enabling factors across the phases and how these can be used to effectively provide an enabling context for leapfrogging.

Table 6.2 summarises the findings and shows the intensity of the influence of each enabling factor during the four distinguished phases. As observed in the graphic summary, whilst the foundational factors (and one acceleration factor – grassroots participation) are present during the pre-development phase, the intensity of activity associated with the enabling factors reaches a crescendo during the acceleration phase. Similarly, as is detailed below, during the acceleration phase, multiple enabling factors begin to interact to create the enabling context observed within Surabaya. A more detailed account of how the enabling factors unfold across the transition is explored below through a brief retelling of Surabaya's transition journey (outlined in Chapter 4 through the multi-phase concept) with the inclusion of the enabling factors and their significance throughout the journey.

Table 6.2 Impact of enabling factors during different transition phases

	Enabling Factor	Pre-development 1945 - 1999	Take-off 2000 - 2004	Acceleration 2005 - 2015	Pre-stabilisation 2016 - ongoing
FF1	Clear vision, goals and indicators				
FF2	Supportive policy and regulations				
FF3	Stronger law enforcement				
FF4	Intra and inter-sector collaboration				
FF5	Cultural beliefs and environmental values				
FF6	Resources tailored to local conditions				
FF7	Best practice recognition				
AF1	Political leadership and trust				
AF2	Community champions				
AF3	Women's empowerment				
AF4	Grassroots innovation and participation				
AF5	Prioritizing the vulnerable				
AF6	Capability building				
AF7	Targeted incentives				
AF8	Strategic financial resources and CSR programs				
AF9	Market opportunities				

Legend: Levels of shading reflecting the intensity of each factor during each transition phase

No presence | Least intense | More intense | Most intense

Pre-development phase (1945 - 1999)

Defined by shifts in the landscape conditions that begin to pressure the regime, within the case study, this phase started with an independent Indonesia, aiming to restore the country and the inequality Indonesian people experienced from colonial power (Chapter 4). Following concerns over the impacts on public health from the resurgence of malaria in kampungs due to poor living conditions, a shift in socio-environmental conditions led to a post-war institutionalisation of government support for kampung improvement in the 1950s. The acknowledgment of this issue led to increasing tension on the regime around how it viewed kampungs as slum areas. As a result of this pressure on the regime and clarity in defining issues around

adequate housing for Indonesians, there was a recognition of the strong culture heritage and value of kampungs (FF5), and they became formally incorporated into municipality policy as viable living environments. In addition, the government proposed kampung rehabilitation projects which provided new directions for the future of these areas. As such, growing awareness for supportive policy and regulations (FF1) and a new vision (FF2) started to develop.

During this phase, a group of actors began to engage with each other over the newly defined issue of adequate kampung living environments. A relationship between the government and academia was built, leading to a shared vision of better-managed kampungs and environmental protection progress. Both helped formulate programs (e.g. KIP) and strategies (e.g. co-productive arrangement with kampung community) to promote public health protection, cleaner environments and access to basic infrastructure and services. This relationship was key to leveraging community participation, growing an actor-network over the next phases, and supporting greater inter-organisational collaboration (FF4). Importantly, they also led to an international collaboration with the World Bank, which funded and helped sustain KIP improvements for over three decades. Whilst international resources benefited the scaling-up and mainstreaming of the KIP, the support respected the state-coordinated but community-driven upgrading nature of the program, ensuring that the international resources were tailored to local conditions (FF6). The successful KIPs in Indonesia inspired the World Bank to internationally promote slum upgrading programs in other developing cities (Das, 2018), in addition to other awards that Surabaya's programs won during this phase. These developments recognised (FF7) the efforts local actors were employing towards improving kampung environments, despite complex challenges (e.g. post-war implications, lack of financial resources).

The pre-development phase saw the beginning of Surabaya experimenting with and exploring strategies for improving kampung environments. These early activities began to challenge the existing regime and establish an institutional framework that would have a lasting impact on Surabaya's transition. As the SKE niche began to emerge, a new type of actor-network that had a growing awareness of the need to improve kampung environments began to initiate strategies that helped articulate these new societal needs in line with cultural and environmental values.

Take-off phase (2000 - 2004)

As the initial strategies in the pre-development phase became more established and effective at disturbing the dominant regime of low prioritization and highly uneven distribution of blue-green services in kampungs, Surabaya experienced further innovation and the growth of the SKE niche as a more holistic way of perceiving kampungs (e.g. caring for the community health and environment). The 2000 waste crisis was an opportunity to catalyse environmental repair by modulating initiatives at the micro-level and increasing the number of people that acknowledged and shared an understanding of the environmental issue (e.g. waste pollution), which fostered a new set of environmental values (FF5). This led to the build-up of an innovation actor-network, including a strong inter-sector collaboration (FF4) with NGOs, private sector and international organisations.

During this period, the call for better waste management was supported by the international collaboration with the city of Kitakyushu, Japan (Chapter 4), in continuing the tailoring of international resources to local conditions begun by the World Bank (FF6). This led to the establishment of a formal waste management program, which included a multi-actor support network. The program upheld the national recognition of Surabaya's practices and became the breeding ground for strategies, such as capability building (AF6) and strategic financial resources (AF8), which were central to embedding the new SKE thinking in the next phase. This positive behaviour change was amplified by the rise of key factors such as political leaders (AF1), community champions (AF2), empowered women (AF3), and grassroots organisations (AF4) acted as catalysts of innovation, helping to stimulate change and support the network building and innovation processes (e.g. testing new sustainable practices – compost bins).

The take-off phase in Surabaya was a result of the interplay between various factors, actor dynamics and events. These included: the existence of alternative ideas and new thinking, the emergence of committed champions at the micro-level; a waste-crisis that necessitated response and created momentum for change; a strong inter-organisational collaboration, which emphasized the need for structural change; and meso-level revisions of a clearer vision (FF1), supportive policy (FF2) and institutional arrangements (e.g. stronger law enforcement – FF3).

Acceleration phase (2005 - 2015)

In the acceleration phase, structural changes became visible as the SKE niche expanded, attracted more participation of different actors, practices started to the mainstream, and foundational factors, such as clear vision (FF1) and supportive policies (FF2), become more established). At the beginning of this phase, the SGC was a key program that helped different actors (e.g. private sector) become familiar with preliminary solutions that emerged in the take-off phase and build a shared responsibility for its implementation. This allowed the local experiments, such as urban farming and waste-water recycling devices, and the collective learning-by-doing process to become more aggregated. This aggregation process is marked by a broader and formal cross-sectorial network of actors, including local and district government, academia, private sector, non-governmental organisations and community, enabled by an intra and inter sector collaboration (FF4). These actors supported the mainstreaming of the Green and Clean niche through practical action and by forming networks with on-ground actors. They also built strategic initiatives such as prioritizing the vulnerable (AF5), targeted incentives (AF7), and market opportunities (AF9) that helped to speed up this transition phase (Chapter 5). Notably, international support (FF6) did not play a pivotal role during this phase. Whilst, aid cooperation is still present in Surabaya, the most defining strategies and programs have been developed and maintained locally.

At a more strategic level, several actor groups became more prominent during this acceleration phase, including political leaders (AF1), community champions (AF2), empowered women (AF3) and grassroots organisations (AF4). Their role has been central in the acceleration process (Chapter 5), supporting and advancing a rapid implementation of solutions (e.g. knowledge dissemination and practice diffusion) across

kampungs. Importantly, they also helped connect and align the various perspectives from top (government) to bottom (grassroots). Throughout this phase, the up-skilling and self-confidence of these actors were evident, and programs such as the UKM (small and medium enterprises program) supported this process (Chapter 4).

The acceleration phase in Surabaya created more pressure on the dominant regime from the micro and macro-level; however, whilst different dynamics brought an accumulation of socio-economic, cultural, environmental, and institutional changes, the regime-building process remains ongoing. A key contribution of this phase was the increased pace of change, the number of actors involved, and the number of resources being mobilised. In this phase, both foundational and acceleration factors played a critical role in influencing the direction and speed of change, and significance for this research, is where leapfrogging processes emerged (Chapter 5).

Pre-stabilisation phase (2016 - ongoing)

By 2016, Surabaya had made significant progress in embedding SKE practices and subsequent stabilisation of the SKE practices across kampungs with different starting conditions (Chapter 5). The dominant regime still has some presence, such as pockets of poverty and slum-like conditions that are not legally recognised as areas to provide blue-green services, but its power has been significantly weakened. Consequently, while the SKE has not yet fully developed as a new regime, its cultures, structures and practice have become embedded across society and government in the form of new thinking, institutional reform and technical practice. Consequently, foundational factors such as a clear vision (FF1), supportive policy (FF2), intra and inter sector collaboration (FF4) are maturing and shaping the establishment of a new regime, as suggested by Surabaya's current green agenda (Chapter 4).

However, Surabaya is still influenced by macro-level issues, such as larger economic forces leading to the creation of new slum areas with poor living conditions, which could represent a threat for the emerging SKE regime if changes in legislation or redirection in action and interest do not support its strategies. In support of stabilisation of the SKE as a new regime, the execution of the KOTAKU program in 2016 has served as an example of how its approaches became legitimised, as they not only went unchallenged but drove a rapid implementation of prioritized kampungs (AF5) by reinforcing the already engrained foundational and acceleration factors. It is at this point in the transition that primary data collection stopped; however, as mentioned in Chapter 4, a desktop analysis of Surabaya's progress in 2020 suggest that SKE practices (and many of the enabling factors supporting the transition) are continuing.

6.5 Summary

This chapter has drawn on the depth of information presented within the case study chapters to expand on the enabling factors for leapfrogging processes by identifying a further seven foundational factors. The foundational factors highlight the importance of early, clear, long-term visions that are supported by policy and regulation and their effective enforcement. Similarly, the inherent cultural beliefs and environmental values within Surabaya's citizens was a critical factor and supported improved intra and inter-sector collaboration in determining responses to these visions. Finally, both international and local resources were tailored to local conditions to support the adoption of new, often foreign initiatives, at times resulting in awards for innovative practices, which further supported the diffusion and uptake of SKE practices. The significance of these, and the nine acceleration factors, within the overall transition has been documented to demonstrate the progressive build of supportive conditions that led to Surabaya's transition. There is a clear build-up of enabling factors throughout the four transition phases, as many of the foundational factors begin to take shape during the pre-development phase. Moving forward into the take-off phase, the foundational factors become more defined, and the early formation of many of the acceleration factors is clear. During the acceleration (and subsequent pre-stabilisation) phase of the transition, the full impact of the conditions created by the enabling factors becomes evident, as multiple factors are being actioned across multiple levels of society. Whilst both the summary of the sixteen enabling factors (Table 6.1) and their build-up across the transition highlight the enabling conditions for leapfrogging, underlying each of the enabling factors is the role of multiple actors, who, through their actions, ultimately created the enabling context. The next chapter explores the actors behind the enabling context.

Chapter 7

Shaping an actor-driven enabling context for leapfrogging

7.1 Introduction

Analysis of the Surabaya case study has revealed a process of change that has been underpinned by sixteen key enabling factors. However, these enabling factors have not existed in a vacuum. What is clear from Chapters 4 and 5 is that these enabling factors have been established and reinforced by the strategic actions of multiple groups of actors, working both collaboratively and independently to bring about the change. As explored in Chapter 2, Farla *et al.* (2012) highlight that whilst sustainability transitions are characterised as broad systemic changes, they are often driven by purposeful actions and strategies by actors. Understanding the roles that actors play in strengthening key enablers is vital for developing an understanding of transitions that move beyond the broad niche-regime dynamics to explore the underlying drivers of these changes (De Haan and Rotmans, 2018). Given the significance attributed to the role of actors within sustainability transitions scholarship, this chapter explores the role of actors in implementing strategies to establish these enabling factors. This contributes to the thesis's third objective: to identify and characterise the actor strategies that have driven Surabaya's sustainability transition and examine how they influenced parts of Surabaya to accelerate change through leapfrogging.

This chapter is divided into two parts. Section 7.2 begins by identifying the key actor groups supporting Surabaya's transition and draws attention to their roles in Surabaya's transition process, focusing on the strategies each of these actor groups employed to trigger SKE change. Section 7.3 builds on this analysis to place the actor strategies within the context of the transition phases outlined in Chapters 4 and 6. In order to examine the role of actors in the leapfrogging processes observed in kampungs across Surabaya, attention is then given to analysing how the different actor groups facilitated the enabling factors within the acceleration phase. It also explores how the combined impacts of the activities of these actor groups supported SKE leapfrogging. As (Grin *et al.*, 2011) highlight, it is largely the agency of actors that influence whether, how and how fast a transition occurs. In focusing the analysis on this period of the transition, a foundation for understanding the role of the actors during the leapfrogging process is developed.

7.2 Actor roles in Surabaya's transition process

Surabaya's transition was neither a smooth nor a straightforward one; substantial challenges such as resource and capacity constraints stemming from administrative decentralisation represented a constant barrier for achieving SKE. However, as explored in Chapters 4 and 5, whilst there may have been challenges in taking actions supporting an individual enabling factor, these were often overcome by the actions of actors supporting other enabling conditions (such as grassroots capability buildings and leveraging international resources). In order to explore the role of actors and their relationship with the enabling factors within Surabaya's transition, the main actors within Surabaya's kampung transitions are grouped into five 'societal realms' or 'sectors' (Avelino and Wittmayer, 2016; Fischer and Newig, 2016): government (national, city and district), academia, private sector, civil society (NGOs and kampung community), and international

organisations (Table 7.1). Grouping the actors in such a way helps to distinguish the commonalities between actor strategies and the enabling factors and allows for a more detailed understanding of non-market and non-state actors (Avelino and Wittmayer, 2016). A more detailed analysis of each actor group is presented below the table to draw out key strategies that were employed to support the SKE transition.

Table 7.1 Actor groups and included actors

Actor group	Actors included
Government	- National Government (Indonesia's central government and ministries) - City Government (including agencies) - District Government (including district and sub-district level)
Academia	- Academic researchers
Private sector	- Semi-private and private firms, and private developers
Civil society	- Non-governmental organisations - Kampung community (community leaders, environmental cadres and the community in general)
International Aid	- Aid organisations and bilateral collaboration

National government includes Indonesia's central government and ministries. The national government provided a framework of policies and institutional arrangements that the city government of Surabaya could leverage in order to create effective local strategies and action (Chapters 4, 5 and 6). This institutional framework included the enactment of housing, land and environmental policies, government decentralisation reform, and provision of incentives to stimulate environmental stewardship (e.g. Adipura awards). Their role as institutional agenda-setters also contributed to the build-up of actor-networks. For instance, without the national government pushing an international cooperation agenda, programs like the KIP would not have had the financial support necessary to succeed. The same applies for decentralisation policies such as the institutionalisation of *Musrenbang,* which endowed community participation, promoting informal networks with non-state actors.

The national government's endorsement of Surabaya's city-wide reform agenda improved as programs became particularly effective in greater alignment with the SDG agenda. This national recognition helped give credibility to Surabaya's best practices whilst maintaining momentum for SKE, promoting the emulation of these practices in other Indonesian cities, and influencing the development of national programs aimed to improve the living conditions of poor-housing areas. Whilst autonomy structure remains in Indonesia, the dynamic between the Surabaya government and the national level has grown to a coalition of local-national interests that exert agency to help shape best urban-green policies and practices.

City government includes the city (*kota*) and city-governmental agencies. The Surabaya government has played a fundamental role in driving an urban transition agenda from the start (Chapter 4, 5 and 6), particularly in relation to 1) institutionalisation of the SKE niche, and 2) creation and leveraging of actor-networks. The city government has played a prominent role in steering a clear vision and supporting an ongoing policy

reform that responds to local needs. These have enabled a shift in the kampung narrative to recognise them as areas of cultural value. This has presented an opportunity to connect with multiple actors to improve the living conditions of the kampung community and enhance the city's greenery. In doing so, the city government also facilitated structural changes within their institutions (e.g. creating new governmental agencies) and implemented these by strengthening the law enforcement. At a more strategic level, the city government took a political leadership role in effectively materialising change through facilitating trust and transparency, guiding and mobilising actors, empowering vulnerable groups and sustaining program implementation and actor engagement.

The successful enabling role played by the city government was reliant on their ability to strategically develop partnerships, build an actor-network and utilise their resources (human, capital and material) effectively. In the early transition phases, the city government established a collaboration with academic researchers to develop urban development strategies (including the future of kampungs). This initial collaboration evolved to a science-government partnership, in which scientists now play the role of policy advisers; an influence that has become evident in Surabaya's policy-making, decision-making and development of urban strategies (Chapter 4, 5 and 6). Both government and academic actors leveraged this relationship for knowledge-adaptation, knowledge-development, and knowledge-dissemination throughout the transition. That is, adapting knowledge to the specific conditions and needs of the actor and local area, stimulating the development of new knowledge to articulate better solutions (e.g. feedback into strategic policy), and helping to disseminate this knowledge across different actors. In doing so, the city government also connected and facilitated a space for actors (e.g. community, government employees) to promote innovation of best-practice ideas and increased recognition of Surabaya's best urban practices.

District government includes district (*kecamatan*) and sub-district level (*kelurahan*). The district government played an important role in the successful implementation of the city governments vision and policies, steering them to be context-specific and focused on empowering kampung communities (Chapter 4 and 5). Their role as a closer government-level to the communities enabled them to provide valuable, localised information to support policy development. For example, district governments assisted in community mapping through the collection of household information and with law enforcement by controlling residency statuses. This also facilitated the support, assessment, and improvement of SKE strategies, whilst also strategically allocating resources to achieve SKE.

The district government also played a key role in driving collective action through fostering participation and partnerships across actors. Within this role, a critical action was to appoint government officials as environmental facilitators who encouraged community participation, promoted experimentation, innovation, and environmental awareness; and provided capability building. They also connected actors (e.g. NGOs with community leaders) to facilitate a more direct collaboration and partnership, resulting in more efficient communication and resource provision and controlling tensions between different neighbourhood associations. Whilst the city government approach had a tendency for on-ground action, the district

government's role strengthened the institutional implementation of SKE at a grassroots level, advancing the local capacity of different actors.

Academic researchers have been actively involved throughout Surabaya's transition process (Chapter 4 and 5). They have played a critical role in changing the city government's perception of kampungs (eviction, demolition or improvement) as a cultural heritage area, which eventually started the kampung transformation. Their subsequent role as government advisors helped translate science-based insights to accessible practices and solutions, influencing policy, decision-making and on-ground change. These positions also served to facilitate a context-specific implementation of international programs, ensure credibility of the programs, and incentivise them to advance research and scientific knowledge to provide better solutions.

Academics also played an active role in stimulating learning and innovation and disseminating knowledge across actors from different levels and organisations. These were facilitated through actor-targeted capability building programs (e.g. the green-school program), strategies (e.g. learning-by-doing and developing or expanding business opportunities), and cross-sectorial collaboration. Their position allowed them to foster relationships with diverse actors, enable knowledge-sharing networks, facilitate communication amongst actors, and inform and connect on-ground specific needs with city government strategies. Surabaya's science-policy interface has been key to supporting the kampung transformation, particularly in guiding solutions that have helped overcome the local contextual challenges (e.g. limited resources), facilitating a space for the co-production of knowledge to generate changes in behaviour and actions across actor groups.

Private sector includes representatives from state-owned firms and private firms. The private sector played an important role in supporting and directing resources towards SKE change (Chapter 4 and 5). As Surabaya's economy expanded in the 1970s, the private sector's real estate boom emerged to cater to upper and middle-class housing and large-scale developments (e.g. shopping malls). This strengthened the local economy and improved the physical development around these developments, but it also represented pressure on urban kampungs to vacate the area for land availability. Despite this land tension (which could have displaced existing kampungs, and in some cases did), the vast majority of kampungs have remained, pointing to the local governments and kampung communities' ability to protect and preserve these traditional areas.

The CSR (Corporate Social Responsibility) national policies shaped the role of the private sector, enabling them to support the Surabaya government and the kampung community. Given their trusted partnership with the city government, the private sector played an important role in providing financial resources, training, and research and development in line with the government's vision for SKE. Similarly, support to the kampung community was provided through direct intervention by private companies in response to community needs and utilising market opportunities to bolster a collective sense of responsibility towards achieving SKE. The marketing skills of the private sector were used to drive effective environmental campaigns, which further contributed to the diffusion of the SKE.

Non-governmental organisations include civil society organisations. NGOs have played a critical role in advocating for the community, mobilising the community's resources, and connecting actors with the

kampungs' specific needs for targeted support (Chapter 4, 5 and 6). Their longstanding engagement and commitment to socio-environmental and cultural activism supported their role in advocating for the inclusion of the most vulnerable communities in governmental programs. In doing so, they helped raise the voices of the marginalised and empower them with self-confidence and skills to make decisions regarding their kampung resources to improve their livelihoods and environments. Similarly, the NGOs' role as educators facilitated knowledge dissemination and on-ground adoption of SKE practices, promoted international technology transfer and grassroots innovation, and reached and influenced a wider grassroots audience.

As connectors and mediators, they played an important role in being bridge-builders between actors. For instance, they supported the government by conveying their vision and development programs at the bottom-level and enabling the community to have a voice and provide useful feedback to ensure the diffusion and continuity of SKE practices. Similarly, they became a reference point for international actors wanting to better understand the local context-specific and the needs of the kampung community. Overall, NGOs brought skills that supplemented the local government's strengths, whilst understanding and advocating for vulnerable groups and the kampung community.

Kampung community includes community leaders, environmental cadres and the community in general within kampung neighbourhood associations (*RT - RW*). The community (at different levels) was a crucial actor, who helped reshape the value of kampungs as cultural heritage and sustainable environments and influenced the direction and speed of change (Chapters 4, 5 and 6). They contributed to the transformation of SKE through two key roles: 1) as the 'grassroots' hand of the government in supporting the urban agenda, and 2) as a self-initiated actor to meet social needs and empower their communities.

Building on the strong interaction and engagement between the city government, academics and community that started with the KIP implementation, the community provided important, localised information to this coalition of actors. In doing so, the government and academics gained deep insights into kampung specific information related to challenges, needs, and drivers; they were able to utilise this information to create better informed policies. The closeness of this relationship also helped generate excitement around city government programs as community champions promoted the benefits of the programs and built local support for action.

Similarly, in a context of low governmental financial resources, the community's ability to independently develop and operate systems of service provision responding to their needs was critical for driving the physical transformation of the kampungs and behaviour change in the community. For instance, the kampung community self-funded and self-improve housing conditions; self-innovated and self-produced green technologies and practices; and actively promoted community awareness of health and environment. Combined, these two roles for the community spearheaded the transformation of Surabaya's kampungs by creating and mobilising actor-networks, diffusing SKE practices, disseminating knowledge, and empowering the community to enact change within their urban environments.

International organisations include aid organisations and bilateral collaboration. International actors have played a significant role in sustaining, scaling up and mainstreaming the local programs (Chapters 4 and 6). The provision of context-specific technical and financial resources contributed to creating the conditions where SKE took place. Their partnership and close collaboration with local actor-networks helped provide a space for local actors to tailor new knowledge and technology to their local conditions, and share and mainstream SKE practices. Also noteworthy was their role in creating international credibility by promoting and recognising Surabaya's programs as best practices.

7.3 Actors driving the leapfrogging process

It is clear that the diversity of actors and their ability to collaborate played a critical role in supporting Surabaya's SKE transition. Table 7.2 aims to bring together the previous work on enabling factors and the actor strategies outlined above with the transition phases in order to gain an understanding of the changing actor roles across the transition. Mapping the actor strategies across the transition phases highlights two key patterns that have emerged within the Surabaya case study. Firstly, the national, city government, and academic researchers (and later the district government) played a critical role in establishing the necessary conditions in which the SKE transformation could occur. The activities of these actors during the pre-development and take-off phases were vital in establishing many of the foundational factors that would go on to support further leapfrogging action. Secondly, whilst many of the other actor groups made contributions to support the transition during the early phases, it was during the acceleration phase where these actors, and the processes they were creating, began developing momentum outside of the support of the collective governments catalysing the leapfrogging process.

Individually there were also clear shifts in the role of the actor groups as the transitions progressed. The national government's role in the pre-development phase was primarily in creating new policies and institutional structures; however, as the transition progressed to the acceleration phase, their role shifted to be predominately focused on supporting and promoting activities through recognition and awards. The evolution of the city government's role is much more varied given their closeness to the processes. However, the general trend is an earlier role of influencing and promoting a development-oriented agenda through strategic visions and aspirational planning documents that progressively becomes more formalised through clear institutional and regulatory structures during the acceleration phase. Underlying this shift is a continual role of advocacy and support for alternative means of community development that evolves from securing financial and intellectual resources in the pre-development phase to the development and support of a variety of community empowerment initiatives and avenues for collaboration. With minimal regulatory means to enact change, the district government's role is largely one of supporting city and national policies in local communities. However, there is also a clear evolution across the transition that sees the focus of this role inverted. Their actions within the pre-development phase are primarily driven by data collection to inform broader policy decisions. As the transition progresses and the city government's policies begin to form, this

role shifts to supporting the translation of these policies into local communities by developing locally contextual strategies and programs.

Whilst there was some early lobbying by academic researchers driving government changes, the primary role of academic researchers appears to have stayed relatively consistent throughout the transition as one of providing expert advice and credibility to support sustainable blue-green service management. However, the focus of this expertise seems to have shifted from urban planning and design strategies in the pre-development phase towards more technological focused support during the acceleration phase. For example, in collaboration with the community, academic researchers played a key role in helping to develop the local water purifying and waste recycling technologies that many of the leapfrogging kampungs adopted.

The primary role of non-governmental organisations maintained a similar level of continuity throughout the transition, namely as one of advocacy and activism for socio-environmental improvements within kampungs and informal settlements. One change that took place was the level of collaboration with other actor groups. During the pre-development phase, the activities of the non-governmental organisations were independent or through small collaborations with other actor groups. As the momentum grew within the transition, the advocacy of non-governmental organisations began to play a crucial role in connecting government, private sector and international actors with kampung communities and facilitated effective on-ground learning of new SKE practices and supported their diffusion.

As one of the key actors engaged with the on-ground changes associated with the blue-green transition within kampungs, the role of the kampung community group underwent one of the most significant changes across the transition phases. The overarching trend is increasing empowerment and agency to enact change both within their own neighbourhoods and across the city. This is best exemplified within Table 7.2 by the growing number of enabling factors the kampung community group support as the transition unfolds. During the pre-development phase, the kampung communities were emerging from a historical legacy of poor government support and a lack of legal recognition in their living quarters. However, despite this (or likely because of this), the kampung communities played an important early role in fostering a sense of independence and community-led action. As government support grew during the take-off and acceleration phase, this was further facilitated to the point where once leapfrogging of individual kampungs was taking place, much of the innovation, deployment of capital and knowledge sharing was either being driven by, or at least supported by the actions of kampung communities.

The private sector's role evolved from minimal engagement with kampung improvement or corporate responsibility actions during the pre-development phase. Catalysed by the actions of other actor groups such as the city government and kampung community searching for opportunities to secure additional resources, the private sector's role grew to include the development and facilitation of training courses, sharing of time and resources to support the promotion and diffusion of SKE practices, and the direct support of financial resources.

Finally, the role of international organisations underwent a subtle but important evolution across the transition. Whilst their role of providing technical and financial support was present in each of the transition phases, as the sophistication of government policy grew, and kampung communities developed more agency, the support provided by the international organisations became increasingly tailored to local conditions. This change can also be explained as a shift in mindset from providing support as outside experts during the pre-development phase to one where support is developed in collaboration with local actors.

Table 7.2 Summary of actor's activities across each transition phase

Actor	Pre-development 1945 - 1999	Take-off 2000 - 2004	Acceleration 2005 - 2015	Pre-stabilisation 2016 - ongoing[39]
Foundational Factors: clear vision, goals and indicators (FF1), supportive policy and regulations (FF2), stronger law-enforcement (FF3), intra and inter-sector collaboration (FF4), and cultural beliefs and environmental values (FF5), resources tailored to local conditions (FF6), and best practice recognition (FF7) *Acceleration Factors:* political leadership and trust (AF1), community champions (AF2), women's empowerment (AF3), grassroots innovation and participation (AF4), prioritizing the vulnerable (AF5), capability building (AF6), targeted incentives (AF7), strategic financial resources and CSR programs (AF8), and market opportunities (AF9).				
National government	- Shaping housing and environmental policies (FF2) - Creating new institutional arrangements (FF2) - Stimulating environmental stewardship (FF5, FF7) - Promoting international cooperation (FF4)	- Promoting community participation and transparency, through policy development (FF1) - Stimulating environmental stewardship (FF5)	- Endorsed Surabaya's urban transition agenda (FF7) - Provision of incentives for spatial planning as green open spaces and awards for actors involved in environmental activism (AF7) - Promoting the emulation of Surabaya's best practices with other Indonesian cities (FF7)	- Commitment to the implementation of the SDGs - Development of programs to improve the quality of existing slums

[39] It is at this point in the transition that primary data collection stopped; however, as mentioned in Chapter 4, a desktop analysis of Surabaya's progress in 2020 suggests that many of the enabling factors continue to support pre-stabilisation of the new SKE regime.

Actor	Pre-development 1945 - 1999	Take-off 2000 - 2004	Acceleration 2005 - 2015	Pre-stabilisation 2016 - ongoing[39]
Foundational Factors: clear vision, goals and indicators (FF1), supportive policy and regulations (FF2), stronger law-enforcement (FF3), intra and inter-sector collaboration (FF4), and cultural beliefs and environmental values (FF5), resources tailored to local conditions (FF6), and best practice recognition (FF7) *Acceleration Factors:* political leadership and trust (AF1), community champions (AF2), women's empowerment (AF3), grassroots innovation and participation (AF4), prioritizing the vulnerable (AF5), capability building (AF6), targeted incentives (AF7), strategic financial resources and CSR programs (AF8), and market opportunities (AF9).				
City government	- Promoting kampungs as a viable living environment and of cultural value (FF5) - Guiding and articulating solutions for kampung improvement (FF1, FF6) - Influencing political responses (FF2) - Finding and directing resources (FF2) - Initiated and establish close collaboration with academia (FF4) - Functional coordination of program implementation with international organisations and NGOs (FF4) - Planning, evaluation and monitoring of programs (FF1)	- Facilitating a political and institutional structure (FF2) - Establishment of formal policy instruments to stimulate sustainable development of kampungs (FF2) - Guiding a compelling SKE narrative (FF1) - Strengthening of law enforcement (FF3) - Finding and directing resources (FF2) - Forming actor-networks and promoted a multi-actor collaboration (FF4) - Introducing and supporting experimentation innovation (new practices and programs for SKE) (AF6) - Fostering environmental awareness protection (FF5)	- Building-up and strengthening institutional and regulatory structures (FF2, FF3) - Bolstering women empowerment supporting their influencing to mainstream of SKE (AF3) - Introducing new strategies to maximize and maintain participation and collaboration of actors (AF2, AF6, AF9) - Creating and facilitating a space of trust, transparency and commitment for actors to support SKE through political leadership (AF1) - Guiding and mobilizing actors in the diffusion of the vision - Finding and directing strategic resources (FF2, AF8) - Provision of incentives and training opportunities for intra-sector employees (AF7) - Prioritization and application of SKE approach in vulnerable areas (AF5)	- Continuing improvement and sustaining the SKE agenda
District government	- Collecting household information, community problems (FF2) - Controlling of residency status (FF3) - Allocating resources (FF2, FF6) - Appointing program facilitators (FF1) - Controlling tensions at kampung level (FF4)	- Promoting experimentation (AF4) - Collecting household information (FF2) - Appointing environmental facilitators (AF2) - Supporting adoption of new practices and technology (FF1, AF6) - Supporting trustful cooperation within the actor-networks (AF1, FF4)	- Provision of capability building programs (AF6) - Incentivising actor participation and diffusion of SKE (AF7) - Assessing and improving the applicability of the strategies to diffuse SKE (FF1, AF8, AF9) - Guiding and aligning city government's vision with the context-specific of the community (FF1) - Fostering partnerships across actors (FF4)	- Advocating and supporting the stabilisation of SKE by mobilising and extend community participation for SKE application

Actor	Pre-development 1945 - 1999	Take-off 2000 - 2004	Acceleration 2005 - 2015	Pre-stabilisation 2016 - ongoing[39]
Foundational Factors: clear vision, goals and indicators (FF1), supportive policy and regulations (FF2), stronger law-enforcement (FF3), intra and inter-sector collaboration (FF4), and cultural beliefs and environmental values (FF5), resources tailored to local conditions (FF6), and best practice recognition (FF7) *Acceleration Factors:* political leadership and trust (AF1), community champions (AF2), women's empowerment (AF3), grassroots innovation and participation (AF4), prioritizing the vulnerable (AF5), capability building (AF6), targeted incentives (AF7), strategic financial resources and CSR programs (AF8), and market opportunities (AF9).				
Academic researchers	- Articulating and guiding solutions (FF1) - Providing advice to the government (changing kampung perception) (FF4) - Science-based research (knowledge building on kampung- housing) (FF5, FF6) - Lobbying to generate political support for kampung improvement (FF2) - Facilitating communication and connecting local context-specific between community and government (FF4, FF6) - Fostering innovation and credibility of the programs (FF7)	- Promoting new scientific insights that include accessible practices and technology (FF6, AF4, AF6) - Promoting experimentation and innovation (AF4) - Facilitating and guided a formal knowledge-sharing network (AF6) - Government advisor, helped the government to refine SKE approach (FF1, FF2) - Supporting cultural authenticity within kampungs (FF5)	- Advancing science and adoption of SKE practices (AF6) - Encouraging and supporting innovation at the community level (AF4) - Encouraging women's participation and leadership (AF3) - Commitment and multi-actor collaboration (FF4) - Government advisor, provides scientific evidence to support decision-making for advancing SKE (FF1, FF2) - Engaging in the creation of incentives and knowledge dissemination for different actors (AF7, AF9)	- Advocating and supporting the stabilisation of SKE by promoting ongoing research
Non-governmental organisations	- Socio-environmental activism and advocacy (FF1, FF5) - Producing technical reports (FF2) - Leveraging of social capital (FF1) - Connecting local context-specific (FF6) - Supporting city government's program (FF1)	- Socio-cultural and environmental activism and advocacy (FF1, FF5) - Producing technical studies (FF2) - Engaging in supporting city government's programs by mediating between government and communities (FF4, FF6) - Socio-technical learning facilitator (AF6) - Empowering key community actors (AF2)	- Socio-cultural and environmental activism, advocacy and commitment (FF1, FF5, AF3) - Empowering of vulnerable groups (AF3, AF5) - Facilitating on-ground adoption of SKE practices (AF4) - Partnering with other actors to support and ensure the continuity of momentum (FF4)	- Advocating and supporting the stabilisation of SKE through socio-cultural and environmental activism

Actor	Pre-development 1945 - 1999	Take-off 2000 - 2004	Acceleration 2005 - 2015	Pre-stabilisation 2016 - ongoing[39]
Foundational Factors: clear vision, goals and indicators (FF1), supportive policy and regulations (FF2), stronger law-enforcement (FF3), intra and inter-sector collaboration (FF4), and cultural beliefs and environmental values (FF5), resources tailored to local conditions (FF6), and best practice recognition (FF7) *Acceleration Factors:* political leadership and trust (AF1), community champions (AF2), women's empowerment (AF3), grassroots innovation and participation (AF4), prioritizing the vulnerable (AF5), capability building (AF6), targeted incentives (AF7), strategic financial resources and CSR programs (AF8), and market opportunities (AF9).				
Kampung community	- Supporting mapping of kampung challenges (FF6) - Provision of resources (including voluntary financial contributions) (FF6) - Community-led (hands-on) improvement projects (collective self-help initiatives) (AF4) - Facilitating associated cultural beliefs (FF5)	- Providing deep insights into kampung-specific (needs, barriers, drivers) (FF6) - Mobilising and facilitating strong community interaction and social cohesion (FF4) - Promoting community awareness on health and environment (FF5) - Promoting experimentation and innovation (AF2, AF3, AF4) - Socio-environmental activism (FF5) - Socio-technical learning facilitator (AF2, AF6) - Learning new skills to improve kampung conditions (AF6)	- Socio-cultural and environmental activism and commitment (FF5) - Initiating on-ground action, including organisation, management and dissemination of resources and vision (FF1, AF4) - Bolstering community empowerment (particularly of women and children) and kampung cultural value (FF5, AF3) - Supporting replication of SKE practices and connectivity with laggard kampungs (AF2, AF6, AF7) - Aligning different perspectives between community and other actors (FF1, FF4) - Foster bottom-up innovations that responded to their local needs (FF6) and of more vulnerable areas (AF5) - Facilitating connectivity and collaboration amongst actors (FF4)	- Advocating and supporting the stabilisation of SKE by fostering and supporting expansion of SKE to other kampungs
Private sector	- Strengthening the local economy and physical development of certain areas (FF6)	- Improving cooperation with the government through formal environmental responsibilities (FF4) - Engaging in supporting community awareness on environmental protection by directing resources (AF8)	- Provision of resources and skills to market and upscale participation (AF4) - Partnering and commitment to collaborate with the government and community to support the diffusion of SKE (FF4) - Capitalising market opportunities to bolster a sense of collective responsibility towards achieving SKE (AF9)	- Continuing to be actively engaged with SKE actions
International organisations	- Provision of technical and financial support (FF6) - Construction of international credibility by promoting slum upgrading approach (FF7)	- Provision of technical and financial context-specific support (FF6) - Technology transfer with support and collaboration of local-actor-network (FF4, AF6)	- Provision of technical and financial context-specific support in collaboration with local actors (FF6) - Construction of international credibility by promoting best urban green practices (FF7)	- Supporting locals with context-specific resources

The analysis shows that Surabaya's transition is the outcome of the interaction between the enabling factors and different types of actors at different levels. This can be described as a two-step process in which the governments (with their collaborative partnerships) first facilitate a program of change from a top-down perspective. Through the actor activities described in Table 7.2, momentum builds for transforming kampungs into sustainable living environments to the point where bottom-up processes, led by the community, begin to be the driving force behind the diffusion and innovation of SKE practices supporting leapfrogging during the acceleration phase.

The interplay between the roles of both top-down directives and bottom-up initiatives were vital to ensure leapfrogging during the acceleration phase. The government actors had a role in laying the foundations (e.g. formulating supportive policies and regulations – FF2) and creating the enabling context, which set the scene for community action to accelerate change to drive the leapfrogging process in certain kampungs. The kampung communities were then able to leverage this to arrange collaborative grassroots innovation and participation (e.g. AF4). Important to highlight is that in the Surabaya case study, the top-down and bottom-up collaborative processes were underpinned by two factors: strong collaboration amongst actors (FF4) and cultural beliefs and environmental values (FF5). As explored in Section 7.2, the collaborative implementation commonly involved a trusting space, recommendations and feedback to better allocate resources to local conditions, and an overall collective value. At the same time, shared environmental values motivated individual actors, and the shared cultural beliefs of *gotong-royong* (mutual cooperation) enabled them to join forces for the benefit of all.

Examining the acceleration phase specifically, Figure 7.1 outlines the actor relations and the influence of the enabling factors (driven by their actions) on other actor groups. With the support of national government policies, the city government of Surabaya is the primary driver for creating the initial conditions that supported the acceleration of the transition and ultimately led to leapfrogging within several kampungs. As a dominant force shaping much of the policy conditions within which many of the other actors operate, they were able to influence many of the other local actors. However, as the diagram indicates, this was no dictatorship—there were clear avenues for feedback and iteration between the city government and local actor groups. Consequently, it is not surprising to see top-down governance dominating most of the foundational factors, as governments take on partner state role to ensure other actors' involvement and contribution. In contrast, actor groups such as international organisations and the private sector supported a much more focused set of enabling factors, such as resources tailored to local conditions (FF6) and market opportunities (FF9, respectively. Finally, as the success of SKE began to gain traction, further support from the national government and international organisations helped to create a positive feedback loop that further supported the transition process.

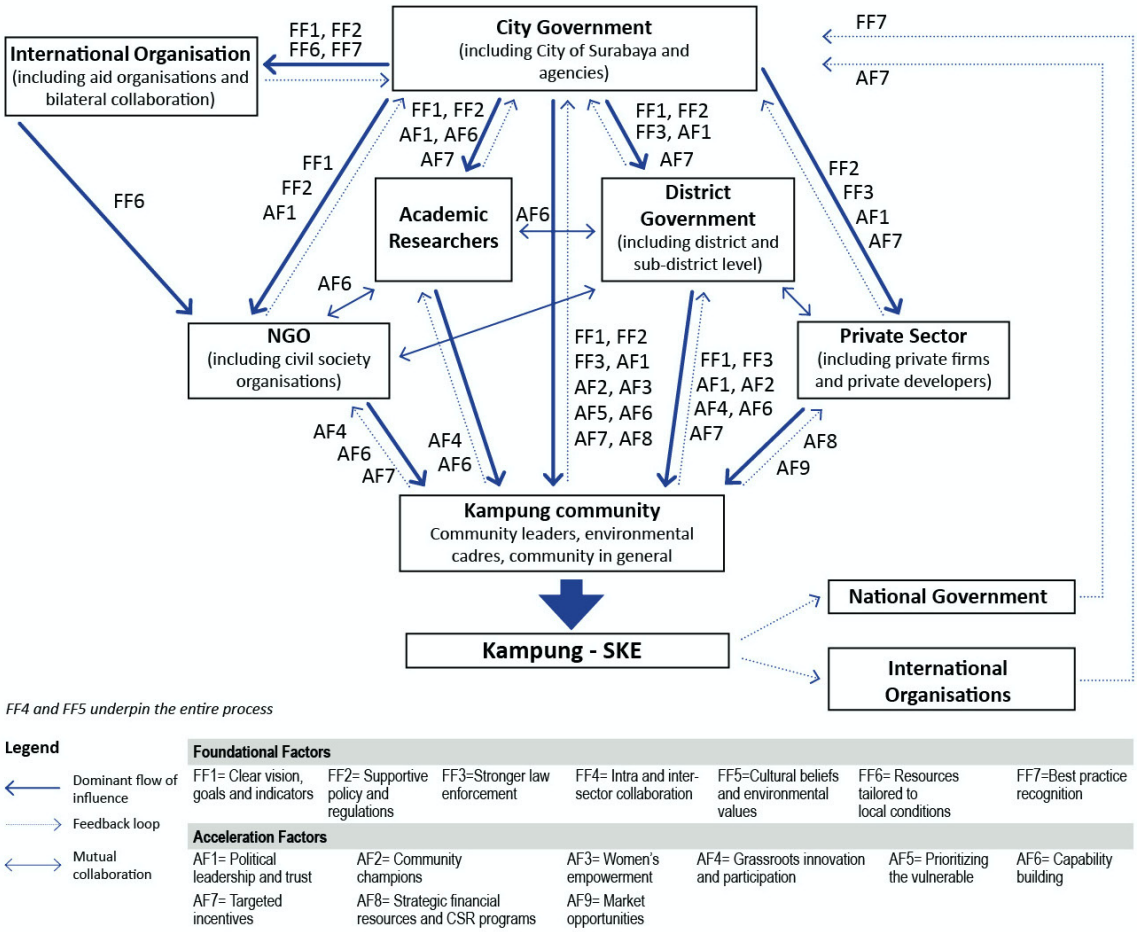

Figure 7.1 Top-down process of a SKE transformation in the acceleration phase

As the government was organising actors throughout the pre-development, take-off and acceleration phase, a bottom-up process was also emerging. This would ultimately lead to community-driven processes of change within several kampungs and facilitate leapfrogging processes. Figure 7.2 outlines this bottom-up process, which was primarily driven by the acceleration factors (especially those increasing the community's capacity for action). As SKE became more mainstream and community values changed, communities within kampungs not involved in the initial greening programs begin agitating for skills and resources to support the transformation of their own local environments. As the figure highlights, community actors began reaching out to NGOs, the private sector, academic researchers, the city government, and the district government for enabling inputs into their communities. The bottom-up process also facilitated actor collaboration for on-ground actions within kampungs, contributing to replication through faster learning processes, diffusion of practices and partnering with established actor-network.

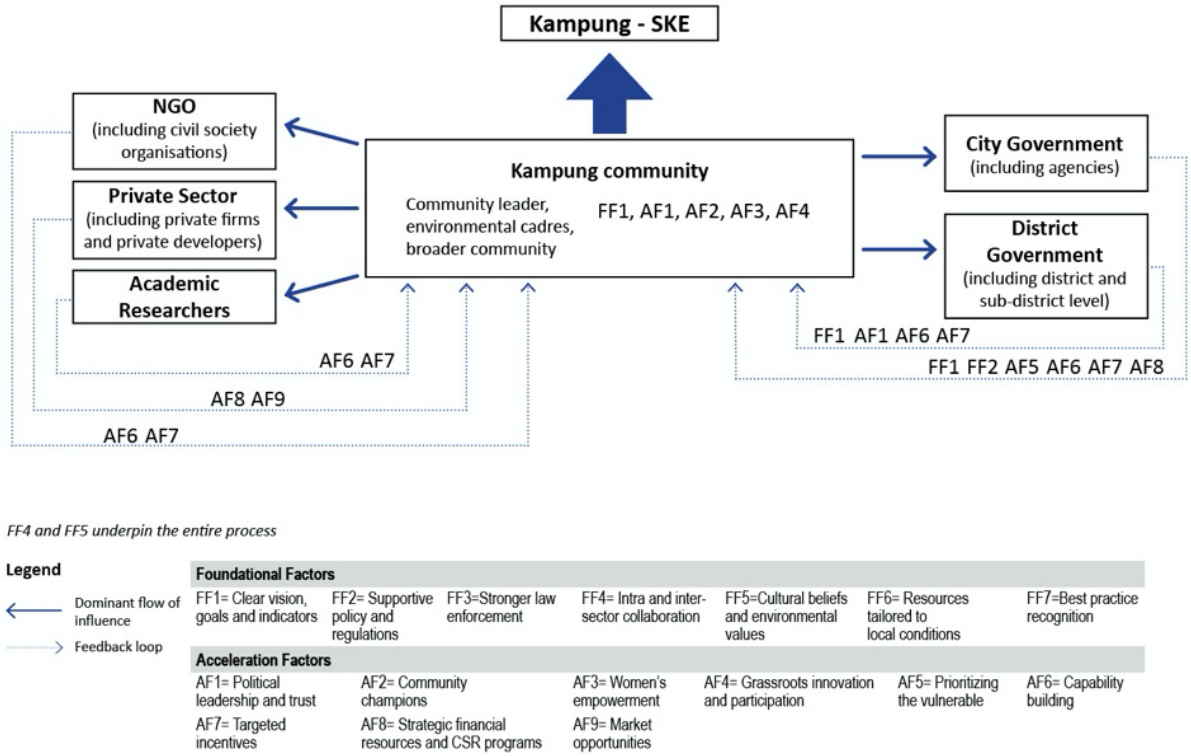

Figure 7.2 Bottom-up process of SKE transformation at the acceleration phase

The top-down/bottom-up processes observed within the Surabaya case both support and challenge existing transitions scholarship. Much of the existing transitions scholarship within developing contexts has found that many transition initiatives originate in bottom-up processes that drive top-down changes (Ehnert *et al.*, 2018; Fastenrath and Braun, 2018; Öztekin and Gaziulusoy, 2019), and as such have predominately focused on examining the transitions from this perspective (Köhler *et al.*, 2019). However, as attention is placed on guiding transitions towards desirable sustainable outcomes, there has also been a growing shift within the scholarship to examine top-down transitions (Köhler *et al.*, 2019) and a recognition of the importance of the interplay between top-down and bottom-up processes (Eckerberg *et al.*, 2015; Späth and Ornetzeder, 2017; Wolfram, 2017). The findings from this research indicate that a meeting of both top-down and bottom-up actors facilitated a reciprocal process of learning and development of on-ground initiatives tailored to local needs that supported leapfrogging within Surabaya's transition.

7.3.1 Mechanisms amplifying the impact of actor activities

Individually, the activities described in Table 7.2 are important; however, it is the combined impact of these activities that contributed to the transformative changes observed within Surabaya. Based on the analysis of actor roles, their activities, and the dynamics between these outlined above, it is possible to identify six mechanisms that amplified the individual actions to support a sustainability transition. Building on this research's empirical analysis and insights from scholarship examining processes for amplifying the impact of sustainability initiatives, each phase is linked to six mechanisms *experimenting, building actor-networks, learning,*

partnering, replicating, and *scaling-up* (Johansen and van den Bosch, 2017; Naber *et al.*, 2017; Gorissen *et al.*, 2018; Lam *et al.*, 2020). The six mechanisms outlined below represent the translation of actor activities into creating the sixteen enabling conditions. That is to say, whilst the enabling conditions are the ingredients of Surabaya's success, the mechanisms are the recipe outline how actors have created the conditions for leapfrogging to occur.

Experimenting: Within Surabaya, the activities of the actors progressively aligned as the transition of kampungs from slums to SKE unfolded to increase the impact of local initiatives and create the enabling conditions for leapfrogging. As explored in Chapter 4, the first 50 years of Surabaya's transition provided the foundations for improving blue-green services in kampungs through *experimentation* and innovation, and the beginnings of collaborative relationships and learning. The implementation of the kampung improvement program (KIP) in 1969 started this experimental process, and represented a challenge for the city government due to the limited availability of financial and technical resources. As such, the city government, with support of academia, proposed experimental initiatives to promote kampungs as a viable living environment and of cultural value under conditions of uncertainty and ambiguity. The initial KIP expanded through several phases (e.g. KIP II, III), allowing the city government to gain first-hand experience of the socio-political, technical, and economic levers for adapting and shaping broader institutional change. The experimentation process facilitated the emergence of new collaborative relationships, bringing together formal (e.g. NGOs) and informal (e.g. community volunteers) actors.

Building actor-networks: Experimentation led to a new process of *building an actor-network*, which included the promotion of community participation, mobilisation of community interaction and social cohesion, and coordination with international organisations. Not only did this help to identify and understand the key challenges related to improving kampung environments across actors, but also helped generate momentum to facilitate more comprehensive and collaborative programs, such as the C-KIP (1998) and the solid waste management program (2000). This broad actor-network also increased resources availability (e.g. new technologies such as the Takakura compost bins) and learning potential.

Learning: Whilst *learning* processes took place throughout the previous years, it was following the development of the earlier mechanisms that this process was used to build shared values and perspectives across a range of actors. This ensured a shared understanding of the benefits of blue-green services that supported a shift towards the development of strategies for SKE. Learning processes took place on several levels and with the support of different actors. For instance, academic researchers facilitated and guided new knowledge sharing to government officials and NGOs; whilst NGOs and community champions focused on social on-ground learning. These processes strengthened Surabaya's transition pathway and facilitated the amplification of the different actor strategies (Table 7.2), particularly during the implementation of the Surabaya Green and Clean program (SGC) (2005). As outlined in Chapter 5, the SGC became an important catalyst for SKE change and was a critical component of the rapid innovation and implementation of blue-green practices across Surabaya's kampungs.

Partnering: The main process initially catalysing change through the SGC was *partnering*. Strong, trusting, and committed partnerships were developed between many of the actor groups. Highlighted above through the top-down (Figure 7.1) and the bottom-up (Figure 7.2) processes, these varied partnerships supported the resource provision, encouraged community innovation, empowered vulnerable groups, and facilitated the on-ground adoption practices. In doing so, synergies between the resources, competencies, and capacities within the actor groups were leveraged to support and ensure the continuity and widespread implementation of SKE.

Replication: As these partnerships grew stronger, the activities of the actor groups began supporting the *replication* of SKE practices. For example, the City Government began incentivising actor participation and the diffusion of SKE practices, whilst academic researchers encouraged innovation at the community level. Whilst the kampung communities fostered a practice of sharing innovations between communities and supporting laggard kampungs. These activities facilitated rapid knowledge dissemination and practice diffusion amongst different actors, leading to the final mechanism of *scaling-up*.

Scaling-up: The *scaling-up* mechanism is an aggregation of the previous mechanisms and represents the translations of innovative blue-green programs and practices into the institutional operations of the city and its application across a broader context. Whilst work still remains to scale SKE practices across the entire city, the acceptance of SKE as a viable development pathway led the City Government to strengthen institutional and regulatory structures around SKE practices and develop a prioritization framework to apply SKE practices to vulnerable areas of the city. Similarly, the National Government promoted Surabaya's best practices to other Indonesian cities and began developing programs to improve the quality of existing slums nationally.

7.4 Summary

This chapter has explored the role of actor groups in helping to create this enabling environment and their contribution to each enabling factor. An evolution of actor roles is observed across the transition phases, where the roles of most actor groups are increasingly collaborative and nuanced in response to clear government policies and growing agency within kampung communities. This highlights a two-part process that begins with top-down influences from government bodies that helps to build momentum for rapid change to take place during the acceleration phase. The conditions created by these actions facilitate a bottom-up process driven by kampung communities whose actions lead to the recruitment of additional resources and skills within communities and the rapid diffusion of SKEs across Surabaya kampungs. It was observed that throughout the transition, the combined impact of the actor activities was underpinned by six mechanisms. Combined these processes ultimately create the conditions within which kampungs where able to leapfrog from under-serviced areas, directly to sustainable living environments. The next chapter builds on these insights to conceptualise leapfrogging within a transition and proposes strategies to support future leapfrogging activities in other developing cities.

Chapter 8

Conceptualising and theorising leapfrogging

8.1 Introduction

The analysis of Surabaya's change processes in the preceding three chapters have identified several key points that contribute new insights into the socio-technical dynamics of leapfrogging in the sustainability transition of a developing city. Firstly, leapfrogging patterns were observed within individual neighbourhoods, with clear distinctions between the starting and end conditions of their urban blue-green service management. Secondly, following the establishment of the foundational enabling conditions, forerunner neighbourhoods were instrumental in setting conditions for accelerating the pace of change by the latecomer neighbourhoods, resulting in leapfrogging. Thirdly, the leapfrogging studied was taking placing at the neighbourhood level, not at the level of the entire system or uniformly across the city.

Both leapfrogging and transition scholarship offer insights that support an understanding of the socio-technical dynamics during the changes observed within Surabaya. Leapfrogging provides the basis for conceptualising accelerated changes in practices and infrastructure, whereby steps within an established development pathway are skipped. However, as highlighted, many of the underlying drivers of leapfrogging at the neighbourhood level were influenced by changes within the broader socio-technical systems across multiple scales and time. Current conceptualisations of leapfrogging are ill-equipped to incorporate the influence of agency and institutions driving changes within socio-technical systems (Chapter 2). Conversely, transitions scholarship provides a conceptual lens to conceptualise the pace of change in systems and provides a language for analysing the dynamics of actors and institutions influencing change within socio-technical systems. However, current conceptualisations of sustainability transitions do not fully capture the dynamics of leapfrogging observed within Surabaya's neighbourhoods, nor do they conceptualise the interplay between system-level changes and neighbourhood level leapfrogging.

In response to these gaps, this chapter primarily contributes to addressing Objective 1: to conceptualise the relationship between leapfrogging and sustainability transitions, by providing a conceptualisation of leapfrogging as accelerated socio-technical transformation processes; and Objective 4: to develop a preliminary framework to operationalise leapfrogging in developing cities by identifying the scope of strategic actions that best fit the local context. The chapter begins with the development of a framework to capture the observed shifts within neighbourhood service provision infrastructure, community structures, practices and governance, as they move towards being sustainable kampung environments (SKE). This is used as a foundation to conceptualise leapfrogging (at the neighbourhood level) within a system-wide transition, which bridges leapfrogging and transitions theory. Attention is then placed on understanding the implications when considering transitions as the culmination of change processes across multiple neighbourhoods (with distinct contextual conditions and starting points). The chapter concludes by providing a foundation for operationalising the insights gained from this research to drive transitions in developing cities elsewhere.

8.2 Bridging leapfrogging and transitions theory

Leapfrogging has been suggested as an approach to understanding new paths of change in developing cities (IPCC, 2012; Blimpo *et al.*, 2017; UNCTAD, 2018b). However, as explored in Chapter 2, leapfrogging literature to date gives a largely focused on technological advancement, which is too narrow to explore the full dynamics of fundamental change at a socio-technical level (Binz *et al.*, 2012; Schroeder and Anantharaman, 2017; Yap and Truffer, 2018). As the case study has highlighted, the leapfrogging that occurred in Surabaya was heavily influenced by social dynamics and the role of actors within this. This is further exemplified by the differences in the observed enabling factors. As Table 8.1 highlights, the enabling factors identified from existing research reflects only on some of those detected within Surabaya. Similarly, the additional enabling factors identified nearly all relate to important socio-institutional factors that supported the change within Surabaya. Given the dearth of conceptual framing supporting technological leapfrogging or leapfrogging dynamics in general, concepts from socio-technical transitions scholarship can be drawn upon to expand the conceptual toolkit in ways that incorporate this breadth of enabling factors (as foreshadowed in Chapter 2). As Chapters 4, 5 and 6 outline, viewing these processes through a lens of transitions and drawing on the concepts of transition phases provides a useful framing for understanding the combined social, institutional and technological shifts within the change processes that took place within kampungs across Surabaya.

Table 8.1 Key factors that enabled technological leapfrogging and leapfrogging of sustainable kampungs environments

Foundational factors	Acceleration factors
FF1 Clear vision, goals* and indicators	AF1 Political leadership and trust
FF2 Supportive policy and regulations*	AF2 Community champions
FF3 Stronger law enforcement	AF3 Women's empowerment
FF4 Intra and inter-sector collaboration	AF4 Grassroots innovation and participation
FF5 Cultural beliefs and environmental values	AF5 Prioritizing the vulnerable
FF6 International resources tailored to local conditions*	AF6 Capability building*
FF7 International recognition	AF7 Targeted incentives*
* These factors have previously been identified as an enabler for technological leapfrogging (Table 2.2).	AF8 Strategic financial resources* and CSR programs
	AF9 Market opportunities*

As explored in Chapter 2, transition studies has examined socio-technical systems shifts from one state (i.e. conventional[40] state) to another (i.e. sustainable state), commonly framed through the interaction between

[40] A conventional system is characterised by the construction and management of large-scale, centralised, publicly owned and highly capitalised infrastructure (Brown *et al.*, 2009). These conventional, centralised systems have been implemented and still

processes at the three different levels (landscape, regime and niche) (Geels, 2002; Geels and Schot, 2007). This allows understanding about a transition not just being technological, but occurring across different domains (e.g. culture, economy and social behaviour) within the system (Smith *et al.*, 2010; Brown *et al.*, 2013). Similarly, leapfrogging processes extend beyond technological advancement, occurring in the context of a broader complex socio-technical system (Binz *et al.*, 2012; Yap and Truffer, 2018). Consequently, leapfrogging needs to be conceptualised with respect to the different social processes that occur during the 'jump' of a system, including how the social dynamics interact. In doing so, this research also contributes to an important research direction suggested by Köhler *et al.* (2019), who ask whether transitions can be speed up, and if so, under what circumstances?

As seen in Chapters 4 and 5, Surabaya's kampungs underwent various transformational processes, some moving incrementally towards increasingly sustainable practices and infrastructure, whilst others were able to bypass some of this incrementalism and move directly to more sophisticated forms of sustainable neighbourhood arrangements. To support the conceptualisation of leapfrogging in a broader socio-technical context, it is necessary to better understand the start and endpoints of a leapfrogging process. Developing such an understanding provides the basis for being able to map what it is that is being bypassed in the process of leapfrogging. Determining where a city or system is in a sustainability path is often supported by benchmarking tools, which have been used as a process of searching for best practices (Larsson *et al.*, 2002) and are considered powerful visioning tools (Jefferies and Duffy, 2011). Benchmarking tools are valuable as they adopt a more systematic approach to assessing and improving performance by synthesising large amounts of information into a simplified and easy-to-understand format (Keirstead, 2013).

Figure 8.1 draws on the empirical evidence from the changes in Surabaya's kampungs to propose a preliminary heuristic benchmarking tool for understanding the stages of transition for blue-green services management in kampungs within Surabaya. Inspired by the urban water management transitions framework, which provides a city-scale (macro-level) benchmarking tool (Brown *et al.*, 2009), the continuum presented in Figure 8.1 provides a neighbourhood-scale conceptual framework of the development of six neighbourhood states that kampungs either progress through or leapfrog over. Whilst further research across multiple contexts is needed for this to be a valid, generalisable framework to inform neighbourhood blue-green service management in developing cities; the empirical results of the in-depth Surabaya case study provide a strong foundation for conceptualising the attributes of more sustainable neighbourhoods and identify the capacity needs, resources and socio-institutional changes required for more sustainable blue-green services management.

---

operate throughout developed and developing countries as the preferred approach (Lee and Schwab, 2005; Marlow *et al.*, 2017). Examples of a more conventional path of development include wood to coal to oil and gas, basic water supply to sewerage to drainage (Brown *et al.*, 2009), and horse-drawn carriages to automobiles (Geels, 2005b).

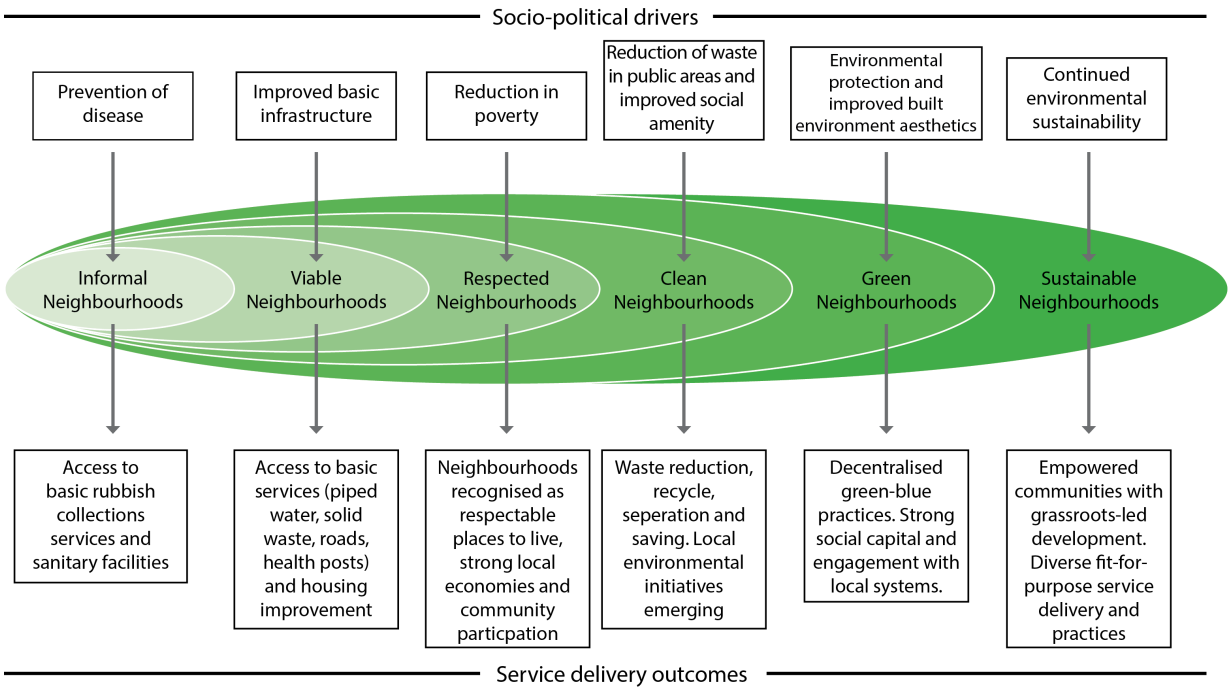

Figure 8.1 Neighbourhood blue-green service management states

The transition observed within Surabaya's kampungs from 1945 to 2016 can be categorised into six distinct neighbourhood states that represent the values, governance and practices of a neighbourhood at a given point in time: informal neighbourhoods, viable neighbourhoods, respected neighbourhoods, clean neighbourhoods, green neighbourhoods, and sustainable neighbourhoods. Each state represents the incorporated values, governance and practices of the former state to form an embedded continuum. However, progression is not necessarily linear or a static process, nor does it imply that an individual neighbourhood must progress through each state in order to develop those values, governance and practices. As was observed in Surabaya (and discussed below), forerunner kampungs experienced a cumulative progression towards sustainable neighbourhoods, whilst the latecomer kampungs were able to leapfrog intermediate neighbourhood states to adopt the values, governance, and practices of sustainable neighbourhoods in their entirety.

The top row of Figure 8.1 captures the cumulative socio-political drivers that catalyse change as neighbourhoods move towards sustainable states. The bottom row shows the outcomes in delivering blue-green management services in developing cities in response to evolving drivers. The six transition states are characterised as follows. The *informal neighbourhoods* are often located in illegal housing areas, including slums households and informal settlements[41]. However, despite their illegal status, they remain part of the urban

[41] Slum households are identified as households whose members suffer one or more of the following household deprivations: lack of access to an improved water source, lack of access to improved sanitation facilities, lack of sufficient living area, lack

context. As such, the provision of rubbish collection and sporadic sanitary facilities supports public health protection by preventing the spread of diseases. The *viable neighbourhoods* represent the most basic state of formalised neighbourhood blue-green service management. Driven by a desire to improve the living conditions through improved infrastructure, it provides access to basic services, including housing improvements, which can be used to support the sustenance and shelter of the neighbourhood dwellers. The *respected*[42] *neighbourhoods* build on the previous state and is driven by a desire to reduce poverty[43]. As such, it provides areas that are recognised as respectable places to live, as they have access to improved basic services and housing conditions; as a result, the local economy is stronger as well as community participation. The *clean neighbourhoods* provide more sophisticated waste management practices, improving social amenity, developing a sense of pride within the community for their neighbourhood, and promoting local environmental initiatives. *Green neighbourhoods* incorporate decentralised blue-green practices, developing greater self-sufficiency within the neighbourhood through the local management of blue-green services. Like the prior neighbourhood state, s*ustainable neighbourhoods* incorporate the values and practices of the previous states and advances this by providing diverse fit-for-purpose services and mechanisms creating empowered communities with grassroots-led development.

As a heuristic tool, Figure 8.1 provides a conceptual foundation for understanding from where neighbourhood blue-green service management are starting, and where they are going during a transition. Similarly, as a nested continuum, the neighbourhood states help understand both the accumulation of values and practices that take place across a typical transition and the leapfrogging that can occur when a neighbourhood adopts a more advanced neighbourhood state directly. Figure 8.2 visualises the different trajectories of development that occurred within the observed kampungs in Surabaya. Many of the forerunner kampungs underwent a cumulative process, moving from *informal neighbourhoods* to *sustainable neighbourhoods* across the 70-year period analysed (Chapter 4). In contrast, some latecomer kampungs were able to leapfrog from *informal neighbourhoods* to *green neighbourhoods,* and from *respected neighbourhoods* to *sustainable neighbourhoods* in a 5-10-year time (Chapter 5), thereby accelerating the realisation of more sustainable practices in their neighbourhoods.

---

of housing durability and, lack of security of tenure. Informal settlements are usually seen as synonymous of slums, with a particular focus on the formal status of land, structure and services; and can be occupied by all income levels of urban residents, affluent and poor (UN-HABITAT, 2020).

[42] The use of the word 'respected' is in reference to the recognition kampungs gained from government officials by the late 1980s as respectable places to live (Dick, 2002; Silas *et al.*, 2012).

[43] Poverty entails more than the lack of income and productive resources to ensure sustainable livelihoods. Its manifestations include hunger and malnutrition, limited access to education and other basic services, social discrimination and exclusion, as well as the lack of participation in decision-making (United Nations, 2018).

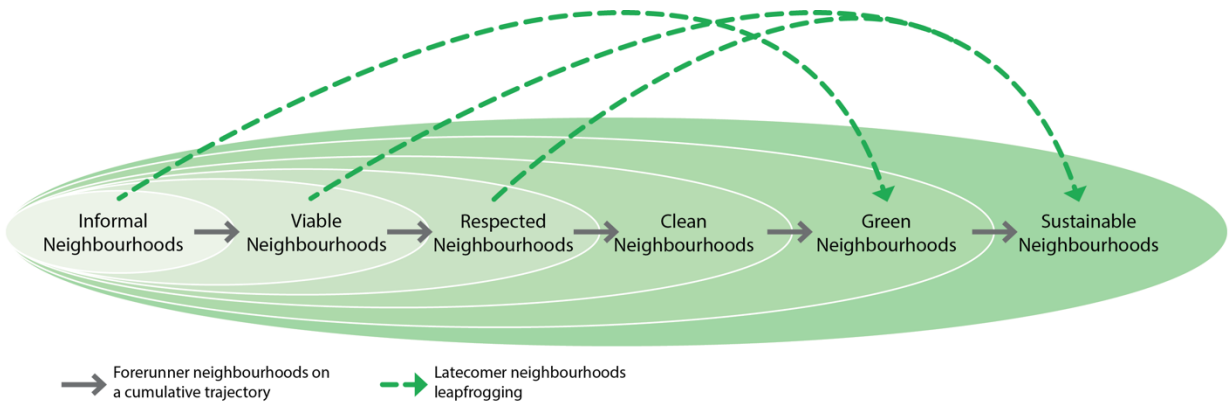

Figure 8.2 Transition pathways for Surabaya's forerunner and latecomer kampungs

In moving towards sustainable neighbourhoods, it is evident from the case study data that this involved a host of changes across social and technological domains. In contrast to the technological focus of leapfrogging scholarship, in which it is often inferred that the implementation of sustainable technologies delivers sustainable outcomes (Chapter 2), the Surabaya case highlights the social and governance mechanisms that preceded and supported the implementation of both sustainable practices and technology solutions. Figures 8.1 and 8.2 captures distinct typologies of socio-political drivers and the blue-green service management; yet, both it and the current leapfrogging scholarship are inadequate for exploring the socio-technical dynamics that supported the neighbourhood changes. As Chapter 2 outlines, transitions scholarship offers a rich suite of conceptual tools with which to examine socio-technical change; however, these typically examine change at the scale of socio-technical systems, often bounded by sectors or geographically by developed countries or cities (e.g. Brodnik and Brown, 2017; Geels et al., 2016; Hodson et al., 2017; Sovacool and Martiskainen, 2020). In contrast, it is argued here that the leapfrogging observed within Surabaya is occurring at the neighbourhood scale as part of a broader transition of the city's neighbourhood service management system towards sustainable neighbourhoods.

Drawing on the multi-phase concept (Rotmans *et al.*, 2001; van der Brugge, 2009) and the associated s-curve from transition studies (van der Brugge and Rotmans, 2007; Sauter and Watson, 2008; Kivimaa *et al.*, 2019), Figure 8.3 frames the leapfrogging that took place within Surabaya as part of an overall transition within the city's neighbourhood service management system (Chapters 4 and 6). This highlights the importance of the forerunner neighbourhoods helping to establish the necessary socio-institutional conditions (Chapter 5 and 6) from which the latecomer neighbourhoods could learn from and ultimately use to facilitate their leapfrogging process. It also highlights the role of leapfrogging in speeding up the acceleration phase of the transition. Without the leapfrogging processes taking place, it is likely that Surabaya would have continued on a transition pathway towards stabilisation; however, at a slower pace as areas (both physically and in their governance) move through the cumulative stages of the neighbourhood states within Figure 8.1. In contrast, the ability for the latecomer neighbourhoods to move directly to the later neighbourhood states resulted in a reinforcing feedback loop, whereby ideas, practices and values adopted from the forerunner neighbourhoods

were being rapidly disseminated, diffusing through to other neighbourhoods, and catalysing more and more opportunities for neighbourhoods to leapfrog. In doing so, the transition (specifically the acceleration phase of the transition) towards sustainable neighbourhoods was accelerated.

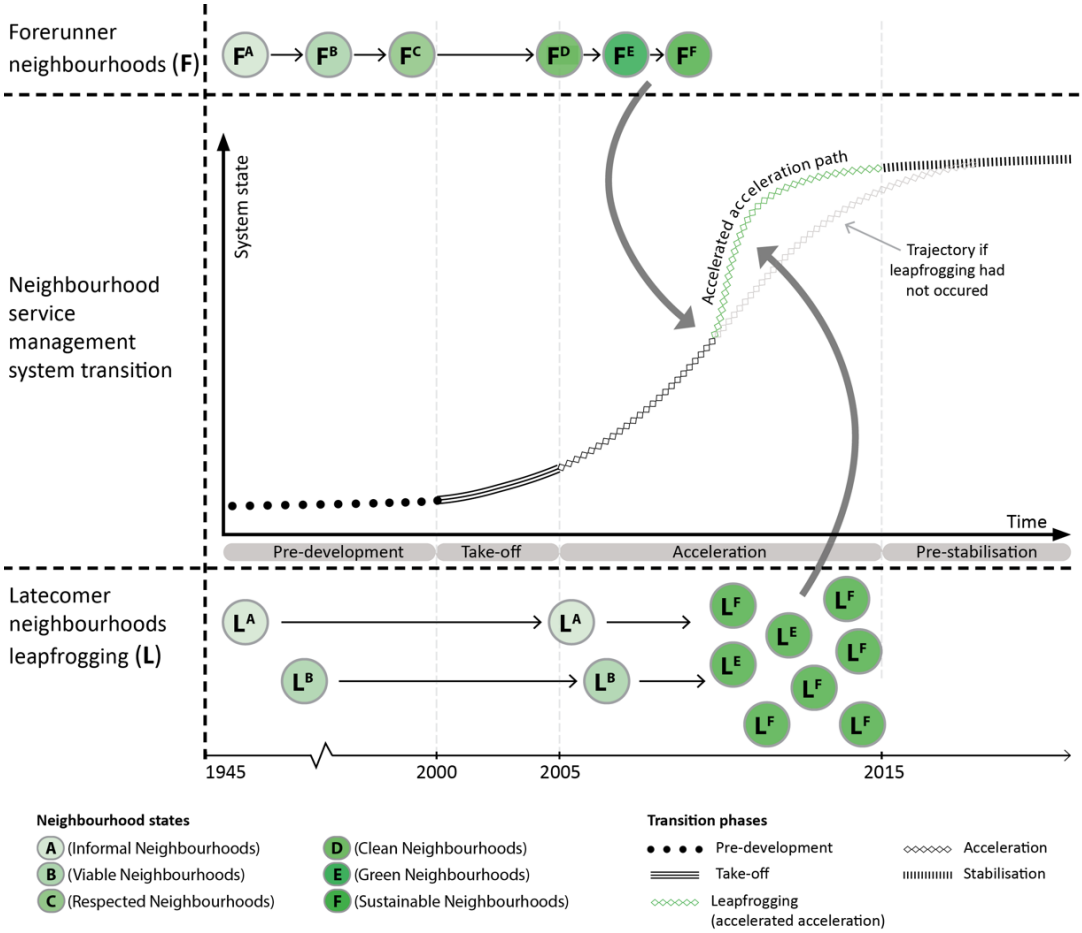

Figure 8.3 Surabaya's neighbourhood blue-green service management transition - The acceleration of the acceleration phase (green hatched line) of Surabaya's transition towards a system of neighbourhood service management that supported SKEs took place following the leapfrogging activity that occurred around 2010 within latecomer neighbourhoods (L). This process was facilitated by the learning outcomes provided by the cumulative progression of service management that the forerunner neighbourhoods (F) experienced.

This helps refine the conceptualisation of leapfrogging within Surabaya as a process happening within a transition and driven by micro-dynamics at the neighbourhood scale. It also challenges the vaguely defined conceptualisations within leapfrogging scholarship, which imply that entire systems can leapfrog (Chapter 2). Whilst further conceptualisation and validation are required across multiple contexts, this research argues is that leapfrogging is a process that accelerates the acceleration phase of an urban socio-technical system's transition, and there is the potential to use this as a strategy for accelerating the overall transition outside of blue-green service management (Figure 8.4).

Under this premise, the liberal use of leapfrogging within policy and development arenas is supported as a potential strategy for developing cities to accelerate a sustainable development path. A more explicit conceptualisation that incorporates a socio-technical system perspective and sustainability orientation can assist in a more rigorous application of the concept rather than just applying it to explain sectorial skipping of technological development (as seen in Chapter 2). Building on the empirical insights from the Surabaya case study and the conceptual framing provided by transitions theory, sustainability leapfrogging can be defined as:

> *"accelerated socio-technical transformation processes toward sustainable systems, characterised as the aggregate of smaller scale elements that jump directly to more sustainable*[44] *approaches under local contextual conditions. The mechanisms underlying this change are built on pre-existing socio-institutional conditions and learning from earlier, forerunner experiences".*

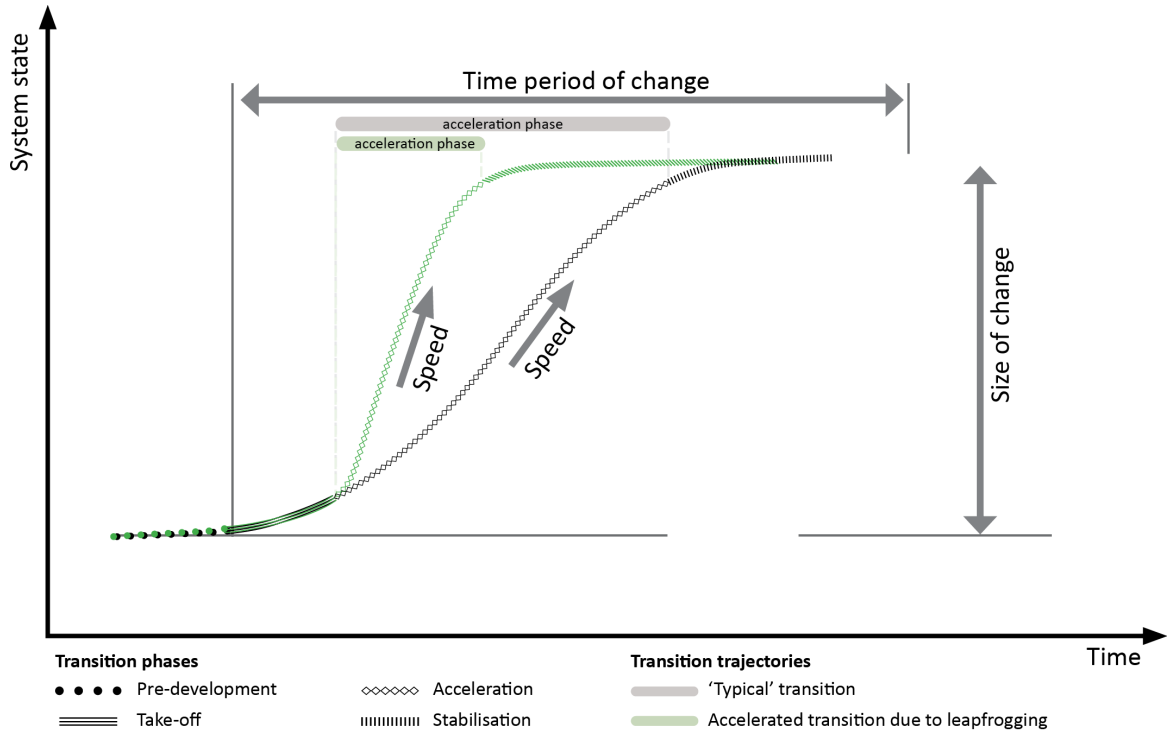

Figure 8.4 Transition accelerated through leapfrogging processes

Conceptualising leapfrogging within transitions in this way supports and extends a small but growing field of transitions scholarship, which has begun to discuss how sustainability transitions may be accelerated. This has been framed as being driven by the growing scarcity of resources, the need for climate change responses, and exponential growth within innovations (Sovacool, 2016); however, the limited number of empirical explorations into the acceleration mechanisms remain overwhelmingly European focused (Sovacool and

[44] What is considered sustainable can be subject to interpretation and might change over time (Markard *et al.*, 2012).

Geels, 2016; Frantzeskaki, Borgström, *et al.*, 2017; Ehnert *et al.*, 2018; Gorissen *et al.*, 2018). Similarly, these studies have examined individual transition initiatives within a single moment in time. Therefore, it is unknown if or exactly how these transition initiatives may be successful in accelerating a transition (Hartz-Karp and Gorissen, 2017; Ehnert *et al.*, 2018; Gorissen *et al.*, 2018). The above conceptualisation of a transition accelerated by leapfrogging represents one of the first attempts at understanding both acceleration dynamics within a developing context and how micro-dynamics of leapfrogging at a neighbourhood-scale can conceivably contribute to an accelerated transition pathway. The following section outlines the critical characteristics of sustainability leapfrogging (as defined above) and leads to a discussion on the implications of neighbourhood-scale leapfrogging within transitions scholarship.

8.3 Critical characteristics of sustainability leapfrogging

In positioning leapfrogging as a systemic strategy that can enable developing countries to accelerate their transition towards sustainable development effectively, this research argues there are five critical characteristics of sustainability leapfrogging.

Firstly, it is critical to acknowledge that systems do not leapfrog as a single unit. Instead, the findings from this research indicate that change within the system is the aggregate of leapfrogging taking place at smaller scales, through latecomers learning from forerunner's experience to be able to rapidly adopt new practices and technologies. This is in contrast to the dominant (albeit under conceptualised) perspective within the current leapfrogging scholarship that considers leapfrogging as a process taking place at the scale of technological sectors.

Secondly, leapfrogging can facilitate accelerated transitions by understanding the mechanisms underlying the acceleration phase. Leapfrogging as a concept has been often analysed as a situation in which developing countries can rapidly implement and adopt new technologies by bypassing intermediate stages of development (Tukker, 2005; World Bank, 2008; Binz *et al.*, 2012; IPCC, 2012; UNCTAD, 2018b), as explored in Chapter 2. By conceptualising leapfrogging within transitions frameworks, the extent to which leapfrogging can facilitate a reduced timeframe for change to take place becomes more evident. Compared to 'traditional' transitions (which play out over 25-100 years), Surabaya's case study and leapfrogging literature (Hobday, 1994; Davison *et al.*, 2000; Gallagher, 2006) both observe periods of transformation between 5-10 years. As Figure 8.4 highlights, whilst certain conditions need to be met within the pre-development and take-off phases, leapfrogging strategies have the potential to accelerate the acceleration phase of a transition and reduce the time required for the entire transition to take place.

Thirdly, as the previous paragraph alludes to, sustainability leapfrogging requires the necessary socio-institutional conditions to be in place in order to facilitate acceleration (Chapter 6). This highlights the dual need for considering both the foundational and acceleration conditions. The foundational factors form the basis of actor-networks and institutional settings that shape the leapfrogging path (Chapter 7). As suggested

by the name, the acceleration factors are conditions that accelerate knowledge dissemination and practice diffusion, triggering individual and collective agency (Chapter 5).

Fourthly, sustainability leapfrogging embraces and is sensitive to human well-being[45] and poverty-alleviation as key drivers to facilitate the shift toward sustainability in developing countries. As observed within Surabaya, poverty reduction and the prioritization of vulnerable communities were critical components in driving and enabling the leapfrogging that occurred. Understanding how the poor use their resources helped the Surabaya government design more flexible and effective strategies (e.g. actor-targeted incentives) that take into account the socio-economic reality of those living in poverty. These strategies help reduce poverty in an integrated way by prioritizing actions for the poorest (AF5) with the support of different actors (e.g. private sector). Similarly, researchers have called for the need to consider the role of poverty and inequality (Hansen *et al.*, 2018; Ramos-Mejía *et al.*, 2018) and human well-being dimensions (Rauschmayer and Lessmann, 2013; Gimelli *et al.*, 2018) when analysing sustainability matters in developing countries. These elements are important given that conditions of insecurity and vulnerability prevail in many areas in developing countries, where people's strategy of survival and security in the present continuously postpones long-term sustained well-being (Wood, 2003).

Finally, sustainability leapfrogging implementation should consider the local contextual conditions and be tailored accordingly to avoid any dysfunctionality in the urban system (Shah *et al.*, 2000). The success of the changes in Surabaya was aided by the development of localised resources from both Indonesian and international governments. As mentioned above, this challenges existing leapfrogging scholarship and, to a lesser extent, transitions scholarship, which tends to view urban systems as relatively homogeneous entities (van Welie *et al.*, 2018). In reality, especially in developing contexts where the service provision infrastructure, community structures, practices and governances between neighbourhoods can be highly diverse, the physical characteristics of the areas that the systems are servicing are markedly different. Therefore, it is critical that leapfrogging strategies are tailored to the diversity of conditions found within a city, especially a developing city.

This last characteristic is further discussed in the next section, which explores how transitions scholarship can be applied within heterogeneous urban environments and develops a typology of urban environments in developing cities to provide a basis for supporting accelerated transitions through leapfrogging across multiple urban contexts within a city.

[45] Well-being is a complex phenomenon that requires meeting various human needs, some of which are essential (e.g. being in good health, living conditions), as well as the ability to pursue one's goals, thrive, and feel satisfied with their life (OECD, 2011).

8.4 Enhancing the resolution of transitions in developing cities

Evident from the Surabaya case study is that, although the SKE niche was ultimately adopted by the regime, the socio-technical and governance changes at the neighbourhood level remain focused on certain pockets of the city. Despite shifts in practices and policies across all levels of government and within some individual neighbourhoods, not all neighbourhoods within Surabaya can be called sustainable. However, as explored in Chapter 2, current transitions theory has, to date, paid limited attention to the heterogeneity within cities, particularly in urban spaces (Frantzeskaki *et al.*, 2017; Fuenfschilling, 2017; Wolfram, 2018) and developing contexts (Fuenfschilling and Binz, 2018; van Welie *et al.*, 2018). The majority of transitions scholarship engages with transitions within sectors and often infer that this is taking place at city, regional, or national scales (Coenen and Truffer, 2012; Coenen *et al.*, 2012; Frantzeskaki, Castán Broto, *et al.*, 2017). What is missed in this approach is a higher resolution understanding that considers both the heterogeneity within the provision of basic services and variations across socio-economic and cultural conditions within developing cities (Botton and Gouvello, 2008; Letema *et al.*, 2014; van Welie *et al.*, 2018). This thesis puts forward the premise that transitions need to better engage with the heterogeneity of cities to assist transition tactics through the development of contextually specific strategies, something that was vitally important to the success observed within Surabaya. Boyer's (2015) and Wolfram (2018) research highlights the potential benefits of examining transitions in cities as taking place in a decentralised yet interconnected manner through the reduced complexity of change processes taking place at the neighbourhood scale.

The reality is that developing cities are challenged by a rapidly growing urban population, where housing-provision systems are hopelessly inadequate to address basic needs issues, in addition to wider and deep socio-political conflicts (United Nations, 2019a), such as corruption (World Bank, 2014), low law-enforcement and inequality (UN-HABITAT, 2016b) (Chapter 2). In many cities of the developing world, spatial organisation and residential conditions are widely diverse (Dave, 2011; UN-HABITAT, 2014). Within the same spatial area, one can find gated communities whose inhabitants have access to all basic needs and conveniences, but also sprawling slums that fail to meet the occupant's most basic needs. As a United Nations (2003) report stated, "the drab vistas of slums, the amorphous, polycentric patchworks of commercial concrete buildings and informal markets is far from the dream of modernist urban planners who sought to design 'garden cities' of harmony and light"(p. xxxi) with the same facilities of developed cities. As such, it is critical that the effects of heterogeneity in cities are accounted for to inform alternative pathways to sustainability that do not enhance further inequality but promote pro-poor policies (Botton and Gouvello, 2008; Jaglin, 2008; Brelsford *et al.*, 2017).

The Surabaya case study is a clear example of the heterogeneous nature of developing cities. The research has demonstrated that acceleration depends on locally specific (neighbourhood) conditions in governance, institutional design, social drivers, culture and values; and on inclusive, strategic, target-oriented action planning. These tailored strategies were able to respond to the specific needs across different actors and areas by understanding their different institutional characteristics. In doing so, it unlocked the potential for

understanding the different layers needed for a sustainable transformation (e.g. social inclusion), particularly when both formal and informal institutions in developing contexts "are too contested and personalised at various extents to guarantee long-term rights…[therefore]…people have to engage in wider strategies of security provision, risk avoidance and uncertainty management" (Wood and Gough, 2006, p. 1697).

The neighbourhood blue-green service management transition continuum presented in Figure 8.1 captures the differences in service management and the corresponding values and practices at a neighbourhood level. This provides a micro-scale heuristic tool to support researchers and policy-makers identify small pockets of change within urban environments that are usually overlooked in city-scale analyses of transitions. Expanding this further, it is evident from the Surabaya case study that not all neighbourhoods are moving at the same pace of change, both within kampung-style neighbourhoods and other neighbourhood typologies across the city. The neighbourhoods analysed in detail within this research represent a distinct segment of Surabaya's urban form (e.g. kampungs). Yet, even within this segment, it was evident that neighbourhoods were starting their transition towards sustainability from different states. As was argued in Chapter 2, most transitions scholarship has focused on developed country contexts, where there is generally a higher level of homogeneity across urban neighbourhoods (De Haan *et al.*, 2015; Fuenfschilling and Binz, 2018). In contrast, Surabaya (and many developing cities) is a city of stark differences between the level of infrastructure and services provided between neighbourhoods, ranging from areas with services akin to highly developed cities through to informal settlements lacking even the most basic infrastructure for water supply (UN-HABITAT, 2020). In attempting to understand sustainability transitions within a developing city's diverse contextual conditions, these differences across the urban environment need to be accounted for. Breaking down a city into neighbourhood typologies also serves to assist with what Ehnert *et al.* (2018) have described as a move from linear models of transitions (such as the transitions phases) to a complex cascade of heterogeneous processes with "multiple dynamics of acceleration, deceleration, and stagnation, varying over time, space, and domains within the city-regions" (p. 20).

Urban development studies provide a lens to better capture different urban spatial patterns across housing in cities. The classification of housing has been explored through different characteristics, for instance; housing and land market-oriented approach (Buckley and Kalarickal, 2005; Henilane, 2016); by combining territory and housing types (Rowe and Kan, 2014); and a set of householder affordability categories, including formal and informal economy housing (Arnott, 2016; Wakely, 2018). In line with this literature, this research explores housing as a way to dissect a developing city whilst recognising the broader prevailing housing resources and needs.

In order to develop a strategic and systematic approach to tailoring transition and leapfrogging strategies to particular neighbourhoods within a developing city, it is necessary to understand the characteristics of different parts of the urban environment and how they might influence the change processes. To facilitate this understanding, this research has adapted the well-accepted United Nations (UN) classification of living

quarters[46] to identify four types of housing units in developing cities: low-density detached, high-density, traditional and informal (Table 8.2). The validity of this approach is based on two key arguments: i) it is a simple classification to implement as housing units are the primary data in housing census and inform many of the housing programmes and policies within developing cities; and ii) it is sensitive to the heterogeneity of service provision across neighbourhoods within a city.

Table 8.2 Classification of living quarters (United Nations, 2017)

Housing unit*	Characteristics
Low-density detached housing unit[a]	These types of housing units normally contain a high-economic value single housing unit. They are characterised by having a high tenure security, with a separate access to a street, intended to be occupied by one household, with different types of rooms within the dwelling (e.g. dining room, living room, studies, servants' rooms, rooms used for professional or business purpose) and all the basic facilities** are available within a dwelling.
High-density residential unit[a]	These types of housing units are normally part of an extensive residential complex (also known as building blocks) and contain more than one housing unit. They are characterised by having a type of infrastructure that can be a stack of apartments or flat units accommodated in an interlocked structure with share common spaces (e.g. outdoor space). Each housing unit has all the basic facilities within a dwelling.
Traditional housing unit[b]	These types of housing units are part of dense urban settlements, where the population has developed, over time, a traditional and typical type of housing unit, commonly seen in kampungs. They are characterised by having a medium to low tenure security and do not necessarily have all the characteristics of conventional dwellings, but they are considered somewhat suitable for living.
Slum housing unit[c]	These types of housing units are generally characterised as unfit for human habitation as neither they have a permanent infrastructure nor are equipped with adequate basic facilities.

* In the UN framework, a housing unit is a "separate and independent place of abode intended for habitation" (United Nations, 2017, p. 249), for example, houses, flats and apartments.

** Basic facilities include but are not limited to piped water, toilet, bathing facilities, kitchen, electricity. Some other basic facilities may be considered as basic or not, depending on the country. For instance, piped gas, where there could be a lack of source of natural gas in the country.

[a] Both low-density detached housing units and high-density residential units sit under UN's category of conventional dwelling, which is a suite of rooms in a permanent building that has all basic facilities and meets all the needs of the household within its confines, such as protection from elements, cooking and maintaining hygiene.

[b] Whilst traditional villages are not explicitly recognised as another type of housing unit; the UN acknowledges under this category that there are traditional and typical types of housing units that do not have all the characteristics of conventional dwellings, but as they have been developed over time, they can be considered suitable for habitation, such as kampungs.

[c] Informal housing sits in the UN category of 'other housing units', which refers to a unit unfit for human habitation as it lacks essential features or facilities of a conventional dwelling; these unit conditions can be seen in slum areas.

Whilst the focus of the empirical data collection for this research was on leapfrogging within kampung neighbourhoods, observations of the level of service provision across the city highlight a system of varied access to basic services. Mapping these observations onto the neighbourhood continuum using the typology in Table 8.2 highlights both the heterogeneity of services across the city (across and within neighbourhood

[46] The United Nations classification of living quarters is part of the series of principles and recommendations on population and housing censuses to assist national statistical offices in planning the Population and Housing Census Programme (United Nations, 2017).

types) and the diversity of starting conditions for a leapfrogging trajectory to take place (Figure 8.5). For example, while this research has focused on successful examples of kampungs reaching 'sustainable' status, other traditional housing neighbourhoods remain in states earlier in the continuum. Similarly, neighbourhoods of high-density housing were seen to be largely within the respected and clean neighbourhood states but were not yet progressing further.

As secondary to the primary data collection, the mapping of these observations should not be interpreted as an empirical assessment of Surabaya's current diversity of service provision, instead it provides the basis for communicating urban diversity. As a heuristic device, the combination of the neighbourhood services continuum and neighbourhood typology provides a clear representation of the diversity of starting conditions existing within neighbourhoods across a single city. As a result, strategies to inform transitions accelerated by leapfrogging need not only to be tailored to the starting state of service provision (e.g. viable, respected, clean etc.), but also the social and physical characteristics of the neighbourhood type. A suite of strategies aimed at leapfrogging a traditional housing neighbourhood from the *respected neighbourhood* stage to the *sustainable neighbourhood* stage is going to look markedly different to the strategies required for supporting a similar leapfrogging trajectory of a high-density housing neighbourhood.

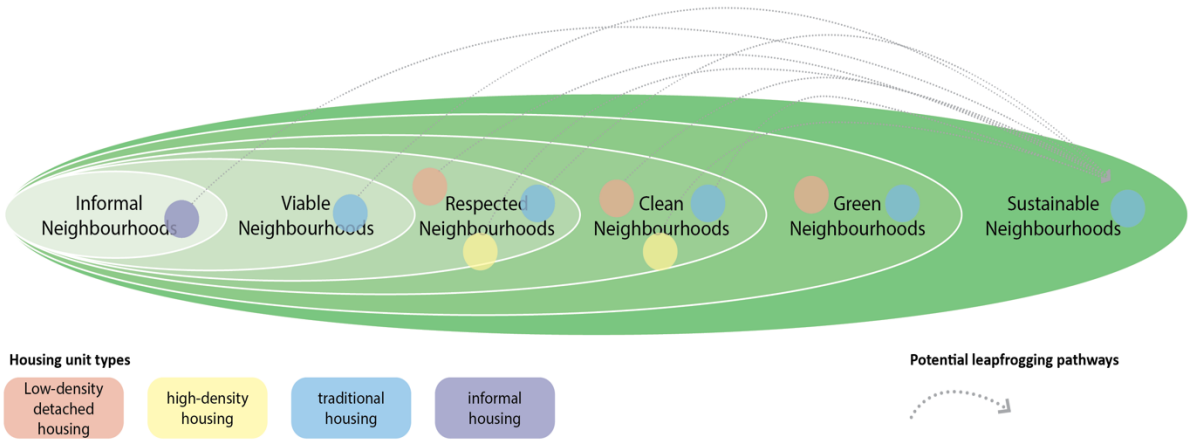

Figure 8.5 Neighbourhood characteristics (based on housing unit) mapped against their starting position on the neighbourhood states continuum for the Surabaya case study

This differentiation across housing units does not suggest that in developing cities, there are only four types of clearly defined socio-technical systems in interaction. Instead, it suggests that the socio-technical systems within a developing context are characterised by a composite of distinct pockets of institutional variation, socio-economic status, service provision, and community cohesion (Romijn and Caniëls, 2011; Ramos-Mejía *et al.*, 2018; van Welie *et al.*, 2018). Recognising the socio-spatial (urban) heterogeneity within a city, as it ranges from the most vulnerable of slums to the gated communities of the rich, means that there is no one-size-fits-all approach. Instead, solutions must be tailored to the specific and relevant socio-environmental needs of the space while addressing the limited capabilities and resources of each context-setting.

8.5 Operationalising leapfrogging

The first half of this chapter has attempted to provide a conceptual foundation for understanding the socio-institutional changes during leapfrogging by drawing on and extending transitions scholarship, including a particular focus on leapfrogging dynamics and considerations in developing cities. In doing so, leapfrogging has been conceptualised as a process that works within an overall transition to accelerate the acceleration phase. Similarly, it has put forward the argument that leapfrogging processes can be better understood by examining sub-parts of the system, as it is here that the tangible outcomes of leapfrogging can be observed and ultimately work to accelerate the system's transition. Whilst what took place within Surabaya was a relatively organic process of change, but with no specific goal of leapfrogging agenda, the conceptualisations developed in the previous sections provide a foundation for translating the empirically observed leapfrogging enabling factors and processes for Surabaya into a preliminary set of functional strategies to assist other developing cities in pursuing a leapfrogging trajectory. The following sections aim to devise a framework for strategically applying the enabling factors to support a transition accelerated by leapfrogging in other developing contexts.

8.5.1 Operationalisation of enabling factors

The enabling factors identified within the Surabaya case study (Chapters 5 and 6) can be used to purposefully devise a strategy for development that supports a transition accelerated by leapfrogging. The empirical data clearly shows an accumulation of enabling factors that took place and, therefore, that some of the enabling factors were prerequisites for others to occur (e.g. foundational versus accelerating). However, these enabling factors are relatively static and provide limited guidance on how they can be implemented to lead to similar transformational changes in other contexts. The following conceptualisation is a first step at building on the enabling factors identified within this research to develop a strategic approach to support a transition accelerated by leapfrogging of systems within developing cities more generally. In doing so, it represents an attempt to transfer the lessons from Surabaya's ~70-year transition into a framework to support other cities transitioning in a much shorter period (acknowledging, of course, that the framework would need empirical testing and validation in diverse case contexts). It is envisaged that development organisations or city governments within developing cities could apply this framework to inform strategies to support the development of a robust social and political context that promotes and enables the development of sustainable urban practices and accelerates the replication and diffusion of these practices across a city. The framework is developed in two stages. The first stage of the preliminary strategic framework (Figure 8.6) proposes a series of nested phases of operation supported by mechanisms amplifying the impact of actor activities (outlined in Chapter 7) and can be used to operationalise the enabling factors. The second stage (Figure 8.7) introduces the enabling factors and neighbourhood typologies as a means of refining strategies for strategic action to support leapfrogging.

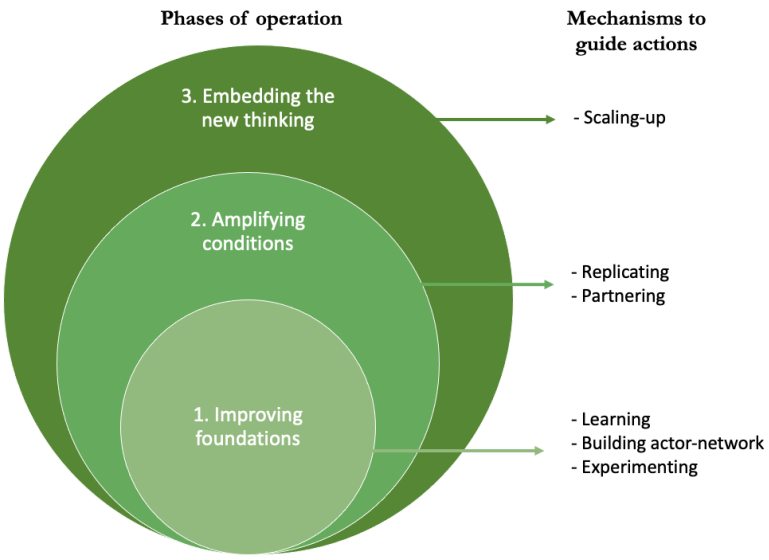

Figure 8.6 Phases of operation to achieve leapfrogging – Each nested phase of operation contains mechanisms to inform the operationalisation of enabling factors.

The strategic framework is based on three nested phases of operation with distinct objectives that build on each other: *improving foundations, amplifying conditions,* and *embedding the new thinking*. These nested phases represent an accumulation of rules, resources, cultural beliefs and relationships deployed through different mechanisms and by different actors to increase the speed of the transformative impact, therefore supporting the acceleration phase of the transition (as seen in Figure 8.4). The mechanisms presented within Chapter 7 are associated with the objectives of a particular phase and provide the framing to guide further action.

As was observed within Surabaya, several contextual factors need to be in place to provide the foundations for rapid change to happen. Whilst it took Surabaya ~50 years for these factors to develop, current cities aiming for a transition accelerated by leapfrogging can potentially learn from Surabaya's pathway and work to implement the necessary enabling factors much more rapidly. Building on this research's empirical analysis and insights from scholarship examining processes for amplifying the impact of sustainability initiatives, each phase is linked to the six mechanisms identified in Chapter 7 (experimenting, building actor-networks, learning, partnering, replicating, and scaling-up) that were found to amplify the impact of actor activities on the overall transition. Similarly, whilst the enabling factors represent the broad conditions necessary to support a transition accelerated by leapfrogging, the mechanisms provide strategic guidance for operationalising the enabling factors during each phase (explored below in Figure 8.7). For example, during the **improving foundations** phase, *experimenting*, *building actor-networks*, and *learning* should inform the development of supportive policy and regulations (FF2) to help create the conditions for these mechanisms to occur. As a city moves towards the **amplifying conditions** phase*, replication* and *partnering* become the driving mechanisms for the development of supportive policy and regulations (FF2).

The first nested phase, **improving foundations***,* is focused on identifying the opportunities and challenges within socio-institutional structures to create the conditions for both top-down and bottom-up sustainability

initiatives to emerge. During this phase, three mechanisms—*experimenting*, *building actor-networks* and *learning*—are central to improve, reframe and help leverage existing foundational conditions (e.g. vision, policy and regulations). The experiences of Surabaya showed a process of *experimentation* of different initiatives, programs and actor-relationships that aimed to change established perceptions towards more sustainable ones. This facilitated interaction between key actors (e.g. local government and academia), and newly motivated actor-networks emerged. Experimenting has been found to be a central component in the context of sustainability transitions, as experiments are seen as seeds of change designed to produce potential solutions that may lead to a profound societal transformation (Caniglia *et al.*, 2017; Sengers *et al.*, 2019). The second mechanism, *building an actor-network,* was important within Surabaya as the initial actor-network created developed during *experimentation* gained momentum to engage, support alternative visions, identify windows of opportunity and form a learning platform. Building an actor-network is particularly important to create support, awareness, and articulate expectations (Schot and Geels, 2008; Moore *et al.*, 2015; Naber *et al.*, 2017). This facilitates the growth of informal and formal networks (Fastenrath and Braun, 2018) and helps to spread the initial core initiative to their corresponding network base. Finally, as a mechanism, *learning* was an important mechanism as the starting point of a continuous learning cycle aimed to cultivate and strengthen a collective and shared vision and action across actors. In Surabaya, the learning process was mainly driven by the government, academia, NGOs and community champions through the development of training events to facilitate capability building across the actor-networks. Learning allows actors to understand the current conditions of the targeted context, develop new knowledge, and reassess the strategies that could influence mainstream policy and practice (van den Bosch and Rotmans, 2008; Bos *et al.*, 2013), which can then reframe and improve the foundational conditions accordingly.

The second nested phase aims to **amplifying the necessary conditions** to rapidly increase impact at a larger-system scale. The success of Surabaya's amplification shows two mechanisms—*partnering* and *replicating*—support this phase by impacting more people, increasing the geographical area of change, and leading socio-political change. In this phase, the actors' networks are committed to continue working collectively to achieve socio-institutional change. Is it optimal for the actor-network to be as broad as possible, involving collaboration with multiple actor types across different levels (e.g. academics, private developers, policy-makers, government officials, community leaders, donors, NGOs), including vulnerable groups (e.g. women and youth). This not only enhances engagement with a broad actor base and the quality of decision-making, but the consolidation of formal partnerships ensures a trustful space of collaboration. *Partnering* supported the growth of committed supporters in Surabaya's actor-network, and helped to maintain momentum and to mobilise the necessary action and resources to scale through both top-down and bottom-up processes (Section 7.3). This actor-network developed a strong partnership that was used to coordinate, and steward targeted on-ground strategies through replication. Partnering provides a deeper and larger network cohesion, allowing a more comprehensive array of sources of knowledge, skills and capacities; alternative and increased resource availability (e.g. funding); participatory decision-making processes; and joint advocacy (Schot and Geels, 2008; Healey, 2015; Moore *et al.*, 2015; Ehnert *et al.*, 2018). *Replicating*

involves copying and adapting the core initiative to greater numbers (e.g. people or geographical areas) and in new contexts (e.g. neighbourhood type) in order to disseminate these new ways (Hermans *et al.*, 2016; Naber *et al.*, 2017; Gorissen *et al.*, 2018). The Surabaya case reveals that this mechanism relied heavily on the commitment of the established actor-network, who played a critical role in transferring and diffusing new knowledge and practices across kampungs whilst allowing alignment to local conditions during the replication. Particularly important for the success of this mechanism was the role of the community champions as on-ground diffusion leaders or what Boyer (2015, p. 322) refers to as a "network of dedicated activists". In addition, during this phase, there is space for an accumulation of different experiments (resulting from replicating) contributing to an increased pace of changes required for a broader system transformation.

The third and last nested phaseis about **embedding the new thinking** at a larger scale (e.g. within institutions). This means that there is a shift in the way of thinking, values and perspectives, and this new thinking is shaping broader socio-institutional change (e.g. changing policies). Lessons learned from Surabaya identify *scaling-up* as a mechanism supporting the mainstreaming of new thinking and practices. Scaling-up aggregates initiatives (that have co-evolved with the core initiative) from different contexts into a novel system structure (van den Bosch and Taanman, 2006; Moore *et al.*, 2014; Johansen and van den Bosch, 2017). In order to scale-up, it is important that the actor-network focus shifts from operational (e.g. setting-up initiatives) to strategic (e.g. linking up initiatives) by identifying opportunities and challenges to ensure that the new thinking continues to influence socio-institutional structures.

Underpinning the three phases of operation and their associated mechanisms are the sixteen enabling factors (seven foundational factors and nine acceleration factors). Figure 8.7 highlights how the mechanisms guide the operationalisation of the enabling factors, which are then contextualised through the use of neighbourhood typologies. For a city government, understanding the phase of operation points to mechanisms that need to be happening, which then guide the focus for how the enabling factors need to support those mechanisms through strategic enactment. Importantly, whilst the enabling factors were categorised within Surabaya's transitions as either foundational or acceleration, Surabaya took ~50 years to develop the foundational conditions to support leapfrogging in certain pockets of the city. Although further testing and application of this framework are needed, it is proposed that acceleration factors are not limited to the later stages of operationalisation, and instead (as indicated in Figure 8.7) should be considered relevant during all spheres of operation, as they are not mutually exclusive rather, they overlap in practice. Whilst the foundational factors should still be viewed as critical elements that underpin much of the change process, considering the acceleration factors early in the journey may be a way of helping cities to lay the foundations for the next phase whilst simultaneously improving and strengthening their foundations. A user of this framework can help identify and understand which phase of operation their city may currently be located in and points to mechanisms that need to be happening. These mechanisms can then guide the focus for how the enabling factors need to support those mechanisms through strategic enactment. In practice, this means within the first phase of operation, each of the enabling factors should be considered through the individual

lenses of *experimenting, building actor networks,* and *learning*, aiming to answer the question: how can this mechanism support the enabling factor? For example, AF5 (prioritizing the vulnerable) may be targeted early in the process by developing strategies for experimenting with methods of engagement and practices that support the transition vision, building actor networks within these communities, and learning about the conditions of vulnerable communities with the city. Similarly, within the second phase of operation, *partnering and replicating* should inform strategies that are prioritizing the vulnerable, and likewise *scaling-up* in the final phase of operation. Importantly, the manifestation of each enabling factor should then be contextualised and adapted to suit the specific needs of a variety of neighbourhood typologies. As the operationalisation of the enabling factors takes place, organisational efficiency and implementation procedures improve and have a higher impact, building momentum for change and ultimately accelerating the process.

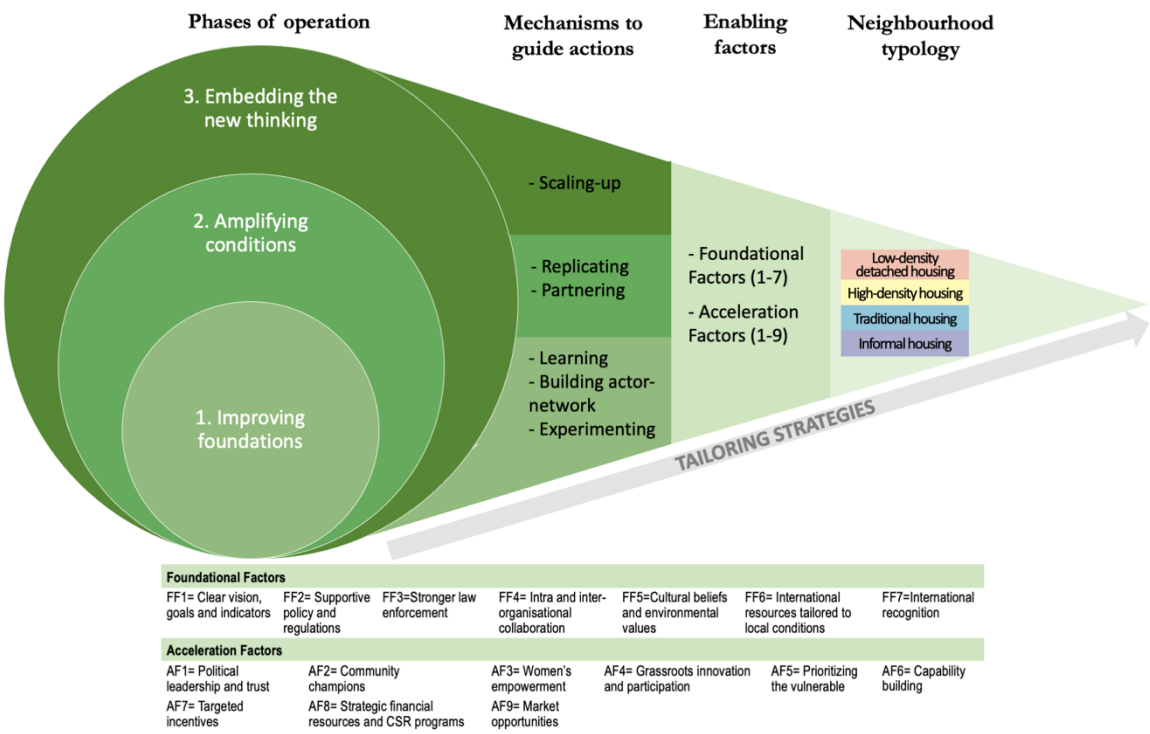

Figure 8.7 Operationalising leapfrogging – Moving from left to right, strategies to support a transition (towards sustainable neighbourhood environments) accelerated through leapfrogging become more refined in targeting of enabling factors and contextualisation to local conditions. Mechanisms guide the development of strategies to support enabling conditions, which are then tailored to fit the local conditions within each neighbourhood typology.

It is pertinent to articulate that this represents a framework for operationalising a transition accelerated by leapfrogging that is primarily based on the empirical findings of an embedded single, in-depth case study. As the exploration into neighbourhood typologies highlights, it is critical to consider the contextual conditions of where strategies are being applied. Therefore, it is likely that whilst this framework has been developed on the foundations of robust empirical work, it needs to be empirically tested in diverse cases, and its application

should remain flexible and cognisant of the local contextual differences within an individual city (and their neighbourhood typology). Similarly, it should not be taken as a "recipe" for successful leapfrogging, but instead as a heuristic for guiding reflective multi-level governance processes that support the desired change.

This research significantly expands the empirical basis from which to understand, theorise and operationalise developing city transitions. Through a historical examination of leapfrogging within a successful socio-technical transition in Surabaya, the interactions between multiple enabling factors are identified to develop a conceptual framing for accelerating a transition through leapfrogging dynamics. Given the distinct contextual differences between developed and developing contexts (ranging from resources and technologies to socio-institutional conditions), the focus on a developing context within this research reveals unique insights into what is required for processes of change to take place. For example, whilst an enabling factor such as FF1 (clear vision, goals and indicators) is recognised as important within existing transitions research focused on developed contexts (Loorbach, 2010; Nevens *et al.*, 2013; Loorbach *et al.*, 2017), factors such as FF7 (international recognition) have limited representation within existing scholarship. Similarly, AF2 (community champions) is a well-recognised factor in supporting transitions in developed cities (Brown *et al.*, 2018; Lindsay *et al.*, 2019; Franco-Torres *et al.*, 2020), yet AF5 (prioritizing the vulnerable) represents a new avenue for research to better understand its role in supporting transitions within developing contexts. One of the dominant differences between the enabling factors existing in transitions research in developed countries and many of the newly identified ones from this research is the need to consider the process from a fundamental level. Many developing contexts lack the socio-institutional structures that allow productive and innovative practices to either develop, or if they do develop, struggle to find the necessary support within a challenging context. To be clear, that is not to say that innovation does not take place within developing contexts; as the proverb goes, 'necessity is the mother of invention'. However, when conditions are such that basic needs of food, water, housing and safety are not guaranteed, the human capacity to develop and expand to more sustainable ways of living is challenged (Cobbinah *et al.*, 2015). The breadth of the enabling factors identified within this research capture these dynamics and point a spotlight to the need to work to develop and establish sound socio-institutional conditions from which the entirety of society can transition to a more sustainable future, where vulnerable groups are not left behind in the path of progress.

Chapter 9

Contributions and outlook

9.1 Synthesis and contributions

The aim of this thesis was to contribute to the development of new empirical and theoretical insights into the dynamics of leapfrogging in the rapid sustainable development of cities in developing contexts. Developing cities are at the forefront of massive global urbanisation and are likely to bear the brunt of climate change impacts into the future. Redefining systems across social, economic, and environmental domains is a matter of urgency for many developing cities; yet solutions are often adopted or replicated from conventional systems within developed contexts. However, it is the relative lack of infrastructure and associated weak institutions that provide an opportunity for these cities to bypass the economically, environmentally, and socially expensive systems that many developed cities are locked-in to and move directly towards more sustainable socio-technical systems: this opportunity is referred to as leapfrogging. Despite the use of leapfrogging (as an idea) within both development practice and scholarship, the concept of leapfrogging is under conceptualised, and its analysis is predominately limited to cases of rapid technological change. As Chapter 2 argues, in order to respond to the challenges facing developing cities, changes within both the technical and societal dimensions of a system are necessary. Sustainability transitions offer the conceptual foundations for exploring changes within socio-technical systems and is a promising field of research to strengthen conceptualisations of leapfrogging; however, to date, these two areas of scholarship have largely not engaged with each other. This research brings these two bodies of scholarship together to examine processes of leapfrogging observed within kampungs in the city of Surabaya and develops a new conceptualisation of leapfrogging as a mechanism to support the acceleration of sustainability transitions. The outcomes of this research respond to growing recognition for a systemic perspective of the concept of leapfrogging and the under-representation of developing contexts within existing transitions scholarship.

The thesis began by examining the current limitations of leapfrogging literature, identifying the present enabling factors for leapfrogging. Seven enabling factors supporting technological leapfrogging have been identified. Whilst leapfrogging studies have predominately focused on technological changes; Chapter 2 argues that consideration of the social and institutional factors driving these changes need to be considered to achieve sustainable development. Sustainability transitions scholarship is positioned as a growing field of research that provides a conceptual understanding of radical changes across socio-technical systems.

The thesis then explores the institutionalisation of 'green and clean' values within kampung upgrading programs by examining Surabaya's blue-green transformation from 1945 to 2017 (Chapter 4). The analysis reveals the crucial role that early policy changes played in providing the foundations for leapfrogging to take place decades later. Health concerns were identified as the initial catalyst for beginning the process of upgrading living environments; however, following increased activity within informal networks and further clarity around the challenges facing living environments within Surabaya, clear visions and policy regulations were established to guide further kampung improvements. The analysis highlights nine key initiatives (Section 4.3 and 4.4) that influenced Surabaya's blue-green transition and identifies leapfrogging processes taking place

within the acceleration phase of the transition. In doing so, Chapter 4 provides an empirical foundation for interrogating the local dynamics of a sustainability transition within a developing city context and key insights into both the structural forces government actions that shaped Surabaya's transition.

Building on this foundation, Chapter 5 examines a key initiative identified within Surabaya's transition that supported rapid innovation and implementation of blue-green practices in kampungs: the Surabaya Green and Clean program. During this period, and largely due to the SGC program, leapfrogging within kampungs occurred. The detailed analysis of this program reveals nine acceleration enabling factors that supported the acceleration phase of the transition and ultimately facilitated leapfrogging (Section 5.3). These findings supported those established within existing leapfrogging literature (Chapter 2) whilst also expanding them to include a more nuanced understanding of the socio-institutional processes supporting leapfrogging. Chapter 6 identifies seven additional foundational enabling factors ranging from deep cultural values to pragmatic policy decisions, developed over the ~70-year transition pathway and provided the foundations for acceleration to occur (Section 6.2). In Chapter 7, a diverse range of actors were found to be contributing to the development and ongoing maintenance of the combined enabling factors by leveraging and developing their political, strategic, capital, and community resources (Section 7.2). Through the activities of these actors, the enabling factors facilitated both bottom-up and top-down processes to generate the conditions for kampungs to leapfrog from under-serviced areas directly to sustainable environments. Similarly, six mechanisms were identified that frame the combined impact of the actor activities and describe how they amplify their impact and supported the overall transition.

The findings from the preceding four chapters highlighted that whilst a broader transition may have been occurring at a system level, leapfrogging was occurring within individual neighbourhoods. Chapter 8 incorporates these findings to develop a conceptual bridge between the previously technologically focused leapfrogging scholarship and the socio-technical systems focused transitions scholarship. The first step in creating this bridge was to develop a heuristic tool for assessing from- and to-where leapfrogging occurred within neighbourhoods (Section 8.2). This maps the socio-political drivers and associated service delivery outcomes against six neighbourhood states, moving progressively toward more sophisticated and empowered sustainable communities as socio-political drivers for change become equally nuanced. The concept of these six neighbourhood states is then used to highlight both the linear pathway toward sustainability that the forerunner neighbourhoods experienced and the leapfrogging trajectories that many of the latecomer neighbourhoods followed. This heuristic tool provides the impetus for both understanding the changes that occurred within neighbourhoods, and the role of these neighbourhood level leapfrogging processes within a larger system-wide transition. Building on this foundation, the leapfrogging that occurred within Surabaya at the neighbourhood level is then conceptualised with the city's system-wide blue-green service management transition. As the system-wide transition progressed into the acceleration phase, the first forerunner neighbourhoods were reaching a state of 'sustainable neighbourhood', supporting the development of the socio-institutional conditions that enabled the latecomer neighbourhoods to leapfrog. The rapid diffusion of ideas, practices and values between neighbourhoods at different stages of the 'blue-green services' continuum

created the opportunity for multiple neighbourhoods to leapfrog. In doing so, it is argued that the acceleration phase of the transition was further accelerated by these leapfrogging actions. This research extends leapfrogging scholarship by conceptualising sustainability leapfrogging as a process taking place at the neighbourhood scale that builds on pre-existing socio-institutional conditions to accelerate socio-technical transformation processes (Section 8.3). In contrast, previous leapfrogging scholarship has predominately focused on technological cases with minimal conceptualisation of its place within broader societal changes or interactions with socio-technical systems.

Building on this conceptualisation of leapfrogging, it is argued that leapfrogging can be used as a systemic strategy to support sustainable development within developing cities by accelerating change processes, facilitating the development of supportive socio-institutional conditions for leapfrogging, prioritizing human well-being, and responding to local conditions. Due to the diverse nature of service provision infrastructure, community structures, practices and governances between neighbourhoods in developing cities, it is critical to apply leapfrogging as a transitions acceleration strategy to consider neighbourhood level changes and the need to respond to local place-based conditions. In contrast, existing transitions scholarship predominately view processes of change at the sectoral level and in developing contexts where service provision is generally more uniform across cities. In response to this, a typology of housing units is put forward as a means of understanding the heterogeneity within developing cities and support the identification of the diversity of starting points (on the neighbourhood blue-green services continuum) that may exist within a single city (Section 8.4). Within Surabaya, it was recognised that whilst some of the kampung neighbourhoods reached a 'sustainable' status (in terms of blue-green services) and there was an associated shift in the socio-institutional conditions that supported the stabilisation of niche ideas and practices driving blue-green infrastructure and management, there remains many other kampungs at earlier stages of the continuum. Similarly, other housing unit types were observed to be at varying states across the continuum. Explicitly highlighting neighbourhood-level change processes and providing a foundation for mapping the impact of this diversity across developing cities contributes to understanding transition processes within these under-researched contexts. In considering leapfrogging from a systemic perspective across, this thesis has shown the importance of engaging with the role that broader socio-institutional factors play in creating the conditions necessary for leapfrogging to occur. In doing so, it has also provided a strong empirical foundation on which to understand processes of both socio-technical transitions and leapfrogging within a developing context. By conceptualising leapfrogging as a process for accelerating system-wide transitions, this thesis demonstrates that the micro-dynamics of change processes at the neighbourhood level are a critical consideration for future research in transitions studies in developing contexts and leapfrogging more generally.

Building on these conceptual advances, a framework for operationalising leapfrogging is then developed (Section 8.5). The framework proposes three nested phases of operation to inform the development of localised actor strategies that contribute to creating the necessary socio-institutional conditions for leapfrogging mechanisms to be implemented. This approach is intended to support development

organisations and city governments in developing contexts to work strategically and effectively to drive leapfrogging action. It provides an empirically derived framework to guide targeted actions to support rapid and lasting sustainable development outcomes within developing cities.

Combined, the insights developed within this thesis support the research aim to *develop new empirical and theoretical insight into the dynamics of leapfrogging to support the rapid development of sustainable socio-technical systems in developing cities*. Individually, the scholarly contributions of this thesis to leapfrogging and sustainability transitions scholarship can be summarised in the following points:

- **Produces detailed empirical evidence of contemporary leapfrogging dynamics through a longitudinal case study of rapid place-based sustainable development in a developing city**

This study is one of the first detailed empirical case studies of leapfrogging and urban transformation dynamics in a non-western context. The study undertook an in-depth, longitudinal structured investigation of a real-life transformation of blue-green services and analysed its socio-technical initiatives and outcomes, providing deep insight into the socio-technical dynamics of leapfrogging and transition processes. The value of such an approach lies in its ability to address the dearth of evidence on leapfrogging processes and provide an empirical foundation for understanding the nuances of rapid transformation processes in developing contexts. By doing so, the research is addressing two widely acknowledge critical gaps: i) limited conceptualisations and understanding of leapfrogging dynamics that go beyond a technological focus (Binz *et al.*, 2012; Poustie *et al.*, 2016; Yu and Gibbs, 2018); and ii) limited evidence within transition studies to better understand transition dynamics in different urban spaces such as developing city contexts (Berkhout *et al.*, 2009; Hansen *et al.*, 2018; Wieczorek, 2018).

- **Empirically identifies social and institutional factors, and specific strategies across different actor types that enabled a systemic place-based leapfrogging process**

Existing scholarship examining leapfrogging has been predominately focused on technological leapfrogging (Lee and Lim, 2001; Wang and Kimble, 2011; Fleary and Chunming, 2017; Tan *et al.*, 2018). A consequence of this is a lack of understanding of leapfrogging within the context of sustainability, its place within broader socio-technical systems, and the social and institutional factors associated with leapfrogging (Schroeder and Anantharaman, 2017). This research provides an evidence base detailing the enabling context and actor groups that interacted to catalyse action towards leapfrogging to sustainable neighbourhoods. The data analysis confirmed numerous aspects about the social, technical, institutional, economic, cultural and physical contexts that enabled the transitioning process in Surabaya. Consequently, this research identifies sixteen factors (seven foundational and nine acceleration factors) and their corresponding strategic actions (listed in Table 6.1) as the most significant to the leapfrogging process. This research has shown how the interplay between the enabling factors and the role of actors was critical to providing the structure and ongoing catalyst for the leapfrogging process thus far. In addition, the focus on socio-technical systems within this thesis has

brought new understanding to the social and institutional mechanisms that influence the uptake and success of technological innovations in developing contexts.

- **Develops a heuristic tool for identifying the socio-political drivers and outcomes of blue-green service management as they moved towards sustainable neighbourhoods in developing cities**

To support the conceptualisation of leapfrogging in a broader socio-technical context, a better understanding of Surabaya's journey to greater sustainability was needed. As such, this research proposes a benchmarking tool for understanding the transition of blue-green services management in kampungs within Surabaya. This can support processes of visioning and facilitates the mapping of what it is that is being bypassed in the process of leapfrogging. As a heuristic, it also synthesises large amounts of information regarding the capacity needs, resources and socio-institutional changes required for more sustainable blue-green services management and the attributes of more sustainable neighbourhoods. This framework responds to the need for tools for assessing and informing the transitioning of urban spaces towards greater sustainability (Brown, 2012; Hodson *et al.*, 2017).

- **Proposes a new definition and conceptualisation of sustainability leapfrogging based on an expanded and refined understanding of its dynamics as a driver for accelerating sustainability transitions**

Leapfrogging occurs in the context of a broader complex socio-technical and environmental system (Binz et al. 2012; Yap & Truffer 2018). To date, this context remains under conceptualised within the scholarship to support the types of systemic shifts required to meet the challenges facing developing cities (Sauter and Watson, 2008; Binz *et al.*, 2012; Casiano Flores *et al.*, 2019), and yet is frequently used as a strategy for developing countries to bypasses environmental detrimental configuration (IPCC, 2012; Poustie *et al.*, 2016; Remigios and Reckson, 2018). This research proposes a new definition and conceptualisation of 'sustainability leapfrogging' to accommodate these complexities and provide a systemic basis to guide empirical analyses, conceptual development and strategic action for driving leapfrogging trajectories in practice towards sustainability. In doing so, it also presents leapfrogging as a process for accelerating sustainability transitions in urban contexts. This response to current transition scholarship that calls for the development of more insights into how and under which conditions accelerated transitions can be achieved (Sovacool and Geels, 2016; Gorissen *et al.*, 2018; Köhler *et al.*, 2019). The lessons from Surabaya suggest that a possible avenue to accelerate transitions is through leapfrogging, where bottom-up and top-down actors' interplay with the enabling context (foundational and acceleration factors) to provide the best-targeted solutions and minimising impediments of change.

- **Highlights the heterogeneity of neighbourhoods across a developing city and their need for different pathways to transition to sustainable futures**

The results also contribute to the practical agenda of transitions scholarship that seeks to understand transitions in urban spaces (Frantzeskaki, Castán Broto, *et al.*, 2017; Fuenfschilling, 2017; Wolfram, 2018), account for where transitions take place (Coenen *et al.*, 2012; Wolfram, 2017), and expand insights within developing contexts (Hansen *et al.*, 2018; Ramos-Mejía *et al.*, 2018; van Welie *et al.*, 2018). One of the key differences in applying sustainability transitions to developing contexts in comparison to developed contexts is the increased need to consider the heterogeneity of service provision across neighbourhoods. Whilst service provision of basic services such as water supply, wastewater treatment, and rubbish collection are largely homogenous across neighbourhoods within developed contexts, the level of services varies greatly across developing contexts. This research suggests characterising a city through differences in service management at the neighbourhood scale. In doing so, it proposes a neighbourhood typology based on the United Nations' (2017) classification of living quarters that is sensitive to the heterogeneity of service provision across neighbourhoods within a developing city. This results in a heuristic device that, combined with the neighbourhood blue-green service management benchmarking tool, provides a clear representation of the diversity of starting conditions existing within neighbourhoods across a single city.

- **Develops an operationalisation framework to guide strategic actions and decision-making to support the acceleration of a sustainability transition through leapfrogging**

As an emergent area of enquiry, transitions scholars are asking whether transitions can unfold more quickly, and if so how? (Köhler *et al.*, 2019). In response, research to support the acceleration dynamics of urban sustainability transitions has emerged; however, it focuses on initiatives that hindered the acceleration of the acceleration phase in European cities (Ehnert *et al.*, 2018; Gorissen *et al.*, 2018). This research within this thesis proposes a framework to guide the acceleration of a sustainability transition through leapfrogging processes. When operationalising leapfrogging through the three proposed phases of operation, it is critical to consider the application of the mechanism, enabling factors, and neighbourhood typology in order to respond to the contextual conditions. In developing a preliminary framework for leapfrogging, this research contributes to the growing call for supporting acceleration dynamics within transitions and provides insights based on the under-studied contextual conditions of a developing city.

9.2 Implications and outlook

Beyond the theoretical advances made within this thesis, the primary driver for this research is to support the improvement of living conditions within developing cities through rapid sustainable advances. Whilst there has been growing global attention on supporting sustainable development for the last three decades, it has been recognised that conventional approaches to development are often unsatisfactory and at times hinder the prospect of future development toward sustainable systems through an over-reliance on both

technological solutions and linear models of development. Yet despite widespread calls for development models responding to a more systemic perspective that acknowledges the complexity within cities and enables processes of rapid change to occur, there has been limited progress in advancing these alternative visions. In particular, there has been much discussion within development reports on the opportunities for leapfrogging as a mechanism to support rapid and sustainable development. However, the vast majority of existing programs have focused on technological solutions, and there remain significant questions around the feasibility of leapfrogging to support a system-wide transition to a sustainable future within both social and technological domains. The scholarly insights within this thesis provide the basis to support practical insights into how sustainable development within developing cities can be strategically targeted to catalyse leapfrogging processes and support rapid sustainability transitions. Consequently, it is envisaged that governments can use several of these insights within developing contexts and development organisations to build a robust suite of practical and policy implementations targeted that can support a rapid shift towards sustainability.

Firstly, the research has highlighted the importance of a broad set of socio-institutional enabling factors that can support a transition accelerated by leapfrogging. As shown in Chapters 4 and 5, whilst many of the enabling factors are individually supported within the literature as important for guiding development activities, the insights from this research showcase the impact that these enabling factors can have when combined. The sixteen identified enabling factors cover a range of distinct yet complementary social and technical aspects that, combined can support the development of strategic initiatives focused on enabling rapid processes of change for some of the world's most vulnerable people. Whilst previous attempts at instigating leapfrogging processes within developing countries have focused on technological implementation; this research shows the importance of considering this within the social contexts of a place and the positive impact that vulnerable groups can have when included in change processes. Both the empowerment of women and the prioritization of vulnerable groups were identified as key enabling factors due to the impact that the actor groups connected with these had, when they were empowered. These insights can be used to support the strategic decision-making of local governments and development organisations and promote the integration of these perspectives into urban policy and development initiatives.

Secondly, the research also shows that, whilst the development of strategic initiatives can begin from a top-down perspective, it is through interactions between multiple actors and enabling factors that supported the changes observed within Surabaya. In particular, the results suggest that the processes supporting a transition accelerated by leapfrogging occur when both bottom-up and top-down processes facilitate a 'middle' meeting space where top-down initiatives can be tested and localised, whilst bottom-up initiatives can inform and be adopted by more formal policy or regulatory measures. This understanding can be used by governments, development organisations and local community groups to inform their strategic actions when planning or agitating for change.

Finally, the neighbourhood blue-green service management transition continuum presented in Figure 8.1 captures the differences in service management and the corresponding values and practices at a neighbourhood level. In light of the growing call for considering an urban change at a neighbourhood scale (Wolfram, 2018), this provides a practical heuristic tool to benchmark and compare neighbourhood blue-green service management across cities. Doing so supports researchers and policy-makers in identifying small pockets of change within urban environments that are usually overlooked in city-scale analyses of transitions. Similarly, when considering the development of initiatives to support a sustainability transition and leapfrogging, such a tool helps provide guidance on where one aspires their neighbourhoods to be, as well as the ability to identify what stages may be bypassed if leapfrogging is achieved.

These practical contributions are specifically relevant to policy-makers within developing countries and development organisations attempting to catalyse or promote activities that support the rapid upward mobility of vulnerable groups in conjunction with sustainable outcomes. In addition, these results can be used by proponents or advocates for local neighbourhood change to inform their activities and develop strategic collaborations with supporting actor groups. However, whilst these represent promising and practical contributions from this thesis, further research across both theoretical and empirical domains would support the generalisability of these findings and the development of a stronger foundation for practical application.

This thesis represents one of the first attempts at understanding the socio-institutional factors influencing leapfrogging processes. As such, the broader scholarly area is very much still in its infancy. The lack of leapfrogging scholarship examining socio-institutional factors was navigated within this thesis by adopting the theoretical foundations of sustainability transitions. However, given the unique case study of Surabaya and the research limitations outlined in Chapter 3, further theoretical and empirical work is needed to assist in the development of a more robust framing of leapfrogging both as a concept and as a phenomenon within Surabaya.

Conceptually, questions remain as to whether leapfrogging dynamics are limited to the acceleration phase of transitions, or if other types of systems (i.e. not blue-green services) can also leapfrog. Is it possible for entire systems to leapfrog, or is it limited to sub-systems or neighbourhood scale leapfrogging? Similarly, whilst the Surabaya case study provides evidence for the importance of considering a diversity of enabling conditions within a city and micro-dynamics of change processes within neighbourhood blue-green service management, this was found to be deeply influenced by the local community, their deep connection to place, and the continuity of spatial conditions dating back to pre-colonial times. This raises interesting questions about the current framing of sustainability transitions (and subsequently the conceptualisation of leapfrogging within this thesis) around the relationship with cyclical patterns of urban development (Tosics, 2004; Szmytkie, 2021). There may be valuable connections with socio-ecological resilience concepts such as adaptive cycles (Holling and Goldberg, 1971; Gunderson and Holling, 2002).

Considered within an urban context (with cities viewed as socio-ecological systems), resilience literature focuses on how the sustainability of a system can maintain stability in the face of disturbances (Gunderson and Holling, 2002; Ferguson *et al.*, 2013). A key conceptual element within resilience theory is the adaptive cycle; it represents a nested unit of dynamic change (across time and space) within complex systems, in which cities and infrastructure cycle through four phases: *growth, conservation, release,* and *reorganisation* (Gunderson and Holling, 2002). As such, the adaptive cycle represents a distinctly different approach to sustainability transitions in conceptualising transformative change within social systems. Whilst sustainability transitions frameworks infer a forward-looking process of change (albeit with internal cyclical dynamics), others have discussed urban development in the context of the adaptive cycle and the ramification of this on urban resilience (Marcus and Colding, 2014; Moglia *et al.*, 2018). Conceptualising urban transformation this way captures the cyclical nature of urban development often framed as a process of *negative impacts*, leading to *reorganisation*, which is disrupted by increasing *pressure* and *unintended consequences* of development decisions, before starting the cycle all over again (Moglia *et al.*, 2018). Having the ability to build on this knowledge and develop strategies for proactive transformation is increasingly viewed as a key pathway towards sustainable and resilient cities (Kabisch *et al.*, 2017; Moglia *et al.*, 2018; Sharifi and Yamagata, 2018).

Similarly, there is a growing recognition of the important role that traditional knowledge can play in socio-ecological systems (Berkes *et al.*, 2000; Hosen *et al.*, 2020) with an increasingly urban focus (McMillen *et al.*, 2017; Pedersen Zari *et al.*, 2019). The integration of traditional local knowledge and consideration of vernacular architecture into the planning process has been recognised as one avenue for increasing adaptive resilience within cities (Sharifi and Yamagata, 2018). In the context of Surabaya, future research could explore the impact of community, their connection to place, and the spatial conditions of their neighbourhoods on processes of socio-technical change in greater depth. Framing the transformative change observed within Surabaya through an urban resilience lens would also help further develop the conceptualisation of leapfrogging (refining or potentially even challenging how it is framed in this thesis). Doing so would be a worthwhile research endeavour to robustly capture the role and impact of kampungs (as a vernacular spatial and social unit) and the cultural dimensions (e.g. *arek suroboyo* spirit) on change processes and provide a foundation for understanding how much of what has been observed is a reclamation of the inner roots of the citizens' socio-economic and cultural creation versus a linear pathway of development.

The case study of Surabaya presented within this thesis represent a single perspective with a clear focus on the process of change leading to broad blue-green services transformation; however, this perspective necessarily excludes alternative disciplinary and/or thematic lenses. Future research should be targeted at developing a greater understanding of the broader dynamics behind the changes identified within this thesis. For example, deeper engagement with the socio-political dynamics underlying changes within the city can shed further light on the transferability of the lessons learnt from Surabaya. Additionally, a critical spatial political-economy or social-geography perspective would likely provide valuable insights into the relationship between the observed change processes and their link to economic and socio-political drivers of spatial change within cities.

In a similar vein, through their activities, collaboration, and organisation, a diverse range of actors were found to be a driving force behind the implementation of the sixteen enabling factors within Surabaya. Further research to explore both the actor roles and dynamics between actors in more depth could provide valuable insights to inform the practical implementation of leapfrogging strategies.

Finally, these examples demonstrate that whilst the approach taken within this thesis has provided a comprehensive exploration of the enabling factors driving transformation within the blue-green service management system, there are numerous avenues for further research into both the case of Surabaya and conceptualisation of leapfrogging. The applicability of these insights to other Indonesian cities, other developing cities, or even developed cities remains hypothetical. Further research into leapfrogging across multiple contexts would support the further refinement of the findings within this research and greater generalisability to both the theoretical framing of leapfrogging and practical implementation of leapfrogging to support rapid sustainable development.

Guiding future research directions into this area and those mentioned above would help to further extend the contributions made within this thesis to both leapfrogging and sustainability transitions scholarship, and a greater understanding of the Surabaya case study. Nevertheless, in its current form, the contributions of this thesis have been guided by the aim to *develop new empirical and theoretical insight into the dynamics of leapfrogging to support the rapid development of sustainable socio-technical systems in developing cities*. In doing so, the insights gained from this thesis have demonstrated that leapfrogging can drive rapid sustainable development within vulnerable communities in a developing city. If cities cannot leverage their local opportunities to support sustainable development, as described by one of the interviewees, "the danger is the frog boiling in the water". In the face of climate change, complacency and lack of action on sustainable development may result in irreversible consequences for a large portion of the global population, the majority of which resides in developing countries. It is hoped that these insights, combined with the operationalisation of the enabling factors, support local governments, development organisations, researchers and community groups in developing strategies to improve the living conditions of some of the world's most vulnerable people.

References

Abeysuriya, K., Mitchell, C. and White, S. (2007) 'Can corporate social responsibility resolve the sanitation question in developing Asian countries?', *Ecological Economics*, 62(1), pp. 174–183. doi: 10.1016/j.ecolecon.2006.06.003.

ADB (2012) *Key Indicators for Asia and the Pacific 2012*. Asian Development Bank.

ADB (2020) *Asian Development Outlook (ADO) 2020: What Drives Innovation in Asia?* Manila, Philippines. doi: 10.1177/2631684620982127.

Agustin, S. A. (2020) 'The Development of Sustainable Village Design Model Using Educative Graphic Mural on Community's Environmental Responsibility Through the Application of Participatory Design Method', *Advances in Social Science, Education and Humanities Research*, 491, pp. 842–848. doi: 10.2991/assehr.k.201201.140.

AIC (2018) *Leapfrogging towards a Water Sensitive City: Exploring pathways for Bogor*.

Aleluia, J. and Ferrão, P. (2016) 'Characterization of urban waste management practices in developing Asian countries: A new analytical framework based on waste characteristics and urban dimension', *Waste Management*, 58, pp. 415–429. doi: 10.1016/j.wasman.2016.05.008.

Almeida, C. M. V. B. *et al.* (2017) 'Cleaner Production towards a sustainable transition', *Journal of Cleaner Production*. Elsevier Ltd, 142, pp. 1–7. doi: 10.1016/j.jclepro.2016.10.094.

Alvesson, M. and Sköldberg, K. (2018) *Reflexive Methodology: New Vistas for Qualitative Research*. 3rd Editio. London: SAGE Publications.

Ambar, I. and Meirinawati (2018) 'Manajemen strategi dalam menanggulangi permasalahan permukiman kumuh melalui program KOTAKU (kota tanpa kumuh) di kawasan Kenjeran oleh badan perencanaan pembangunan Kota Surabaya', *Unesa Journal*, 6(6), pp. 1–7.

Angel, D. and Rock, M. T. (2009) 'Environmental rationalities and the development state in East Asia: Prospects for a sustainability transition', *Technological Forecasting and Social Change*. Elsevier Inc., 76(2), pp. 229–240. doi: 10.1016/j.techfore.2008.01.004.

Anggraini, R. N. E., Rochimah, S. and Soedjono, A. R. (2016) 'PKK-man: A System to Manage PKK Activities in Indonesia', in *Materials Science and Engineering*. IOP Publishing. doi: 10.1088/1757-899X/105/1/012008.

Annez, P. and Friendly, A. (1996) 'Cities in the Developing World: Agenda for Action Following Habitat II', *Finance & Development*, (December), pp. 12–14.

Aprilia, A., Tezuka, T. and Spaargare, G. (2012) 'Household Solid Waste Management in Jakarta, Indonesia: A Socio-Economic Evaluation', in Marmolejo Rebellon, L. F. (ed.) *Waste Management - An Integrated Vision*, pp. 71–100. doi: 10.5772/51464.

Arksey, H. and O'Malley, L. (2005) 'Scoping studies: Towards a methodological framework', *International*

Journal of Social Research Methodology, pp. 19–32. doi: 10.1080/1364557032000119616.

Arnott, R. (2016) *Housing Policy in Developing Countries: The Importance of the Informal Economy*, *The International Bank for Reconstruction and Development*. 13. Washington, D.C. doi: 10.2139/ssrn.2842193.

Arthur, B. W. (1989) 'Competing technologies, increasing returns, and lock-in by Historical events', *The Economic Journal*, 99, pp. 116–131.

ASEAN Secretariat (2017) *Fifth ASEAN State of the Environment Report*. Jakarta. doi: 10.1017/CBO9781107415324.004.

Astara, O. H. (2014) 'Culture as the Fourth Pillar of Sustainable Development', *Sustaibable development, culture, traditions*, 1(2a), pp. 93–102. doi: 10.14217/smalst-2007-3-en.

Astra (2015) *Sustainability Report*.

Avelino, F. and Wittmayer, J. (2016) 'Shifting Power Relations in Sustainability Transitions: A Multi-actor Perspective', *Journal of Environmental Policy & Planning*. Taylor & Francis, 18(5), pp. 628–649. doi: 10.1080/1523908X.2015.1112259.

Bappeko (2017) *Utilization of green open space in the City of Surabaya*. Surabaya, Indonesia.

Batinge, B., Musango, J. . and Brent, A. . (2017) 'Leapfrogging to renewable energy: the opportunity for unmet electricity markets', *South African Journal of Industrial Engineering*, 28(December), pp. 32–49.

Beaman, L. *et al.* (2012) 'A Policy Experiment in India', *Science*, 335, pp. 582–587.

Ben-Eli, M. U. (2018) 'Sustainability: definition and five core principles, a systems perspective', *Sustainability Science*. Springer Japan, 13, pp. 1337–1343. doi: 10.1007/s11625-018-0564-3.

van Benthem, A. A. (2015) 'Energy leapfrogging', *Journal of the Association of Environmental and Resource Economists*, 2(1), pp. 93–132. doi: 10.1086/680317.

Bento, N. and Wilson, C. (2016) 'Measuring the duration of formative phases for energy technologies', *Environmental Innovation and Societal Transitions*. Elsevier B.V., 21, pp. 95–112. doi: 10.1016/j.eist.2016.04.004.

Bercegol, R. de, Cave, J. and Huyen, N. T. (2017) 'Waste Municipal Service and Informal Recycling Sector in Fast-Growing Asian Cities: Co-Existence, Opposition or Integration?', *Resources*, 6(70), pp. 1–10. doi: 10.3390/resources6040070.

Berglöf, E. and Claessens, S. (2006) 'Enforcement and good corporate governance in developing countries and transition economies', *World Bank Research Observer*, 21(1), pp. 123–150. doi: 10.1093/wbro/lkj005.

Berkes, F., Colding, J. and Folke, C. (2000) 'Rediscovery of traditional ecological Knowledge as adaptive management', *Ecological Applications*, 10(5), pp. 1251–1262.

Berkhout, F., Angel, D. and Wieczorek, A. J. (2009) 'Sustainability transitions in developing Asia: Are alternative development pathways likely?', *Technological Forecasting and Social Change*. Elsevier Inc., 76(2), pp.

215–217. doi: 10.1016/j.techfore.2008.04.003.

Berkhout, F., Stirling, A. and Smith, A. (2004) 'Socio-technological regimes and transition contexts', in Elzen, B., Geels, F. W., and Green, K. (eds) *System innovation and the transition to sustainability: Theory, evidence and policy*. Edward Elgar, Cheltenham. doi: 10.4337/9781845423421.00013.

Binz, C. *et al.* (2012) 'Conceptualizing leapfrogging with spatially coupled innovation systems: The case of onsite wastewater treatment in China', *Technological Forecasting and Social Change*, 79(1), pp. 155–171. doi: 10.1016/j.techfore.2011.08.016.

Binz, C. and Truffer, B. (2009) 'Leapfrogging in Infrastructure: Identifying transition trajectories towards decentralized urban water management systems in China', in *Summer Conference 2009, Copenhagen Business School*. denmark, pp. 1–26.

Biswas, A. K. and Hartley, K. (2013) 'Why India's Secondary Cities Are the Future', *UBM's Future Cities: The Global Community for 21st Century City Decision Makers*. Available at: http://www.ubmfuturecities.com/author.asp?section_id=217&doc_id=526126.

Blaikie, N. (2007) *Approaches to social enquiry: Advancing knowledge*. 2nd Editio. Cambridge: Polity Press.

Blimpo, M. P. *et al.* (2017) *Leapfrogging: the key to Africa's development?* Washington, D.C. Available at: https://openknowledge.worldbank.org/handle/10986/28440.

Bordat, S. W., Davis, S. S. and Kouzzi, S. (2010) 'Women as Agents of Grassroots Change: Illustrating Micro-Empowerment in Morocco', *Journal of Middle East Women's Studies*, 7(1), pp. 90–119. doi: 10.2979/mew.2011.7.1.90.

Bos, J. J., Brown, R. and Farrelly, M. A. (2013) 'A design framework for creating social learning situations', *Global Environmental Change*. Elsevier Ltd, 23(2), pp. 398–412. doi: 10.1016/j.gloenvcha.2012.12.003.

Bos, J. J. and Brown, R. R. (2012) 'Governance experimentation and factors of success in socio-technical transitions in the urban water sector', *Technological Forecasting and Social Change*. Elsevier Inc., 79(7), pp. 1340–1353. doi: 10.1016/j.techfore.2012.04.006.

van den Bosch, S. and Rotmans, J. (2008) *Deepening, Broadening and Scaling up: a Framework for Steering Transition Experiments*, *Essay 02: Knowledge Centre for Sustainable System Innovations and Transitions (KCT)*. Delft, Rotterdam. doi: 10.1177/104990910101800102.

van den Bosch, S. and Taanman, M. (2006) 'How innovation impacts society: Patterns and mechanisms through which innovation projects contribute to transitions', in *Innovation Pressure Conference*.

Botton, S. and Gouvello, B. de (2008) 'Water and sanitation in the Buenos Aires metropolitan region: Fragmented markets, splintering effects?', *Geoforum*. Elsevier Ltd, 39, pp. 1859–1870. doi: 10.1016/j.geoforum.2008.08.003.

Bowen, J. R. (1986) 'On the Political Construction of Tradition: Gotong Royong in Indonesia', *The Journal of*

Asian Studies, 45(3), pp. 545–561. doi: 10.2307/2056530.

Boyer, R. H. W. (2015) 'Grassroots innovation for urban sustainability: Comparing the diffusion pathways of three ecovillage projects', *Environment and Planning A*, 45(2), pp. 320–337. doi: 10.1068/a140250p.

BPS Surabaya (2017) *Statistics of people welfare, City of Surabaya*. Surabaya, Indonesia.

Braunstein, E. (2019) 'Gender-inclusive industrialization for growth and development in the context of globalization', in Elson, D. and Seth, A. (eds) *Gender equality and inclusive growth: Economic policies to achieve sustainable development*. New York: UN Women.

Brelsford, C. *et al.* (2017) 'Heterogeneity and scale of sustainable development in cities', *Proceedings of the National Academy of Sciences*, 114(34), pp. 8963–8968. doi: 10.1073/pnas.1606033114.

Brodnik, C. and Brown, R. R. (2017) 'The Co-Evolution of Institutional Logics and Boundary Spanning in Sustainability Transitions: the Case of Urban Stormwater Management in Melbourne, Australia', *Environment and Natural Resources Research*, 7(3), pp. 36–50. doi: 10.5539/enrr.v7n3p36.

Brown, R. R. (2012) 'Transitioning to the water sensitive city: the socio-technical challenge', in Howe, C; Mitchell, C. (ed.) *Cities of the Future Series: Water Sensitive Cities*, pp. 29–42.

Brown, R. R. and Clarke, J. (2007) *Transition to water sensitive urban design: the story of Melbourne, Australia*.

Brown, R. R., Farrelly, M. a. and Loorbach, D. (2013) 'Actors working the institutions in sustainability transitions: The case of Melbourne's stormwater management', *Global Environmental Change*. Elsevier Ltd, 23(4), pp. 701–718. doi: 10.1016/j.gloenvcha.2013.02.013.

Brown, R. R., Keath, N. and Wong, T. H. F. (2009) 'Urban water management in cities: historical, current and future regimes', *Water Science and Technology*, 59(5), pp. 847–855. doi: 10.2166/wst.2009.029.

Brown, R. R., Rogers, B. C. and Werbeloff, L. (2016) *Moving toward Water Sensitive Cities: A guidance manual for strategists and policy makers*. Melbourne, Australia.

Brown, R. R., Rogers, B. C. and Werbeloff, L. (2018) 'A Framework to Guide Transitions to Water Sensitive Cities', in Moore, T. et al. (eds) *Theory and Practice of Urban Sustainability Transitions*. Springer, pp. 129–148. doi: 10.1007/978-981-10-4792-3.

van der Brugge, R. (2009) *Transition Dynamics in Social-Ecological System - The Case of Dutch Water Management*. Erasmus Universiteit Rotterdam, The Netherlands.

van der Brugge, R. and van Raak, R. (2007) 'Facing the adaptive management challenge: Insights from transition management', *Ecology and Society*, 12(2). doi: 10.5751/ES-02227-120233.

van der Brugge, R. and Rotmans, J. (2007) 'Towards transition management of European water resources', *Water Resources Management*, 21, pp. 249–267. doi: 10.1007/s11269-006-9052-0.

van der Brugge, R., Rotmans, J. and Loorbach, D. (2005) 'The transition in Dutch water management', *Regional Environmental Change*, 5, pp. 164–176. doi: 10.1007/s10113-004-0086-7.

Bryman, A. (2012) *Social Research Methods*. 4th ed. New York: Oxford University Press. doi: 10.1192/bjp.112.483.211-a.

Buckley, R. M. and Kalarickal, J. (2005) 'Housing policy in developing countries: Conjectures and refutations', *Oxford University Press*, 20, pp. 233–257. doi: 10.1093/wbro/lki007.

Budiharso, S. A. (2014) *Risma: Perempuan Hebat & Fenomenal*. Yogjakarta: Sinar Kejora.

Bunnell, T. *et al.* (2013) 'Urban Development in a Decentralized Indonesia: Two Success Stories?', *Pacific Affairs*, 86(4), pp. 1–24. doi: http://dx.doi.org/10.5509/2013864857.

Cahyono, S. (2018) '98 Persen Perekonomian Surabaya Ditopang UKM', *JawaPos*, March.

Caniglia, G. *et al.* (2017) 'Experiments and evidence in sustainability science: A typology', *Journal of Cleaner Production*, 169, pp. 39–47. doi: 10.1016/j.jclepro.2017.05.164.

Caruso, G. *et al.* (2015) 'Greener and larger neighbourhoods make cities more sustainable! A 2D urban economics perspective', *Computers, Environment and Urban Systems*. Elsevier Ltd, 54, pp. 82–94. doi: 10.1016/j.compenvurbsys.2015.06.002.

Casiano Flores, C. *et al.* (2019) 'Governance Assessment of the Flood's Infrastructure Policy in San Pedro Cholula, Mexico: Potential for a Leapfrog to Water Sensitive', *Sustainability*, 11(7144), pp. 1–28. doi: 10.3390/su11247144.

Chandra, A. A. (2016) 'Risma: Dulu Ada 92 UKM di Surabaya, Sekarang 3.000 Lebih', *Detik Finance*, February.

Chen, D. and Li-hua, R. (2011) 'Modes of technological leapfrogging : Five case studies from China', *Journal of Engineering and Technology Management*. Elsevier B.V., 28(1–2), pp. 93–108. doi: 10.1016/j.jengtecman.2010.12.006.

Chen, S.-H., Chen, Y.-C. and Wen, P.-C. (2009) 'MNCs' Offshore R & D mandates and host countries' locational advantages: a comparsion between Taiwan and China', *China Information*, 23(1), pp. 159–187.

Cherif, R. and Hasanov, F. (2019) 'The Leap of the Tiger: Escaping the Middle-income Trap to the Technological Frontier', *Global Policy*, 10(4), pp. 497–511. doi: 10.1111/1758-5899.12695.

Chiang, H. H. (2008) 'The "Flying Geese Development" model of the IT industry in East Asia', *Journal of the Asia Pacific Economy*, 13(2), pp. 227–242. doi: 10.1080/13547860801923616.

Choguill, M. B. (1996) 'A Ladder of Community Participation for Underdeveloped Countries', *Habitat International*, 20(3), pp. 431–444.

Chowdhury, A. and Sugema, I. (2005) 'How significant and effective has foreign aid to indonesia been?', *ASEAN Economic Bulletin*, 22(2), pp. 186–216.

Chun, H.-S. and Hyun, C.-H. (2001) 'Innovation and the Role of Government in Indian Software Industry', *Technology Innovation Study*, 9(2), pp. 120–139.

City Government of Surabaya (2007) *Kondisi sanitasi di kota surabaya (Sanitary conditions in the city of Surabaya)*. Surabaya, Indonesia.

City Government of Surabaya (2011) *Mutual agreement between the Government of Surabaya City with PT Pembangkitan Jawa-Bali*. Surabaya.

City Government of Surabaya (2012) *Community-based solid waste Management as best practice in Surabaya City*.

City Government of Surabaya (2013) *Regional regulation of the City of Surabaya, number 72 of 2013*. Indonesia.

City Government of Surabaya (2016a) *Information on Basic Data for the City of Surabaya in 2015*. Surabaya, Indonesia.

City Government of Surabaya (2016b) *KAK Surabaya Green and Clean 2016*. Surabaya, Indonesia.

City Government of Surabaya (2016c) *Surabaya City profile 2016*. Surabaya, Indonesia.

Clark, J. (2005) 'Competition Advocacy: Challenges for Developing Countries', *OECD Journal of Competitin Law and Policy*, 6(4), pp. 1–10. Available at: http://www.keepeek.com/Digital-Asset-Management/oecd/governance/competition-advocacy_clp-v6-art10-en#.WkrcomiWabg#page3.

Cleary, D. (2011) *Technical Report on the analysis of the national structures for water and sanitation management, SOPAC, Published Report: PR17,*. Available at: http://ict.sopac.org/library/download/index/412?file=PR17.pdf.

Cobbinah, P. B., Erdiaw-Kwasie, M. O. and Amoateng, P. (2015) 'Rethinking sustainable development within the framework of poverty and urbanisation in developing countries', *Environmental Development*. Elsevier, 13, pp. 18–32. doi: 10.1016/j.envdev.2014.11.001.

Coenen, L., Benneworth, P. and Truffer, B. (2012) 'Toward a spatial perspective on sustainability transitions', *Research Policy*. Elsevier B.V., 41(6), pp. 968–979. doi: 10.1016/j.respol.2012.02.014.

Coenen, L. and Truffer, B. (2012) 'Places and Spaces of Sustainability Transitions: Geographical Contributions to an Emerging Research and Policy Field', *European Planning Studies*, 20(3), pp. 367–374. doi: 10.1080/09654313.2012.651802.

Cohen, B. (2006) 'Urbanization in developing countries: Current trends, future projections, and key challenges for sustainability', *Technology in Society*, 28, pp. 63–80. doi: 10.1016/j.techsoc.2005.10.005.

Cohen, W. M. and Levinthal, D. A. (2017) 'Absorptive Capacity: A New Perspective on Learning and Innovation', *Administrative Science Quarterly*, 35(1), pp. 128–152.

Colombijn, F. (2016) '"I Am a Singer": A Conversation with Johan Silas, Architect and Urban Planner in Surabaya, Indonesia', *Indonesia*, 102(1), pp. 7–30. doi: 10.5728/indonesia.102.0007.

de Coninck, H. *et al.* (2018) 'Strengthening and Implementing the Global Response', in Masson-Delmotte, V. et al. (eds) *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change,* pp. 313–443. Available at:

https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter4_Low_Res.pdf.

Corbin, J. and Strauss, A. (2008) *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. 3rd Ed. Sage Publications Inc.

Creswell, J. W. and Creswell, D. J. (2018) *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. 5th Ed. Sage Publications Inc.

Dai, Y. and Xue, L. (2015) 'China's policy initiatives for the development of wind energy technology', *Climate Policy*. Taylor & Francis, 15(1), pp. 30–57. doi: 10.1080/14693062.2014.863549.

Damanhuri, E., Handoko, W. and Padmi, T. (2014) 'Municipal Solid Waste Management in Indonesia', in Pariatamby, A. and Tanaka, M. (eds) *Municipal Solid Waste Management in Asia and the Pacific Islands Challenges and Strategic Solutions*. Springer Singapore, pp. 139–155. doi: 10.1007/978-981-4451-73-4.

Damayanti, R. (2006) 'Planning issue and problem in Surabaya, Indonesia', *Dimensi Teknik Arsitektur*, 34(1), pp. 40–43.

Damayanti, R. (2015) *Extending Kevin Lynch's Theory of Imageability through an investigation of kampungs in Surabaya, Indonesia*. The University of Sheffield.

Daniels, R. J. and Trebilcock, M. (2004) 'The Political Economy of Rule of Law Reform in Developing Countries', *Michigan Journal of International Law*, 26, pp. 99–139.

Das, A. (2015a) 'Autonomous but constrained: CBOs and urban upgrading in Indonesia', *Cities*. Elsevier Ltd, 48, pp. 8–20. doi: 10.1016/j.cities.2015.05.009.

Das, A. (2015b) 'Slum upgrading with community-managed microfinance: Towards progressive planning in Indonesia', *Habitat International*. Elsevier Ltd, 47, pp. 256–266. doi: 10.1016/j.habitatint.2015.01.004.

Das, A. (2017) 'A city of two tales: Shelter and migrants in surabaya', *Environment and Urbanization ASIA*, 8(1), pp. 1–21. doi: 10.1177/0975425316686501.

Das, A. (2018) 'Development and Shelter Challenges of Small Islands: Planning With a Pro-Poor Perspective', *Journal of architecture & environment*, 17(2), p. 85. doi: 10.12962/j2355262x.v17i2.a4376.

Das, A. and King, R. (2019) *Surabaya: The Legacy of Participatory Upgrading of Informal Settlements. World Resources Report Case Study*. Washington, DC.

Dave, S. (2011) 'Neighbourhood Density and Social Sustainability in Cities of Developing Countries', *Sustainable Development*, 19, pp. 189–205.

Davidson, C. H. *et al.* (2007) 'Truths and myths about community participation in post-disaster housing projects', *Habitat International*, 31, pp. 100–115. doi: 10.1016/j.habitatint.2006.08.003.

Davis, K., Drey, N. and Gould, D. (2009) 'What are scoping studies? A review of the nursing literature', *International Journal of Nursing Studies*, 46, pp. 1386–1400. doi: 10.1016/j.ijnurstu.2009.02.010.

Davison, R. *et al.* (2000) 'Technology Leapfrogging in Developing Countries - An Inevitable Luxury?', *The Electronic Journal on Information Systems in Developing Countries*, 1(1), pp. 1–10. doi: 10.1002/j.1681-4835.2000.tb00005.x.

Department of Settlement and Regional Development (2016) *Program KOTAKU Handbook*. Jakarta.

Dethier, J.-J. (2017) 'Trash, Cities, and Politics: Urban Environmental Problems in Indonesia', *Indonesia*. Southeast Asia Program Publications at Cornell University, (103), pp. 73–90. doi: 10.1353/ind.2017.0003.

Devolder, S. and Block, T. (2015) 'Transition thinking incorporated: Towards a new discussion framework on sustainable urban projects', *Sustainability*, 7(3), pp. 3269–3289. doi: 10.3390/su7033269.

DFAT (2016) *IAT: Mission 3 Report, Indonesia Infrastructure Initiative (IndII) Phase 2*.

Dhakal, S. (2002) *Comprehensive Kampung Improvement as Model of Community Participation: Surabaya, Indonesia*.

Dhokhikah, Y., Trihadiningrum, Y. and Sunaryo, S. (2015) 'Community participation in household solid waste reduction in Surabaya, Indonesia', *Resources, Conservation and Recycling*. Elsevier B.V., 102, pp. 153–162. doi: 10.1016/j.resconrec.2015.06.013.

Dick, H. (2002) *Surabaya, city of work : a socioeconomic history, 1900-2000*. NUS Press.

Diliani, D. S. N. A. and Susanti, D. S. (2015) 'A Female Leader in Executive Service: The Case of Mayor Risma of Surabaya', in Berman, E. and Haque, M. S. (eds) *Asian Leadership in Policy and Governance*. Emerald Publishing Limited, pp. 287–304.

Directorate General of Human Settlements (2015) *Technical Guidelines: Community-based environmental management program*.

Dispendukcapi (2017) 'Surabaya jumlah penduduk', *Dispendukcapil*.

DKP Surabaya (2015) *Profile of the City of Surabaya 2015*. Surabaya, Indonesia.

DKP Surabaya (2016) *Data on green open spaces 2001 - 2015*. Surabaya, Indonesia.

Donmoyer, R. (2000) 'Generalizability and the single-case study', in Gomm, R., Hammersley, M., and Foster, P. (eds) *Case study method: key issues, key texts*.

Doyal, L. and Gough, I. (1991) *A Theory of Human Need*. London: The Macmillan Press LTD.

Duflo, E., Galiani, S. and Mobarak, M. (2012) 'Improving Access to Urban Services for the Poor: Open Issues and a Framework for a Future Research Agenda', (October), p. 46. Available at: https://www.povertyactionlab.org/sites/default/files/publications/USI Review Paper.pdf.

Durham, J. (2014) 'Ethical challenges in cross-cultural research: A student researcher's perspective', *Australian and New Zealand Journal of Public Health*, 38(6), pp. 509–512. doi: 10.1111/1753-6405.12286.

Eckerberg, K., Bjärstig, T. and Zachrisson, A. (2015) 'Incentives for Collaborative Governance: Top-Down and Bottom-Up Initiatives in the Swedish Mountain Region', *Mountain Research and Development*, 35(3), pp.

289–298. doi: 10.1659/MRD-JOURNAL-D-14-00068.1.

Ehnert, F. *et al.* (2018) 'The acceleration of urban sustainability transitions: A comparison of Brighton, Budapest, Dresden, Genk, and Stockholm', *Sustainability (Switzerland)*, 10(612), pp. 1–25. doi: 10.3390/su10030612.

Ehrhardt, D., Rekas, M. and Richards, K. (2010) 'Investment in Indonesia's Water Sector: Evidence of Financing, Capacity, and Governance Effects', *International Conference on Infrastructure Economics and Development*, pp. 1–41. doi: 10.1097/00001888-195509001-00013.

Elayah, M. (2016) 'Lack of foreign aid effectiveness in developing countries between a hammer and an anvil', *Contemporary Arab Affairs*. Taylor & Francis, 9(1), pp. 82–99. doi: 10.1080/17550912.2015.1124519.

Elson, D. and Seth, A. (2019) *Gender equality and inclusive growth: Economic policies to achieve sustainable development*. New York: UN Women.

Elyazar, I. R. F., Hay, S. I. and Baird, J. K. (2011) 'Malaria Distribution, Prevalence, Drug Resistance and Control in Indonesia', *Adv Parasitol*, 74, pp. 41–175. doi: 10.1016/B978-0-12-385897-9.00002-1.Malaria.

Elzen, B. and Wieczorek, A. (2005) 'Transitions towards sustainability through system innovation', *Technological Forecasting and Social Change*, 72(6 SPEC. ISS.), pp. 651–661. doi: 10.1016/j.techfore.2005.04.002.

Emas, R. (2015) *Brief for GSDR 2015 The Concept of Sustainable Development: Definition and Defining Principles*.

Ernawati, R. (2015) 'Optimalisasi Fungsi Ekologis Ruang Terbuka Hijau Publik di Kota Surabaya', *EMARA Indonesian Journal of Architecture*, 1(2), pp. 1–9.

Etoundi, R. A. *et al.* (2016) 'Special issue on ict for Africa development: An introduction and framework for research', *Electronic Journal of Information Systems in Developing Countries*, 76(1).

Evans, D. M., Browne, A. L. and Gortemaker, I. A. (2018) 'Environmental leapfrogging and everyday climate cultures: sustainable water consumption in the Global South', *Climatic Change*. Climatic Change, pp. 1–15.

Falagas, M. E. *et al.* (2017) 'Comparison of PubMed , Scopus , Web of Science , and Google Scholar : strengths and weaknesses', 22(2), pp. 338–342. doi: 10.1096/fj.07-9492LSF.

Falkner, R. (2012) 'Global environmentalism and the greening of international society', *International Affairs*, 88(3), pp. 503–522.

Farla, J. *et al.* (2012) 'Sustainability transitions in the making: A closer look at actors, strategies and resources', *Technological Forecasting and Social Change*. Elsevier Inc., 79(6), pp. 991–998. doi: 10.1016/j.techfore.2012.02.001.

Farrelly, M. A. and Brown, R. (2011) 'Rethinking urban water management: Experimentation as a way forward?', *Global Environmental Change*. Elsevier Ltd, 21(2), pp. 721–732. doi: 10.1016/j.gloenvcha.2011.01.007.

Fastenrath, S. and Braun, B. (2018) 'Sustainability transition pathways in the building sector: Energy-efficient building in Freiburg (Germany)', *Applied Geography*. The Authors, 90, pp. 339–349. doi:

10.1016/j.apgeog.2016.09.004.

Faure, M. and Niessen, N. (eds) (2006) *Environmental Law in Development: Lessons from the Indonesian Experience*. Cheltenham, UK: Edward ElgarPublishing Limited.

Federal Democratic Republic of Ethiopia (2019) *Ethiopia's Climate Resilient Green Economy: National Adaptation Plan*.

Ferguson, B. C., Brown, R. R., Frantzeskaki, N., *et al.* (2013) 'The enabling institutional context for integrated water management: Lessons from Melbourne', *Water Research*. Elsevier Ltd, 47(20), pp. 7300–7314. doi: 10.1016/j.watres.2013.09.045.

Ferguson, B. C., Brown, R. R. and Deletic, A. (2013) 'A diagnostic procedure for transformative change based on transitions, resilience, and institutional thinking', *Ecology and Society*, 18(4). doi: 10.5751/ES-05901-180457.

Fernández-Maldonado, A. M. (2008) 'Expanding networks for the urban poor: Water and telecommunications services in Lima, Peru', *Geoforum*. Elsevier Ltd, 39(6), pp. 1884–1896. doi: 10.1016/j.geoforum.2007.11.007.

Financial Service Authority (2016) *Development of Micro, Small and Medium Enterprises in Indonesia*. Jakarta, Indonesia.

Fionna, U. (2016) 'The trap of pop-charisma for the institutionalization of Indonesia's post-Suharto parties', *Asian Journal of Political Science ISSN:* Taylor & Francis, 24(1), pp. 124–141. doi: 10.1080/02185377.2015.1136227.

Fionna, U. (2017) *Investigating the popularity of Surabaya's Mayor Tri Rismaharini*. Singapore: ISEAS.

Fischer, L. and Newig, J. (2016) 'Importance of Actors and Agency in Sustainability Transitions: A Systematic Exploration of the Literature', *Sustainability*, 8(476), pp. 1–21. doi: 10.3390/su8050476.

Fleary, K. M. and Chunming, Y. (2017) 'Huawei Leapfrogging System Integration With TSTT', *SAGE Open*, 7(2). doi: 10.1177/2158244017697769.

Flyvbjerg, B. (2006) 'Five Misunderstandings About Case-Study Research', *Qualitative Inquiry*, 12(2), pp. 219–245. doi: 10.1177/1077800405284363.

Foxon, T. J. (2014) 'Technological lock- in and the role of innovation', in Atkinson, G. et al. (eds) *Handbook of Sustainable Development*. Edward Elgar Publishing, pp. 304–316.

Foxon, T. and Pearson, P. (2008) 'Overcoming barriers to innovation and diffusion of cleaner technologies: some features of a sustainable innovation policy regime', *Journal of Cleaner Production*, 16, pp. 148–161. doi: 10.1016/j.jclepro.2007.10.011.

Franco-Torres, M., Rogers, B. C. and Ugarelli, R. M. (2020) 'A framework to explain the role of boundary objects in sustainability transitions', *Environmental Innovation and Societal Transitions*. Elsevier, 36(April), pp. 34–48. doi: 10.1016/j.eist.2020.04.010.

Frantzeskaki, N. *et al.* (2016) 'Elucidating the changing roles of civil society in urban sustainability transitions', *Current Opinion in Environmental Sustainability*, 22, pp. 41–50. doi: 10.1016/j.cosust.2017.04.008.

Frantzeskaki, N., Borgström, S., *et al.* (2017) 'Nature-Based Solutions Accelerating Urban Sustainability Transitions in Cities: Lessons from Dresden, Genk and Stockholm Cities', in Kabisch, N. et al. (eds) *Theory and Practice of Urban Sustainability Transitions*, pp. 65–88. doi: 10.1007/978-3-319-56091-5.

Frantzeskaki, N., Castán Broto, V., *et al.* (2017) *Urban Sustainability Transitions*. Taylor & Francis Group.

Frantzeskaki, N. and de Haan, H. (2009) 'Transitions: Two steps from theory to policy', *Futures*, 41(9), pp. 593–606. doi: 10.1016/j.futures.2009.04.009.

Frantzeskaki, N. and Loorbach, D. (2010) 'Towards governing infrasystem transitions. Reinforcing lock-in or facilitating change?', *Technological Forecasting and Social Change*. Elsevier Inc., 77(8), pp. 1292–1301. doi: 10.1016/j.techfore.2010.05.004.

Frederick, W. H. (1978) *Indonesian urban society in transition: Surabaya, 1926-1946*. University of Hawaii.

Fu, X. and Zhang, J. (2011) 'Technology transfer, indigenous innovation and leapfrogging in green technology: the solar-PV industry in China and India', *Journal of Chinese Economic and Business Studies*, 9(4), pp. 329–347. doi: 10.1080/14765284.2011.618590.

Fuenfschilling, L. (2017) 'Urban sustainability transitions: Opportunities and challenges for institutional change', in Frantzeskaki, N. et al. (eds) *Urban Sustainability Transitions*. Taylor & Francis Group, pp. 148–156. doi: 10.4324/9781315228389.

Fuenfschilling, L. and Binz, C. (2018) 'Global socio-technical regimes', *Research Policy*. Elsevier, 47, pp. 735–749. doi: 10.1016/j.respol.2018.02.003.

Fuenfschilling, L. and Truffer, B. (2016) 'The interplay of institutions, actors and technologies in socio-technical systems - An analysis of transformations in the Australian urban water sector', *Technological Forecasting and Social Change*. Elsevier Inc., 103, pp. 298–312. doi: 10.1016/j.techfore.2015.11.023.

Gal, M. S. (2004) 'The Ecology of Antitrust Preconditions for Competition Law Enforcement in Developing Countries', *Competition, Competitiveness and Development*, (June), pp. 20–38. Available at: http://ssrn.com/abstract=665181.

Gallagher, K. S. (2006) 'Limits to leapfrogging in energy technologies? Evidence from the Chinese automobile industry', *Energy Policy*, 34(4), pp. 383–394. doi: 10.1016/j.enpol.2004.06.005.

Geels, F. W. (2002) 'Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study', *Research Policy*, 31, pp. 1257–1274. doi: 10.1016/S0048-7333(02)00062-8.

Geels, F. W. (2004) 'From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory', *Research Policy*, 33(6–7), pp. 897–920. doi: 10.1016/j.respol.2004.01.015.

Geels, F. W. (2005a) 'Co-evolution of technology and society: The transition in water supply and personal hygiene in the Netherlands (1850-1930) - A case study in multi-level perspective', *Technology in Society*, 27(3), pp. 363–397. doi: 10.1016/j.techsoc.2005.04.008.

Geels, F. W. (2005b) 'The dynamics of transitions in socio-technical systems: a multi-level analysis of the transition pathway from horse-drawn carriages to automobiles (1860-1930)', *Technology Analysis & Strategic Management*, 17(4), pp. 445–476. doi: 10.1080/09537320500357319.

Geels, F. W. (2006) 'The hygienic transition from cesspools to sewer systems (1840-1930): The dynamics of regime transformation', *Research Policy*, 35(7), pp. 1069–1082. doi: 10.1016/j.respol.2006.06.001.

Geels, F. W. *et al.* (2016) 'The enactment of socio-technical transition pathways : A reformulated typology and a comparative multi-level analysis of the German and UK low-carbon electricity transitions (1990 – 2014)', *Research Policy*. Elsevier B.V., 45(4), pp. 896–913. doi: 10.1016/j.respol.2016.01.015.

Geels, F. W. *et al.* (2017) 'Accelerating innovation is as important as climate policy', *Policy Forum*, pp. 1242–1244.

Geels, F. W. and Schot, J. (2007) 'Typology of sociotechnical transition pathways', *Research Policy*, 36(3), pp. 399–417. doi: 10.1016/j.respol.2007.01.003.

Geels, F. W. and Schot, J. (2010) 'The dynamics of sociotechnical transitions – a socio- technical perspective', in *Transitions to Sustainable Development*, pp. 9–101.

Gerschenkron, A. (1962) *Economic Backwardness in Historical Perspective*. Cambridge, Massachusetts: Belknap Press of Harvard University Press.

Gervasi, M. (2011) *Surabaya, Indonesia: Green and clean initiative*.

Ghofrani, Z., Sposito, V. and Faggian, R. (2017) 'A comprehensive review of blue-green infrastructure concepts', *International Journal of Environment and Sustainability*, 6(1), pp. 15–36.

Gilby, S. *et al.* (2017) *Planning and implementation of integrated solid waste management strategies at local level: The case of Surabaya City*. surabaya; waste.

Gimelli, F. M., Bos, J. J. and Rogers, B. C. (2018) 'Fostering equity and wellbeing through water: A reinterpretation of the goal of securing access', *World Development*. Elsevier Ltd, 104, pp. 1–9. doi: 10.1016/j.worlddev.2017.10.033.

Global Forum on Human Settlements (2017) *UN-Habitat World Best Practices, Asia-Pacific Edition*.

Goldemberg, J. (1998) 'Leapfrog energy technologies', *Energy Policy*, 26(10), pp. 729–741. doi: 10.1016/S0301-4215(98)00025-1.

Goldemberg, J. (2011) 'Technological Leapfrogging in the Developing World', *Science & Technology*, pp. 35–42.

Goldemberg, J. (2020) 'The evolution of the energy and carbon intensities of developing countries', *Energy*

Policy, 137. doi: 10.1016/j.enpol.2019.111060.

Gore, C. D. (2018) 'How African cities lead: Urban policy innovation and agriculture in Kampala and Nairobi', *World Development*. Elsevier Ltd, 108, pp. 169–180. doi: 10.1016/j.worlddev.2018.03.011.

Gorissen, L. *et al.* (2018) 'Moving towards systemic change? Investigating acceleration dynamics of urban sustainability transitions in the Belgian City of Genk', *Journal of Cleaner Production*. Elsevier Ltd, 173, pp. 171–185. doi: 10.1016/j.jclepro.2016.12.052.

Gottinger, H.-W. (2005) 'Economic growth, catching up, falling behind and getting ahead', *World Review of Entrepreneurship, Management and Sustainable Development*, 1(2), pp. 101–120. doi: 10.1504/wremsd.2005.007975.

Government of India (2020) 'Production Linked Incentive (PLI) Scheme to 10 key Sectors for Enhancing India's Manufacturing Capabilities and Enhancing Exports – Atmanirbhar Bharat', in. Available at: https://pib.gov.in/PressReleasePage.aspx?PRID=1671912.

Government of Indonesia (2009) *Environmental Protection and Management*. Indonesia. Available at: http://faolex.fao.org/docs/pdf/ins97643.pdf.

Grant, M. J., Booth, A. and Centre, S. (2009) 'A typology of reviews : an analysis of 14 review types and associated methodologies', pp. 91–108. doi: 10.1111/j.1471-1842.2009.00848.x.

Gray, D. E. (2014) *Doing Research in the Real World*. 3rd Ed. SAGE Publications. doi: 10.1057/9781137016669.

Grin, J., Rotmans, J. and Schot, J. (2010) *Transitions to sustainable development: New Directions in the Study of Long Term Tansformative Change*. New York: Routledge. doi: 10.4324/9780203856598.

Grin, J., Rotmans, J. and Schot, J. (2011) 'On patterns and agency in transition dynamics: Some key insights from the KSI programme', *Environmental Innovation and Societal Transitions*. Elsevier B.V., 1, pp. 76–81. doi: 10.1016/j.eist.2011.04.008.

Grubler, A., Wilson, C. and Nemet, G. (2016) 'Apples, oranges, and consistent comparisons of the temporal dynamics of energy transitions', *Energy Research and Social Science*. Elsevier Ltd, 22, pp. 18–25. doi: 10.1016/j.erss.2016.08.015.

Guangzhou Institute for Urban Innovation (2019) *Global Openness & Inclusive Innovation: A Collection of Shortlisted Initiatives of the 4th Guangzhou International Award for Urban Innovation*.

Gunderson, L. H. and Holling, C. S. (2002) *Panarchy Understanding Transformations in Human and Natural Systems*. Washington, D.C.: Island Press.

Gupta, A. K. (2010) 'Grassroots Green Innovations for Inclusive, Sustainable Development', in Lopez-Claros, A. (ed.) *The Innovation for Development Report 2009–2010*. Springer, pp. 137–146. doi: 10.1057/9780230285477_6.

De Haan, F. J. (2010) *Towards Transition Theory*. Erasmus Universiteit Rotterdam, The Netherlands.

De Haan, F. J. *et al.* (2014) 'The needs of society: A new understanding of transitions, sustainability and

liveability', *Technological Forecasting and Social Change*. Elsevier Inc., 85, pp. 121–132. doi: 10.1016/j.techfore.2013.09.005.

De Haan, F. J. *et al.* (2015) 'Transitions through a lens of urban water', *Environmental Innovation and Societal Transitions*, 15, pp. 1–10. doi: 10.1016/j.eist.2014.11.005.

De Haan, F. J. (2018) 'Place in Transitions—Concepts for When it Matters: Essentially, Accidentally, Locus and Nexus', in Moore, T. et al. (eds) *Theory and Practice of Urban Sustainability Transitions*. Springer, pp. 19–34.

De Haan, F. J. and Rotmans, J. (2018) 'A proposed theoretical framework for actors in transformative change', *Technological Forecasting & Social Change*. Elsevier, 128, pp. 275–286. doi: 10.1016/j.techfore.2017.12.017.

Hackbarth, G. and Kettinger, W. J. (2004) 'Strategic aspirations for net-enabled business', *European Journal of Information Systems*, 13(4), pp. 273–285.

Hakala, E. S. and Bjelic, I. B. (2016a) 'Leapfrogging potential for sustainable energy transition in Serbia', *International Journal of Energy Sector Management*, 10(3), pp. 381–401. doi: 10.1108/IJESM-12-2014-0001.

Hakala, E. S. and Bjelic, I. B. (2016b) 'Leapfrogging potential for sustainable energy transition in Serbia Article information ':, *International Journal of Energy Sector Management*, 10(3), pp. 381–401. doi: 10.1108/IJESM-12-2014-0001.

Hakim, L., Siswanto, D. and Nakagoshi, N. (2017) 'Mangrove Conservation in East Java: The Ecotourism Development Perspectives', *Journal of Tropical Life Science*, 7(3), pp. 277–285. doi: 10.11594/jtls.07.03.14.

Hammer, S. *et al.* (2011) *Cities and Green Growth: A Conceptual Framework*, *OECD Regional Development Working Papers 2011/08*. doi: http://dx.doi.org/10.1787/5kg0tflmzx34-en.

Hansen, U. E. *et al.* (2018) 'Sustainability transitions in developing countries: Stocktaking, new contributions and a research agenda', *Environmental Science and Policy*, 84, pp. 198–203. doi: 10.1016/j.envsci.2017.11.009.

Hardjasoemantri, K. (1989) *Environmental legislation in Indonesia*. Yogyakarta, Indonesia.

Harsaputra, I. (2014) 'Surabaya bids farewell to Dolly', *The Jakarta Post*, 19 June.

Hartz-Karp, J. and Gorissen, L. (2017) 'The role of transition initiatives in urban sustainability', in Marinova, D. and Hartz-Karp, J. (eds) *Methods for Sustainability Research*. Cheltenham: Edward ElgarPublishing Limited, pp. 173–188. doi: 10.4337/9781786432735.00022.

Hasyimi, V. and Abi Suroso, D. S. (2017) 'Urban Green Space Development Strategy Reconverting Gas Station To Public Parks In The City Of Surabaya, Indonesia', *Journal of Geoscience, Engineering, Environment and Technology*, 02(02), pp. 102–109. doi: 10.24273/jgeet.2017.2.2.306.

Hausmann, R., Hwang, J. and Rodrik, D. (2007) 'What you export matters', *Journal of Economic Growth*, 12(1), pp. 1–25. doi: 10.1007/s10887-006-9009-4.

van der Have, R. P. and Rubalcaba, L. (2016) 'Social innovation research: An emerging area of innovation

studies?', *Research Policy*. Elsevier B.V., 45(9), pp. 1923–1935. doi: 10.1016/j.respol.2016.06.010.

Healey, P. (2015) 'Citizen-generated local development initiative: recent English experience', *International Journal of Urban Sciences*, 19(2), pp. 109–118. doi: 10.1080/12265934.2014.989892.

Hendriks, C. M. and Grin, J. (2007) 'Contextualizing Reflexive Governance: the Politics of Dutch Transitions to Sustainability', *Journal of Environmental Policy & Planning*, 9(3–4), pp. 333–350. doi: 10.1080/15239080701622790.

Henilane, I. (2016) 'Housing Concept and Analysis of Housing Classification', *Baltic Journal of Real Estate Economics and Construction Management*, 4(1), pp. 168–179. doi: 10.1515/bjreecm-2016-0013.

Hennink, M. M. (2008) 'Language and Communication in Cross-Cultural Qualitative Research', in Liamputtong, P. (ed.) *Doing Cross-Cultural Research*. Springer, pp. 21–33. doi: 10.1007/978-1-4020-8567-3_2.

Hermans, F., Roep, D. and Klerkx, L. (2016) 'Scale dynamics of grassroots innovations through parallel pathways of transformative change', *Ecological Economics*. Elsevier B.V., 130, pp. 285–295. doi: 10.1016/j.ecolecon.2016.07.011.

Hidayati, N. D. (2011) 'Pattern of corporate social responsibility programs : a case study', *Social Responsibility Journal*, 7(1), pp. 104–117. doi: 10.1108/17471111111114576.

Hilman, M. (2012) *The Way to Achieve Sustainable Cities in Indonesia.*

Hirokawa, K. H. (2011) 'Sustainability and the Urban Forest : An Ecosystem Services Perspective', *Natural Resources Journal*, 51(2), pp. 233–259.

Ho, P. (2005) 'Greening industries in newly industrialising countries: Asian-style leapfrogging?', *International Journal of Environment and Sustainable Development*, 4(3), p. 209. doi: 10.1504/IJESD.2005.007738.

Hobday, M. (1994) 'Technological learning in Singapore: A test case of leapfrogging', *Journal of Development Studies*, 30(4), pp. 831–858. doi: 10.1080/00220389408422340.

Hobday, M. (1995a) 'East Asian Latecomer Firms: Learning the Technology of Electronics', *World Development*, 23(7), pp. 1171–1193.

Hobday, M. (1995b) *Innovation in East Asia: The challenges to Japan*. UK: Edgar Elgar.

Hodson, M., Geels, F. W. and Mcmeekin, A. (2017) 'Reconfiguring urban sustainability transitions, analysing multiplicity', *Sustainability*, 9(299), pp. 1–20. doi: 10.3390/su9020299.

Hofman, B. and Kaiser, K. (2006) 'Decentralization, Democratic Transition, and Local Governance in Indonesia', in Bardhan, P. and Mookherjee, D. (eds) *Decentralisation and Local Governance in Developing Countries: A Comparative Perspective*. Cambridge: MIT Press, pp. 81–124. doi: 10.1177/004908570803800311.

Holden, E. and Linnerud, K. (2007) 'The Sustainable Development Area: Satisfying Basic Needs and Safeguarding Ecological Sustainability', *Sustainable Development*, 15, pp. 174–187. doi: 10.1002/sd.313.

Hole, R. (2015) 'Working Between Languages and Cultures', *Qualitative Inquiry*, 13(5), pp. 696–710. doi: 10.1177/1077800407301186.

Holling, C. S. and Goldberg, M. A. (1971) 'Ecology and Planning', *Journal of the American Planning Association*, 37(4), pp. 221–230. doi: 10.1080/01944367108977962.

Honan, E. *et al.* (2013) 'Ethical issues in cross-cultural research', *International Journal of Research and Method in Education*, 36(4), pp. 386–399. doi: 10.1080/1743727X.2012.705275.

Hoogma, R. *et al.* (2002) *No Experimenting for Sustainable Transport: The Approach of Strategic Niche Management*. London: Spon Press.

Hosen, N., Nakamura, H. and Hamzah, A. (2020) 'Adaptation to climate change: Does traditional ecological knowledge hold the key?', *Sustainability*, 12(676), pp. 1–18. doi: 10.3390/su12020676.

Hossain, M. (2016) 'Grassroots innovation: A systematic review of two decades of research', *Journal of Cleaner Production*. Elsevier Ltd, 137, pp. 973–981. doi: 10.1016/j.jclepro.2016.07.140.

Howell, J. M. and Boies, K. (2004) 'Champions of technological innovation: The influence of contextual knowledge, role orientation, idea generation, and idea promotion on champion emergence', *The Leadership Quarterly*, 15, pp. 123–143. doi: 10.1016/j.leaqua.2003.12.008.

Huang, C.-Y. (2011) 'Rethinking leapfrogging in the end-user telecom market', *Technological Forecasting & Social Change*. Elsevier Inc., 78(4), pp. 703–712. doi: 10.1016/j.techfore.2010.10.009.

Huang, J., Yu, Y. and Ma, C. (2018) 'Energy Efficiency Convergence in China : Catch-Up , Lock-In and Regulatory Uniformity', *Environmental and Resource Economics*. Springer Netherlands, 70(1), pp. 107–130. doi: 10.1007/s10640-017-0112-0.

Huitema, D. and Meijerink, S. (2010) 'Realizing water transitions : the role of policy entrepreneurs in water', *Ecology and Society*, 15(2).

Husain, S. B. (2015) 'The improvement of kampong as an instrument to mitigate floods in Surabaya', *HUMANIORA*, 27(3), pp. 317–329.

Idawati, D. E. (2015) 'A case of urban mimicry: Citra Raya, the Singapore of Surabaya', *Architecture and Environment*, 14(1), pp. 19–32.

IGES (2017) *Development of Work Plan for Reducing SLCPs from MSWM in Surabaya , Indonesia*.

Imelda, J. D. (2011) *Mobilizing motherhood: case study of two women's organizations advocating HIV prevention programs in Indonesia*. University of Amsterdam.

Inglehart, R. and Baker, W. E. (2007) 'Modernization, Cultural Change, and the Persistence of Traditional Values', *American Sociological Review*, 65(1), pp. 19–51.

IPCC (2012) *Renewable Energy Sources and Climate Change Mitigation: Special Report of the Intergovernmental Panel on Climate Change*. doi: 10.1017/CBO9781139151153.

Isar, Y. R. (2017) '"Culture", "sustainable development" and cultural policy: a contrarian view', *International Journal of Cultural Policy*. Routledge, 23(2), pp. 148–158. doi: 10.1080/10286632.2017.1280785.

IUWASH (2012) *Quarterly progress report 7*.

IUWASH (2015) *Annual progress report 5 and Quarterly progress report 18*.

Jacobsson, S. and Bergek, A. (2004) 'Transforming the energy sector: The evolution of technological systems in renewable energy technology', *Industrial and Corporate Change*, 13(5), pp. 815–849. doi: 10.1093/icc/dth032.

Jacobsson, S. and Bergek, A. (2011) 'Innovation system analyses and sustainability transitions: Contributions and suggestions for research', *Environmental Innovation and Societal Transitions*. Elsevier B.V., 1, pp. 41–57. doi: 10.1016/j.eist.2011.04.006.

Jaglin, S. (2008) 'Differentiating networked services in Cape Town: Echoes of splintering urbanism?', *Geoforum*. Elsevier Ltd, 39(6), pp. 1897–1906. doi: 10.1016/j.geoforum.2008.04.010.

James, J. (2008) 'Evaluating latecomer growth in information technology: A historical perspective', *Technological Forecasting and Social Change*, 75, pp. 1339–1347.

James, J. (2009) 'Leapfrogging in mobile telephony: A measure for comparing country performance', *Technological Forecasting and Social Change*. Elsevier Inc., 76(7), pp. 991–998. doi: 10.1016/j.techfore.2008.09.002.

James, J. (2013) 'The Diffusion of IT', *Social Indicators Research*, 111(1), pp. 175–184. doi: 10.1007/sl.

Jefferies, C. and Duffy, A. (2011) 'The SWITCH Transitioning Manual', *12th International Conference on Urban Drainage*, (September), pp. 1–8. Available at: http://web.sbe.hw.ac.uk/staffprofiles/bdgsa/temp/12th ICUD/PDF/PAP005129.pdf.

JICA (2000) *Surabaya River Improvement Project*.

JICA (2001) *Brantas River Middle Reaches Improvement Project (II)*.

JICA (2007) *Surabaya Urban Development Project*.

Johansen, F. and van den Bosch, S. (2017) 'The scaling-up of Neighbourhood Care: From experiment towards a transformative movement in healthcare', *Futures*. Elsevier Ltd, 89(May 2016), pp. 60–73. doi: 10.1016/j.futures.2017.04.004.

Johnson, R. B., Onwuegbuzie, A. J. and Turner, L. A. (2007) 'Toward a Definition of Mixed Methods Research', *Journal of Mixed Methods Research*, 1(2), pp. 112–133. doi: 10.1177/1558689806298224.

Johnston, P. *et al.* (2007) 'Reclaiming the Definition of Sustainability', *Environmental Science and Pollution Research*, 14(1), pp. 60–66.

Jomo, K. S. (2001) 'Introduction: Growth and structural change in the second- tier Southeast Asian NIEs.', in Jomo, K. S. (ed.) *Southeast Asia's Industrialization: Industrial Policy, Capabilities and Sustainability*. London, pp. 1–29.

Joss, S., Cowley, R. and Tomozeiu, D. (2013) 'Towards the "ubiquitous eco-city": An analysis of the internationalisation of eco-city policy and practice', *Urban Research and Practice*, 6(1), pp. 54–74. doi: 10.1080/17535069.2012.762216.

Joss, S., Tomozeiu, D. and Cowley, R. (2011) *Eco-city: A Global Survey 2011*. Surabaya: University of Westminster.

Kabisch, N. *et al.* (2017) *Nature-based Solutions to Climate Change Adaptation in Urban Areas: Linkages between Science, Policy and Practice*. Switzerland: Springer Nature. doi: 10.1007/978-3-319-56091-5_3.

Kainuma, M. *et al.* (2017) 'Methodologies for leapfrogging to low carbon and sustainable development in Asia', *Journal of Renewable and Sustainable Energy*, 9(2). doi: 10.1063/1.4978469.

Kanger, L. and Schot, J. (2016) 'User-made immobilities: a transitions perspective', *Mobilities*. Routledge, 11(4), pp. 598–613. doi: 10.1080/17450101.2016.1211827.

Karp, L. and Lee, H. (2001) 'Learning-by-Doing and the Choice of Technology : The Role of Patience', *Journal of Economic Theory*, 100(1), pp. 73–92.

Kazmierczak, A. and Carter, J. (2010) *Adaptation to climate change using green and blue infrastructure: A database of case studies*.

Keeley, M. *et al.* (2013) 'Perspectives on the use of green infrastructure for stormwater management in cleveland and milwaukee', *Environmental Management*, 51, pp. 1093–1108. doi: 10.1007/s00267-013-0032-x.

Keirstead, J. (2013) 'Benchmarking urban energy efficiency in the UK', *Energy Policy*, 63, pp. 575–587. doi: 10.1016/j.enpol.2013.08.063.

Kemp, R. and Loorbach, D. (2007) 'Transition management as a model for managing processes of co-evolution towards sustainable development', *International Journal of Sustainable Development*, 14(1), pp. 78–91. doi: 10.1080/13504500709469709.

Kemp, R. and Rotmans, J. (2005) 'The management of the co-evolution of technical, environmental and social systems', *Towards Environmental Innovation Systems*, pp. 33–55. doi: 10.1007/3-540-27298-4_3.

Kemp, R., Schot, J. and Hoogma, R. (1998) 'Regime shifts to sustainability through processes of niche formation: The approach of strategic niche management', *Technology Analysis & Strategic Management*, 10(2), pp. 175–198. doi: 10.1080/09537329808524310.

Kemp, René and Loorbach, D. (2006) 'Transition management: A reflexive governance approach', in Voss, J., Bauknecht, D., and Kemp, R. (eds) *Reflexive Governance for Sustainable Development*. Cheltenham: Edward Elgar Publishing, pp. 103–130. doi: 10.4337/9781847200266.00015.

Van De Kerkhof, M. and Wieczorek, A. (2005) 'Learning and stakeholder participation in transition processes towards sustainability: Methodological considerations', *Technological Forecasting & Social Change*, 72, pp. 733–747. doi: 10.1016/j.techfore.2004.10.002.

Kern, F. and Rogge, K. S. (2018) 'Harnessing theories of the policy process for analysing the politics of sustainability transitions: A critical survey', *Environmental Innovation and Societal Transitions*. Elsevier, 27, pp. 102–117. doi: 10.1016/j.eist.2017.11.001.

Kiamba, A. (2012) 'The Sustainability of Urban Development in Developing Economies', *Consilience: The Journal of Sustainable Development*, 8(1), pp. 20–25.

Kimble, C. and Wang, H. (2012) 'Transistors , electric vehicles and leapfrogging in China and Japan', *Journal of Business Strategy*, 33(3), pp. 22–29. doi: 10.1108/02756661211224979.

Kivimaa, P. *et al.* (2019) 'Passing the baton: How intermediaries advance sustainability transitions in different phases', *Environmental Innovation and Societal Transitions*. Elsevier, 31, pp. 110–125. doi: 10.1016/j.eist.2019.01.001.

Kivimaa, P. *et al.* (2021) 'Moving beyond disruptive innovation: A review of disruption in sustainability transitions', *Environmental Innovation and Societal Transitions*. Elsevier B.V., 38(November 2019), pp. 110–126. doi: 10.1016/j.eist.2020.12.001.

Köhler, J. *et al.* (2019) 'An agenda for sustainability transitions research : State of the art and future directions', *Environmental Innovation and Societal Transitions*. Elsevier, 31, pp. 1–32. doi: 10.1016/j.eist.2019.01.004.

Kojima, M. (2003) 'Leapfrogging technology. Cost effective solution for pollution in developing countries?', pp. 1–4.

Koontz, T. M. and Newig, J. (2014) 'From Planning to Implementation: Top-Down and Bottom-Up Approaches for Collaborative Watershed Management', *Policy Studies Journal*, 42(3), pp. 416–442. doi: 10.1111/psj.12067.

Kooy, M. (2014) 'Developing informality: The production of jakarta's Urban waterscape', *Water Alternatives*, 7(1), pp. 35–53.

Koswara, A. Y. *et al.* (2017) 'Typology of slum settlements in Keputih sub district', in *IOP Conf. Series: Earth and Environmental Science*. IOP Publishing, pp. 1–8.

KPK (2011) *Laporan Hasil Penilaian Inisiatif Anti-Korupsi (PIAK) 2011 [Anti-Corruption Initiative Assessment Report 2011]*.

Kristanto, G. A., Gusniani, I. and Ratna, A. (2015) 'The performance of municipal solid waste recycling program in Depok, Indonesia', *International Journal of Technology*, (2), pp. 264–272. doi: 10.14716/ijtech.v6i2.905.

Kuenkel, P. (2019) 'Stewarding Sustainability Transformations in Multi-stakeholder Collaboration', in Kuenkel, P. (ed.) *Stewarding Sustainability Transformations: An Emerging Theory and Practice of SDG Implementation*. Switzerland: Springer. doi: 10.1007/978-3-030-03691-1.

Kuffer, M. *et al.* (2018) 'The Scope of Earth-Observation to Improve the Consistency of the SDG Slum

Indicator', *ISPRS International Journal of Geo-Information*, 7(11), p. 428. doi: 10.3390/ijgi7110428.

Kumar Duraoappah, A. (2015) *Sustained Inclusive Growth Reexamined.*

Kurniawan, T. A., Puppim de Oliveira, J. and Premakumara, D. G. J. (2013) 'City-to-city level cooperation for generating urban co-benefits: the case of technological cooperation in the waste sector between Surabaya (Indonesia) and Kitakyushu (Japan)', *Journal of Cleaner Production*. Elsevier Ltd, 58, pp. 43–50. doi: 10.1016/j.jclepro.2013.08.002.

Kurniawati, H. D. (2016) 'Tri rismaharini's androgynous leadership: strategizing "hegemonic masculinity"', *POLITIKA*, 7(2), pp. 143–158.

Kurniawati, S. L., Sari, L. P. and Kartika, T. P. D. (2018) 'Development of Good Sme Governance in Indonesia: An Empirical Study of Surabaya', *International Journal of Economics and Management*, 12(1), pp. 305–319.

Kwanda, T., Kartono, L. and Wonoseputro, C. (2014) 'The emphatic urban parks in Surabaya: the people's perceptions on aesthetic and uses of the parks', in *International Conference on Empathic Architecture*, pp. 177–185.

Lachman, D. a. (2011) 'Leapfrog to the future: Energy scenarios and strategies for Suriname to 2050', *Energy Policy*, 39(9), pp. 5035–5044. doi: 10.1016/j.enpol.2011.06.010.

Lachman, D. A. (2012) 'Developing countries more in need of energy system transition research', *Academic Journal of Suriname*, 2012(3), pp. 284–291.

Lam, D. P. M. *et al.* (2020) 'Scaling the impact of sustainability initiatives: a typology of amplification processes', *Urban Transformations*. Urban Transformations, 2(3), pp. 1–24.

Larsson, M. *et al.* (2002) *Process Benchmarking in the Water Industry: Towards a worlwide approach*. London: IWA Publishing.

Lee, E. J. and Schwab, K. J. (2005) 'Deficiencies in drinking water distribution systems in developing countries.', *Journal of water and health*, 3(2), pp. 109–127.

Lee, K., Kim, B. Y. and Lee, I. (2009) 'The possibility of economic reform in North Korea', *Journal of Contemporary Asia*, 39(2), pp. 279–294. doi: 10.1080/00472330902723865.

Lee, K. and Lim, C. (2001) 'Technological regimes, catching-up and leapfrogging: findings from the Korean industries', *Research Policy*, 30(3), pp. 459–483. doi: 10.1016/S0048-7333(00)00088-3.

Lee, K., Park, T. Y. and Krishnan, R. T. (2014) 'Catching-up or Leapfrogging in the Indian IT Service Sector: Windows of opportunity, path-creating, and moving up the value chain', *Development Policy Review*, 32(4), pp. 495–518.

Lema, R., Iizuka, M. and Walz, R. (2015) 'Introduction to low-carbon innovation and development: Insights and future challenges for research', *Innovation and Development*, 5(2), pp. 173–187. doi: 10.1080/2157930X.2015.1065096.

Van Lente, H. *et al.* (2011) 'Systemic intermediaries and transition processes', in Guy, S. et al. (eds) *Shaping Urban Infrastructures: Intermediaries and the Governance of Socio-Technical Networks*. London: Earthscan, pp. 36–52. doi: 10.4324/9781849775380.

Letema, S., van Vliet, B. and van Lier, J. B. (2014) 'Sanitation policy and spatial planning in urban East Africa: Diverging sanitation spaces and actor arrangements in Kampala and Kisumu', *Cities*. Elsevier Ltd, 36, pp. 1–9. doi: 10.1016/j.cities.2013.08.003.

Levin, T. and Thomas, V. M. (2016) 'Can developing countries leapfrog the centralized electrification paradigm?', *Energy for Sustainable Development*. International Energy Initiative, 31, pp. 97–107. doi: 10.1016/j.esd.2015.12.005.

Lewis, J. I. (2007) 'Technology acquisition and innovation in the developing world: Wind turbine development in China and India', *Studies in Comparative International Development*, 42(3–4), pp. 208–232. doi: 10.1007/s12116-007-9012-6.

Lewis, P. M. (2009) *Ethnologue: Languages of the World*. 16th Editi. Dallas, Texas: SIL International.

Lindsay, J. *et al.* (2019) 'The role of community champions in long-term sustainable urban water planning', *Water*, 11, pp. 1–14. doi: 10.3390/w11030476.

Liu, X., Wang, Z. and Xie, Y. (2019) 'Progression from technological entrant to innovative leader: an analytical firm-level framework for strategic technological upgrade', *Innovation: Organization and Management*. Routledge, 21(3), pp. 443–465. doi: 10.1080/14479338.2019.1583062.

Loorbach, D. (2010) 'Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework', *Governance-an International Journal of Policy Administration and Institutions*, 23(1), pp. 161–183.

Loorbach, D., Frantzeskaki, N. and Avelino, F. (2017) 'Sustainability Transitions Research : Transforming Science and Practice for Societal Change', *Annual Review of Environment and Resources*, 42, pp. 599–626.

Loorbach, D. and Rotmans, J. (2006) 'Managing transitions for sustainable development', in Olsthoorn, X. and Wieczorek, A. (eds) *Understanding Industrial Transformation*. Springer, Dordrecht., pp. 187–206. doi: 10.1007/1-4020-4418-6.

Loorbach, D. and Rotmans, J. (2010) 'The practice of transition management: Examples and lessons from four distinct cases', *Futures*. Elsevier Ltd, 42(3), pp. 237–246. doi: 10.1016/j.futures.2009.11.009.

Loorbach, D., Taanman, M. and van der Brugge, R. (2008) 'Governance in the energy transition : Practice of transition management in the Netherlands', *International Journal of Environmental Technology and Management*, 9(2), pp. 294–315.

Lowenberg, P. (2000) 'Writing and Literacy in Indonesia', *Studies in the Linguistic Sciences*, 30(1), pp. 135–148.

Lucas, A. and Djati, A. W. (2007) 'The politics of environmental and water pollution in east Java', in

Boomgaard, P. (ed.) *A world of water: rain, rivers and seas in Southeast Asian histories*. KITLV Press, pp. 321–351.

Maichal and Urbanus, C. B. (2014) 'Karakteristik Bureaucratic Entrepreneur pada Walikota Surabaya - Characteristics of Bureucratic Entrepreneurs in Surabaya's Mayor', *Journal of Entrepreneur and Entrepreneurship*, 3(2), pp. 107–118.

Malovics, G., Nagypal Csigene, N. and Kraus, S. (2008) 'The role of corporate social responsibility in strong sustainability', *The Journal of Socio-Economics*, 37, pp. 907–918. doi: 10.1016/j.socec.2006.12.061.

Marcus, L. and Colding, J. (2014) 'Toward an integrated theory of spatial morphology and resilient urban systems', *Ecology and Society*, 19(4). doi: 10.5751/ES-06939-190455.

Markard, J., Raven, R. and Truffer, B. (2012) 'Sustainability transitions: An emerging field of research and its prospects', *Research Policy*. Elsevier B.V., 41(6), pp. 955–967. doi: 10.1016/j.respol.2012.02.013.

Markard, J. and Truffer, B. (2008) 'Technological innovation systems and the multi-level perspective: Towards an integrated framework', *Research Policy*, 37(4), pp. 596–615. doi: 10.1016/j.respol.2008.01.004.

Marlow, D. R., Müller, N. A. and Moglia, M. (2017) 'The role of business models and transitional pressures in attaining sustainable urban water management', *Urban Water Journal*. Taylor & Francis, 14(8), pp. 868–875. doi: 10.1080/1573062X.2016.1254258.

Martela, F. (2015) 'Fallible Inquiry with Ethical Ends-in-View: A Pragmatist Philosophy of Science for Organizational Research', *Organization Studies*, 36(4), pp. 537–563. doi: 10.1177/0170840614559257.

Mays, N., Roberts, E. and Popay, J. (2001) 'Synthesising research evidence', in Fulop, N. et al. (eds) *Methods for studying the delivery and organisation of health services*. London: Routledge.

Mazepus, H. (2017) 'What makes political authorities legitimate? Students' ideas about legitimacy in five European democracies and hybrid regimes', *Contemporary Politics*. Taylor & Francis, 23(3), pp. 306–327. doi: 10.1080/13569775.2017.1306762.

McDonald, G. (2000) 'Cross-cultural methodological issues in ethical research', *Journal of Business Ethics*, 27(1), pp. 89–104.

McMillen, H., Ticktin, T. and Springer, H. K. (2017) 'The future is behind us: traditional ecological knowledge and resilience over time on Hawai'i Island', *Regional Environmental Change*. Springer Berlin Heidelberg, 17(2), pp. 579–592. doi: 10.1007/s10113-016-1032-1.

Mealy, P. and Hepburn, C. (2020) 'Transformational change: parallels for addressing climate and development goals', in Chichilnisky, G. and Rezai, A. (eds) *Handbook on the Economics of Climate Change*. Edward Elgar Publishing, pp. 397–419. doi: 10.4337/9780857939067.00025.

Mebratu, D. (1998) 'Sustainability and sustainable development: Historical and conceptual review', *Environmental Impact Assessment Review*, 18(6), pp. 493–520. doi: 10.1016/S0195-9255(98)00019-5.

Meijerink, S. and Huitema, D. (2010) 'Policy Entrepreneurs and Change Strategies: Lessons from Sixteen

Case', *Ecology and Society*, 15(2).

Metropolis (2019) *Solutions for and by cities*.

Meyer, K. E. (2018) 'Catch-Up and Leapfrogging: Emerging Economy Multinational Enterprises on the Global Stage', *International Journal of the Economics of Business*. Routledge, 25(1), pp. 19–30. doi: 10.1080/13571516.2017.1374624.

Miles, M., Huberman, M. and Saldaña, J. (2014) *Qualitative Data Analysis: A Methods Sourcebook*. 3rd Ed. Sage Publications Inc. doi: 10.1192/bjp.111.479.1009-a.

Miller, M. A. (2013) 'Decentralizing Indonesian City Spaces as New "Centers"', *International Journal of Urban and Regional Research*, 37(3), pp. 834–848. doi: 10.1111/j.1468-2427.2013.01209.x.

Milukas, M. V. (1993) 'Energy for secondary cities. The case of Nakuru, Kenya', *Energy Policy*, 21(5), pp. 543–558. doi: 10.1016/0301-4215(93)90040-M.

Minkov, M. (2013) *Cross-cultural analysis : the science and art of comparing the world's modern societies and their cultures*. Sage Publications Inc. doi: 10.1192/bjp.111.479.1009-a.

Mitlin, D. and Satterthwaite, D. (2007) 'Strategies for grassroots control of international aid', *Environment & Urbanization*, 19(2), pp. 483–500. doi: 10.1177/0956247807082831.

Mody, A. and Sherman, R. (1990) 'Leapfrogging in Switching Systems', *Technological Forecasting & Social Change*, 37, pp. 77–83.

Moglia, M. *et al.* (2018) 'Urban transformation stories for the 21st century: Insights from strategic conversations', *Global Environmental Change*. Elsevier Ltd, 50(August 2017), pp. 222–237. doi: 10.1016/j.gloenvcha.2018.04.009.

Moore, A. M., Riddell, D. and Vocisano, D. (2015) 'Scaling Out, Scaling Up, Scaling Deep: Strategies of Non-profits in Advancing Systemic Social Innovation', *The Journal of Corporate Citizenship*, (58).

Moore, J. E. *et al.* (2017) 'Developing a comprehensive definition of sustainability', *Implementation Science*. Implementation Science, 12(110), pp. 1–9. doi: 10.1186/s13012-017-0637-1.

Moore, M.-L. *et al.* (2014) 'Water policy reform and innovation: A systematic review', *Environmental Science & Policy*. Elsevier Ltd, 38, pp. 263–271. doi: 10.1016/j.envsci.2014.01.007.

Morgan, D. L. (2007) 'Paradigms Lost and Pragmatism Regained: Methodological Implications of Combining Qualitative and Quantitative Methods', *Journal of Mixed Methods Research*, 1(1), pp. 48–76. doi: 10.1177/2345678906292462.

Moyo, L. and Mafuso, L. T. (2017) 'The effectiveness of foreign aid on economic development in developing countries: A case of Zimbabwe (1980-2000)', *Journal of Social Sciences*, 52(1–3), pp. 173–187. doi: 10.1080/09718923.2017.1305554.

Muchadenyika, D. and Waiswa, J. (2018) 'Policy , politics and leadership in slum upgrading : A comparative

analysis of Harare and Kampala', *Cities*. Elsevier, 82, pp. 58–67. doi: 10.1016/j.cities.2018.05.005.

Murphy, J. T. (2001) 'Making the energy transition in rural East Africa: Is leapfrogging an alternative?', *Technological Forecasting and Social Change*, 68(2), pp. 173–193. doi: 10.1016/S0040-1625(99)00091-8.

Mustofa, A. *et al.* (2016) 'Role of Stakeholders and Corporate Social Responsibility (CSR): Shortcomings on the Implementation of a Governance-Perspective Based CSR in Indonesia', *International Journal of Management and Administrative Sciences*, 3(05), pp. 35–45.

Naber, R. *et al.* (2017) 'Scaling up sustainable energy innovations', *Energy Policy*. Elsevier Ltd, 110(July 2017), pp. 342–354. doi: 10.1016/j.enpol.2017.07.056.

Naik, M. (2014) 'Greening the kampung: a small but vital step towards sustainable development in Surabaya', *Asia Development Dialogue*, July, pp. 1–7.

Nasution, A. (2016) *Government decentralization program in Indonesia*. 601. Tokyo.

Nawrot, K. A. (2014) 'The role of innovation in development – experiences in leapfrogging and catching up through regional clustering: East Asian perspective', *Actual Problems of Economics*, 161(11), pp. 73–82.

Neuman, L. W. (2011) *Social Research Methods: Qualitative and Quantitative Approaches*. 7th ed. USA: Pearson Education Limited.

Nevens, F. *et al.* (2013) 'Urban Transition Labs: Co-creating transformative action for sustainable cities', *Journal of Cleaner Production*. Elsevier Ltd, 50, pp. 111–122. doi: 10.1016/j.jclepro.2012.12.001.

Newell, P. and Mulvaney, D. (2013) 'The political economy of the "just transition"', *Geographical Journal*, 179(2), pp. 132–140. doi: 10.1111/geoj.12008.

Newell, P. and Phillips, J. (2016) 'Neoliberal energy transitions in the South: Kenyan experiences', *Geoforum*, 74, pp. 39–48. doi: 10.1016/j.geoforum.2016.05.009.

Newton, P. W. and Rogers, B. C. (2020) 'Transforming built environments: Towards carbon neutral and blue-green cities', *Sustainability (Switzerland)*, 12(11), pp. 1–25. doi: 10.3390/su12114745.

Nielsen, J. and Farrelly, M. A. (2019) 'Conceptualising the built environment to inform sustainable urban transitions', *Environmental Innovation and Societal Transitions*. Elsevier. doi: 10.1016/j.eist.2019.07.001.

Novalia, W. *et al.* (2018) 'A preliminary diagnostic framework of strategic agency : operationalising complex interrelationships of agency and structure in urban water sector', *Environmental Science and Policy*. Elsevier, 83(February), pp. 1–15. doi: 10.1016/j.envsci.2018.02.004.

Novalia, W. (2018) *Diagnosing the scope of action for governing sustainable transformation in developing cities*. Monash University.

Novalia, W. *et al.* (2020) 'Transformative agency in co-producing sustainable development in the urban south', *Cities*. Elsevier, 102, pp. 1–14. doi: 10.1016/j.cities.2020.102747.

Novenanto, A. (2019) 'Kota Sebagai Ruang Terbuka: Belajar Dari Waduk Sepat, Surabaya - City as public sphere: learnings from reservoir Sepat, Surabaya', *Jurnal Agraria dan Pertanahan*, 5(2), pp. 1–9.

Nugrahani, W. P., Saleh, S. M. and Ribawanto, H. (2012) 'Implementasi program rehabilitasi sosial daerah kumuh Kota Surabaya', *Jurnal Administrasi Publik*, 1(4), pp. 144–149.

Nurul, I. (2016) *Public – private – community partnerships : A case of Unilever's corporate social responsibility in Surabaya, Indonesia*. University of Malasya.

O'Donnell, E. C., Lamond, J. E. and Thorne, C. R. (2017) 'Recognising barriers to implementation of Blue-Green Infrastructure: a Newcastle case study', *Urban Water Journal*. Taylor & Francis, 14(9), pp. 964–971. doi: 10.1080/1573062X.2017.1279190.

OECD (2011) *How's life?: Measuring well-being*. OECD Publishing. doi: 10.1787/9789264121164-en.

Ojo, T. (2014) 'Global agenda and ICT4D in Africa: Constraints of localizing "universal norm"', *Telecommunications Policy*, 40(7), pp. 704–713.

Oppong, S. H. (2013) 'The problem of sampling in qualitative research', *Asian Journal of Management Sciences and Education*, 2(2), pp. 202–210. Available at: http://www.ajmse.leena-luna.co.jp.

Ostojic, D. R. *et al.* (2013) 'Surabaya, Indonesia', in *Energizing green cities in Southeast Asia: applying sustainable urban energy and emissions planning*. Washington, D.C.: The World Bank, pp. 139–156. doi: 10.1596/978-0-8213-9837-1.

Oxfam (2017) *An economy for the 99%*. Available at: https://www.oxfam.org/sites/www.oxfam.org/files/file_attachments/bp-economy-for-99-percent-160117-en.pdf.

Öztekin, E. E. and Gaziulusoy, A. İ. (2019) 'Designing Transitions Bottom-up: The agency of design in formation and proliferation of niche practices', *Design Journal*, 22(sup1), pp. 1659–1674. doi: 10.1080/14606925.2019.1594999.

Padawangi, R. (2013) 'The Cosmopolitan Grassroots City as Megaphone: Reconstructing Public Spaces through Urban Activism in Jakarta', *International Journal of Urban and Regional Research*, 37(3), pp. 849–863. doi: 10.1111/j.1468-2427.2013.01210.x.

Padawangi, R. (2014) 'Reform, resistance and empowerment: constructing the public city from the grassroots in Jakarta, Indonesia', *International Development Planning Review*, 36(1), pp. 33–50. doi: 10.3828/idpr.2014.3.

Pamungkas, A. *et al.* (2017) 'A Conceptual Model for Water Sensitive City in Surabaya', *IOP Conf. Series: Earth and Environmental Science*, 79, pp. 1–8. doi: 10.1088/1755-1315/.

Pangare, G. *et al.* (2013) *Water Wealth? Investing in Basin Management in Asia and the Pacific*.

Patton, M. Q. (2015) *Qualitative research and evaluation methods*. 4th Ed. Sage Publications Inc.

Paul, D. (1975) *Technical choice innovation and economic growth*. Cambridge: Cambridge University Press.

PDAM Surabaya (2017) *Number of annual customers*. Surabaya, Indonesia. Available at: https://www.pdam-sby.go.id/page.php?get=jumlah_pelanggan_tahunan&bhs=1 (Accessed: 25 October 2017).

Pedersen Zari, M. *et al.* (2019) 'Utilising nature-based solutions to increase resilience in Pacific Ocean Cities', *Ecosystem Services*. Elsevier B.V., 38, pp. 1–10. doi: 10.1016/j.ecoser.2019.100968.

Perez, C. and Soete, L. (1988) 'Catching up in technology: entry barriers and windows of opportunity', in Dosi, G. et al. (eds) *Technical Change and Economic Theory*. London: Pinter Publishers, pp. 458–479.

Perkins, R. (2003) 'Environmental leapfrogging in developing countries: A critical assessment and reconstruction', *Natural Resources Forum*, 27, pp. 177–188. doi: 10.1111/1477-8947.00053.

Perkins, R. and Neumayer, E. (2009) 'Transnational linkages and the spillover of environment-efficiency into developing countries', *Global Environmental Change*, 19(3), pp. 375–383. doi: 10.1016/j.gloenvcha.2009.05.003.

Pertamina (2018) *Corporate governance guidelines*. Available at: https://www.pertamina.com/id/tanggung-jawab-sosial-perusahaan (Accessed: 18 February 2018).

Peters, R. (2013) *Surabaya, 1945-2010: Neighbourhood, State and Economy in Indonesia's City of Struggle*. Singapore: NUS Press Pte Ltd.

Pospieszna, P. (2018) *Democracy assistance bypassing governments in recipient countries*. New York: Routledge. doi: 10.4324/9781315179681-3.

Poustie, M. S. *et al.* (2014) 'Sustainable urban water futures in developing countries: the centralised, decentralised or hybrid dilemma', *Urban Water Journal*, (April 2015), pp. 1–16. doi: 10.1080/1573062X.2014.916725.

Poustie, M. S., Frantzeskaki, N. and Brown, R. R. (2016) 'A transition scenario for leapfrogging to a sustainable urban water future in Port Vila , Vanuatu', *Technological Forecasting & Social Change*. Elsevier Inc., 105, pp. 129–139. doi: 10.1016/j.techfore.2015.12.008.

Prabowo, H. Y., Sriyana, J. and Syamsudin, M. (2018) 'Forgetting corruption: unlearning the knowledge of corruption in the Indonesian public sector', *Journal of Financial Crime*, 25(1), pp. 28–56. doi: 10.1108/JFC-07-2016-0048.

Pramusinto, A. and Purwanto, E. A. (2018) 'Case Study 2: Toward Surabaya Cyber City: From GRMS to e-Sapawarga (2004-2014)', in Hirose Nishihara, A. et al. (eds) *Knowledge Creation in Public Administrations, Innovative Government in Southeast Asia and Japan*. Springer International Publishing, pp. 55–83. doi: 10.1007/978-3-319-57478-3.

Prasad, K. (2018) *Communication, Culture and Ecology: Rethinking Sustainable Development in Asia*. Edited by K. Prasad. Singapore: Springer.

Prihandrijanti, M., Malisie, A. and Otterpohl, R. (2008) 'Cost–Benefit Analysis for Centralized and Decentralized Wastewater Treatment System (Case Study in Surabaya-Indonesia)', *Efficient Management of*

Wastewater: Its Treatment and Reuse in Water-Scarce Countries, pp. 259–268. doi: 10.2175/193864706783761194.

Pusdakota (2013) 'Center for Urban Community Empowerment'. Universitas Surabaya, p. 1.

Puspitasari, D. (2016) 'Surabaya sebagai kota adipura pada masa kepemimpinan poernomo kasidi pada tahun 1984 – 1994', *Avatara*, 4(2), pp. 373–387.

Puspitasari, L. and Ishii, K. (2016) 'Digital divides and mobile Internet in Indonesia: Impact of smartphones', *Telematics and Informatics*. Elsevier Ltd, 33(2), pp. 472–483. doi: 10.1016/j.tele.2015.11.001.

Quibria, M. G. (2014) 'Aid effectiveness: Research, policy and unresolved issues', *Development Studies Research*, 1(1), pp. 75–87. doi: 10.1080/21665095.2014.922890.

Quitzau, M. *et al.* (2013) 'Sustainable urban regime adjustments', *Journal of Cleaner Production*. Elsevier Ltd, 50, pp. 140–147. doi: 10.1016/j.jclepro.2012.11.042.

Van Raak, R. (2016) *Transition Policies: Connecting System Dynamics, Governance and Instruments in an Application to Dutch Healthcare*. Erasmus University Rotterdam.

Radyati, M. R. (2014) 'CSR dan Mata Pencarian Berkelanjutan (CSR and the Sustainable Search)', in *Sustainable Business and Corporate Social Responsibility (CSR)*. CECT Trisakti University Indonesia, pp. 25–29.

Ramdhani, F. (2010) *Inspirasi Dari Timur Jawa: Sebuah Perjalanan Menuju Surabaya Bersih dan Hijau*. Jakarta.

Ramdhoni, S., Rushayati, S. B. and Prasetyo, L. B. (2016) 'Open Green Space Development Priority Based on Distribution of air Temperature Change in Capital City of Indonesia, Jakarta', *Procedia Environmental Sciences*. Elsevier B.V., 33, pp. 204–213. doi: 10.1016/j.proenv.2016.03.071.

Ramos-Mejía, M., Franco-Garcia, M. L. and Jauregui-Becker, J. M. (2018) 'Sustainability transitions in the developing world: Challenges of socio-technical transformations unfolding in contexts of poverty', *Environmental Science and Policy*. Elsevier, 84, pp. 217–223. doi: 10.1016/j.envsci.2017.03.010.

Rauschmayer, F. and Lessmann, O. (2013) 'The Capability Approach and Sustainability', *Journal of Human Development and Capabilities*, 14(1), pp. 1–5. doi: 10.1080/19452829.2012.751744.

Raven, R. (2007) 'Niche accumulation and hybridisation strategies in transition processes towards a sustainable energy system: An assessment of differences and pitfalls', *Energy Policy*, 35, pp. 2390–2400. doi: 10.1016/j.enpol.2006.09.003.

Raven, R., Schot, J. and Berkhout, F. (2012) 'Environmental Innovation and Societal Transitions Space and scale in socio-technical transitions', *Environmental Innovation and Societal Transitions*. Elsevier B.V., 4, pp. 63–78. doi: 10.1016/j.eist.2012.08.001.

Remigios, M. V. and Reckson, T. D. (2018) 'Energy leapfrogging in developing countries a reality or pipedream: The case of Chiwundura Communal Area in Zimbabwe', *Journal of Human Ecology*, 64(1–3), pp. 1–9. doi: 10.31901/24566608.2018/64.1-3.3131.

Reut Institute (2009) *ISRAEL 15 Vision: Principles and Guidelines for Achieving a Socioeconomic Leapfrog*. Israel.

Available at: https://www.reutgroup.org/Publications/ISRAEL-15-Vision%3A-Principles-and-Guidelines-for-Achieving-a-Socioeconomic-Leapfrog-.

Rip, A. and Kemp, R. (1998) 'Technological change', in Rayner, S. and Malone, E. (eds) *Human Choice and Climate Change*. Columbus: Battelle Press, pp. 327–399. doi: 10.1007/BF02887432.

Roberts, B. H. (2014) *Managing Systems of Secondary Cities: Policy Responses in International Development*. Brussels, Belgium: Cities Alliance. Available at: http://www.citiesalliance.org/node/4978.

Robertson, T. *et al.* (2012) 'Knowing our users: Scoping interviews in design research with ageing participants', in *Proceedings of the 24th Australian Computer-Human Interaction Conference, OzCHI 2012*, pp. 517–520. doi: 10.1145/2414536.2414616.

Rock, M. *et al.* (2009) 'A hard slog, not a leap frog: Globalization and sustainability transitions in developing Asia', *Technological Forecasting and Social Change*. Elsevier Inc., 76(2), pp. 241–254. doi: 10.1016/j.techfore.2007.11.014.

Rock, M. T. (2003) *The Politics of Development Policy and Development Policy Reform in New Order Indonesia*. Michigan.

Rockstr, J., Lannerstad, M. and Falkenmark, M. (2007) 'Assessing the water challenge of a new green revolution in developing countries', *National Academy of Sciences*, 104(15), pp. 6253–6260. doi: 10.1073/pnas.0605739104.

Rohracher, H. (2015) 'Science and Technology Studies, History of', *International Encyclopedia of the Social & Behavioral Sciences: Second Edition*, pp. 200–205. doi: 10.1016/B978-0-08-097086-8.03064-6.

Rolalisasi, A. (2006) *Community Participation in Slum Upgrading Programme*.

Romero-Lankao, P. *et al.* (2016) 'Urban sustainability and resilience: From theory to practice', *Sustainability*, 8(1224), pp. 1–19. doi: 10.3390/su8121224.

Romijn, H. A. and Caniëls, M. C. J. (2011) 'Pathways of Technological Change in Developing Countries: Review and New Agenda', *Development Policy Review*, 29(3), pp. 359–380.

Rondinelli, D. A. (1986) 'Metropolitan growth and secondary cities development policy', *Habitat International*, 10(1–2), pp. 263–271. doi: 10.1016/0197-3975(86)90029-9.

Rosemarin, A. (2005) 'Sustainable sanitation and water in small urban centres.', *Water science and technology : a journal of the International Association on Water Pollution Research*, 51(8), pp. 109–18. Available at: http://www.ncbi.nlm.nih.gov/pubmed/16007935.

Rosenberg, N. (1976) *Perspectives on Technology*. Cambridge: Cambridge University Press. doi: 10.1086/352309.

Rotmans, J. (2005) *Societal Innovation: between dream and reality lies complexity*. Inaugural, *Inaugural Addresses Research in Management Series*. Inaugural. Rotterdam: ERIM, Erasmus Research Institute of Management. Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=878564.

Rotmans, J., Kemp, R. and Asselt, M. van (2001) 'More evolution than revolution: transition management in

public policy', *foresight*, pp. 15–31. doi: 10.1108/14636680110803003.

Rousseva, R. (2008) 'Identifying technological capabilities with different degrees of coherence: The challenge to achieve high technological sophistication in latecomer software companies (based on the Bulgarian case)', *Technological Forecasting & Social Change*, 75, pp. 1007–1031.

Rowe, P. G. and Kan, H. Y. (2014) *Urban intensities: contemporary housing types and territories*. Basel: Birkhäuser.

Safarzyńska, K., Frenken, K. and Van Den Bergh, J. C. J. M. (2012) 'Evolutionary theorizing and modeling of sustainability transitions', *Research Policy*, 41(6), pp. 1011–1024. doi: 10.1016/j.respol.2011.10.014.

Salim, W. and Drenth, M. (2020) 'Local Governance and Access to Urban Services: Political and Social Inclusion in Indonesia', in Cheema, S. (ed.) *Governance for Urban Services: Access, Participation, Accountability, and Transparency*. Singapore: Springer, pp. 153–184.

Santosa, H. (2000) 'Environmental management in Surabaya with reference to National Agenda 21 and the social safety net programme', *Environment and Urbanization*, 12(2), pp. 175–184.

Santosa, H., Faqih, M. and Cahyadini, S. (2010) 'Comprehensive Kampung Improvement Programme to Support Better Settlement and Poverty Reduction', in *18th CIB World Building Congress*. United States, pp. 32–42.

Sarabhai, K. and Vyas, P. (2017) 'The leapfrogging opportunity: The role of education in sustainable development and climate change mitigation', *European Journal of Education*, 52(4), pp. 427–436. doi: 10.1111/ejed.12243.

Sarosa, W. (2007) *Third Party Evaluator's Opinion on Surabaya Urban Development Project*. Indonesia.

Sauter, R. and Watson, J. (2008) *Technology leapfrogging: A review of the evidence: A report for DFID, Tyndal Center for Climate Change Report*.

Schäfer, A. I., Hughes, G. and Richards, B. S. (2014) 'Renewable energy powered membrane technology: A leapfrog approach to rural water treatment in developing countries?', *Renewable and Sustainable Energy Reviews*. Elsevier, 40, pp. 542–556. doi: 10.1016/j.rser.2014.07.164.

Scholz, R. W. and Tierje, O. (2002) *Embedded case study methods: integrating quantitative and qualitative knowledge*. SAGE Publications.

Schot, J. and Geels, F. W. (2008) 'Strategic niche management and sustainable innovation journeys: theory, findings, research agenda, and policy', *Technology Analysis & Strategic Management*, 20(5), pp. 537–554. doi: 10.1080/09537320802292651.

Schot, J., Kanger, L. and Verbong, G. (2016) 'The roles of users in shaping transitions to new energy systems', *Nature Energy*, 1(5), pp. 1–7. doi: 10.1038/nenergy.2016.54.

Schot, J. and Steinmueller, W. E. (2018) 'Three frames for innovation policy: R&D, systems of innovation and transformative change', *Research Policy*, 47, pp. 1554–1567. doi: 10.1016/j.respol.2018.08.011.

Schroeder, P. and Anantharaman, M. (2017) '"Lifestyle Leapfrogging" in Emerging Economies: Enabling Systemic Shifts to Sustainable Consumption', *Journal of Consumer Policy*. Journal of Consumer Policy, 40(1), pp. 3–23. doi: 10.1007/s10603-016-9339-3.

Schroeder, P. M. and Chapman, R. B. (2014) 'Renewable energy leapfrogging in China's urban development? Current status and outlook', *Sustainable Cities and Society*. Elsevier B.V., 11, pp. 31–39. doi: 10.1016/j.scs.2013.11.007.

Scoones, I., Leach, M. and Newell, P. (2015) 'The politics of green transformations', in Scoones, I., Leach, M., and Newell, P. (eds) *The politics of green transformations: Pathways to sustainability*. Oxon/New York: Routledge.

Sengers, F., Wieczorek, A. J. and Raven, R. (2019) 'Experimenting for sustainability transitions: A systematic literature review', *Technological Forecasting and Social Change*. Elsevier Inc., 145, pp. 153–164. doi: 10.1016/j.techfore.2016.08.031.

Septanti, D. (2016) 'The empowerment of community by C-KIP to improve the slums', *Architecture and Environment*, 15(1), pp. 53–62.

Setiowati, R., Hasibuan, H. S. and Koestoer, R. H. (2018) 'Green open space masterplan at Jakarta Capital City, Indonesia for climate change mitigation', *IOP Conference Series: Earth and Environmental Science*, 200, pp. 1–8. doi: 10.1088/1755-1315/200/1/012042.

Seyfang, G. and Longhurst, N. (2016) 'What influences the diffusion of grassroots innovations for sustainability? Investigating community currency niches', *Technology Analysis and Strategic Management*. Taylor & Francis, 28(1), pp. 1–23. doi: 10.1080/09537325.2015.1063603.

Seyfang, G. and Smith, A. (2007) 'Grassroots innovations for sustainable development: Towards a new research and policy agenda', *Environmental Politics*, 16, pp. 584–603. doi: 10.1080/09644010701419121.

Shah, T., Makin, I. and Sakthivadivel, R. (2000) 'Three limits to leapfrogging: Issues in transposing successful river basin management institutions in the developing World', *Integrated Water Management in Water-Stressed River Basins in Developing Countries: Strategies for Poverty Alleviation and Agricultural Growth*, pp. 89–114.

Sharif, N. (1989) 'Technological Leapfrogging: Implications for Developing Countries', *Technological Forecasting & Social Change*, 36, pp. 201–208.

Sharif, N. (1992) 'Technological dimensions of international cooperation and sustainable development', *Technological Forecasting and Social Change*, 42, pp. 367–383. doi: 10.1016/0040-1625(92)90080-D.

Sharifi, A. and Yamagata, Y. (2018) 'Resilience-Oriented Urban Planning: Theoretical and Empirical Insights', in Yamagata, Y. and Sharifi, A. (eds) *Resilience-Oriented Urban Planning:* Springer, pp. 3–27.

Shirleyana, Hawken, S. and Riza Yosia, S. (2018) 'City of Kampung: risk and resilience in the urban communities of Surabaya, Indonesia', *International Journal of Building Pathology and Adaptation*, (October). doi: 10.1108/IJBPA-02-2018-0025.

Shirleyana, S. and Sari, A. A. (2012) 'The emergence of informal riverside settlements and challenges for planning: The case of Kali Mas in Surabaya, Indonesia', in *3rd International Seminar on Tropical Eco-settlements*. Research Institute for Human Settlements, pp. 137–148.

Shirleyana and Sari, A. A. (2012) 'Lively riverfront space for community: Challenges for Kalimas River redevelopment plan of Surabaya', in *Planocosmo International Seminar*, pp. 105–115.

Shove, E., Pantzar, M. and Watson, M. (2012) *The Dynamics of Social Practice: Everyday Life and How It Changes*. London: SAGE Publications.

Silas, J. (1988) *The kampungs of Surabaya*. Surabaya, Indonesia: Municipal Government of Surabaya.

Silas, J. (1989) 'Marginal settlements in Surabaya, Indonesia : problem or potential?', *Environment and Urbanization*, 1(2).

Silas, J. (1992) 'Government-community partnerships in kampung improvement programmes in Surabaya', *Environment and Urbanization*, 4(2), pp. 33–41.

Silas, J. *et al.* (2012) *The Kampungs of Surabaya entering the 21st century: Planning and revitalization of Surabaya kampungs*. Surabaya, Indonesia.

Silas, J., Santoso, H., *et al.* (2014) 'Revitalization of ex-Keputih landfill to a city park to support Surabaya towards Eco-City (D. Santoso, Trans.)', in *Simposium Nasional RAPI XIII-2014 FT UMS*, pp. 1–8.

Silas, J., Setyawan, W., *et al.* (2014) *Surabaya Green Spaces: Towards smart, human, and ecological metropolitan*. Surabaya, Indonesia.

Siswanto, V. K., Routray, J. K. and Dewi, R. (2014) 'Rural Urban Disparity in and around Surabaya', *The Journal for Technology and Science*, 25(2).

Slikkerveer, L. J. (2019) 'Gotong Royong: An Indigenous Institution of Communality and Mutual Assistance in Indonesia', in Slikkerveer, L. J., Baourakis, G., and Saefullah, K. (eds) *Integrated Community-Managed Development*. Switzerland: Springer Nature Switzerland, pp. 307–320. doi: 10.1007/978-3-030-05423-6_14.

Smil, V. (2016) 'Examining energy transitions: A dozen insights based on performance', *Energy Research and Social Science*. Elsevier Ltd, 22, pp. 194–197. doi: 10.1016/j.erss.2016.08.017.

Smith, A., Stirling, A. and Berkhout, F. (2005) 'The governance of sustainable socio-technical transitions', *Research Policy*, 34(10), pp. 1491–1510. doi: 10.1016/j.respol.2005.07.005.

Smith, A., Voß, J. P. and Grin, J. (2010) 'Innovation studies and sustainability transitions: The allure of the multi-level perspective and its challenges', *Research Policy*, 39(4), pp. 435–448. doi: 10.1016/j.respol.2010.01.023.

Smith, B. (2008) 'The origins of regional autonomy in Indonesia: Experts and the marketing of political interests', *Journal of East Asian Studies*, 8(2), pp. 211–234. Available at: https://www.jstor.org/stable/23418691?seq=1&cid=pdf-reference#references_tab_contents.

Soeastono, S. (2018) *A brief of Kampung Lawas Maspati*. Surabaya, Indonesia.

Soemarno, I. (2010) 'A "Simple" Solution Proposal for Riverbank Settlement Problems in Surabaya', *Environment and Urbanization Asia*, 1(2), pp. 209–222. doi: 10.1177/097542531000100207.

Soete, L. (1985) 'International Diffusion of Technology, Industrial Development and Technological Leapfrogging', *World Development*, 13(3), pp. 409–422.

Some, W., Hafidz, W. and Sauter, G. (2009) 'Renovation not relocation: The work of Paguyuban Warga Strenkali (PWS) in Indonesia', *Environment and Urbanization*, 21(2), pp. 463–475. doi: 10.1177/0956247809343766.

Sovacool, B. K. (2016) 'How long will it take? Conceptualizing the temporal dynamics of energy transitions', *Energy Research & Social Science*. Elsevier Ltd, 13, pp. 202–215. doi: 10.1016/j.erss.2015.12.020.

Sovacool, B. K. *et al.* (2019) 'The whole systems energy injustice of four European low-carbon transitions', *Global Environmental Change*. Elsevier Ltd, 58, pp. 1–15. doi: 10.1016/j.gloenvcha.2019.101958.

Sovacool, B. K. and Geels, F. W. (2016) 'Further reflections on the temporality of energy transitions: A response to critics', *Energy Research & Social Science*. Elsevier Ltd, 22, pp. 232–237. doi: 10.1016/j.erss.2016.08.013.

Sovacool, B. K. and Martiskainen, M. (2020) 'Hot transformations: Governing rapid and deep household heating transitions in China, Denmark, Finland and the United Kingdom', *Energy Policy*. Elsevier Ltd, 139, pp. 1–16. doi: 10.1016/j.enpol.2020.111330.

Späth, P. and Ornetzeder, M. (2017) 'From building small urban spaces for a car-free life to challenging the global regime of automobility: Cases from Vienna and Freiburg', in Frantzeskaki, N. et al. (eds) *Urban Sustainability Transitions*. Taylor & Francis Group, pp. 191–209. doi: 10.4324/9781315228389.

Spekkink, W. A. H. and Boons, F. A. A. (2016) 'The Emergence of Collaborations', *Journal of Public Administration Research and Theory*, 26(4), pp. 613–630. doi: 10.1093/jopart/muv030.

Squires, A. (2009) 'Methodological challenges in cross-language qualitative research: A research review', *International Journal of Nursing Studies*, 46, pp. 277–287. doi: 10.1016/j.ijnurstu.2008.08.006.

Squires, A., Sadarangani, T. and Jones, S. (2019) 'Strategies for overcoming language barriers in research', *Journal of Advanced Nursing*, pp. 1–9. doi: 10.1111/jan.14007.

Steinmueller, W. E. (2001) 'ICTs and the possibilities for leapfrogging by developing countries', *International Labour Review*, 140(2), pp. 193–210. doi: 10.1111/j.1564-913X.2001.tb00220.x.

Sticzay, N. and Koch, L. (2015) *Slum upgrading*. Available at: https://sustainabledevelopment.un.org/content/documents/5754Slum Upgrading.pdf.

Stirling, A. (2011) 'Pluralising progress: From integrative transitions to transformative diversity', *Environmental Innovation and Societal Transitions*. Elsevier B.V., 1, pp. 82–88. doi: 10.1016/j.eist.2011.03.005.

Suryaningsih, Werdiningsih, E. and Chrisdanty, F. (2018) 'The role of the Surabaya city goverment in optimizing green open space', *International Journal of Law*, 4(5), pp. 50–55.

Swanendri, M. N. (2002) 'Evaluation of the Kampung improvement program (KIP) and the comprehensive KIP, Surabaya, Indonesia', *Regional Development Dialogue*, 23(1), pp. 176–194.

Swilling, M., Musango, J. and Wakeford, J. (2016) 'Developmental states and sustainability transitions: Prospects of a just transition in South Africa', *Journal of Environmental Policy and Planning*. Taylor & Francis, 18(5), pp. 650–672. doi: 10.1080/1523908X.2015.1107716.

Swyngedouw, E. (2005) 'Governance Innovation and the Citizen : The Janus Face of Governance-beyond-the-State', *Urban Studies*, 42(11), pp. 1991–2006.

Szmytkie, R. (2021) 'The Cyclical Nature of the Territorial Development of Large Cities: A Case Study of Wrocław (Poland)', *Journal of Urban History*. SAGE Publications Inc, 47(4), pp. 771–793. doi: 10.1177/0096144219877866.

Tadaki, M., Sinner, J. and Chan, K. M. A. (2017) 'Making sense of environmental values: a typology of concepts', *Ecology and Society*, 22(1). doi: https://doi.org/10.5751/ES-08999-220107.

Tan, B., Ng, E. and Jiang, J. (2018) 'The process of Technology Leapfrogging : Case analysis of the national ICT infrastructure development journey of Azerbaijan', *International Journal of Information Management*. Elsevier, 38(1), pp. 311–316. doi: 10.1016/j.ijinfomgt.2017.10.008.

Tan, P. Y. and Jim, C. Y. (2017) *Greening Cities: Forms and Functions, Advances in 21st Century Human Settlements*. Edited by P. Y. Tan and C. Y. Jim. Singapore: Springer Nature.

Tanu, D. and Parker, L. (2018) 'Fun, "family", and friends Developing pro-environmental behaviour among high school students in Indonesia', *Indonesia and the malay world*, 46(136), pp. 303–324. doi: 10.1080/13639811.2018.1518015.

Taylor, a. C. (2009) 'Sustainable urban water management: understanding and fostering champions of change', *Water Science and Technology*, 59(5), pp. 883–891. doi: 10.2166/wst.2009.033.

Taylor, A. *et al.* (2011) 'An investigation of champion-driven leadership processes', *Leadership Quarterly*. Elsevier Inc., 22(2), pp. 412–433. doi: 10.1016/j.leaqua.2011.02.014.

Taylor, J. (2015) 'A tale of two cities: comparing alternative approaches to reducing the vulnerability of riverbank communities in two Indonesian cities', *Environment and Urbanization*, 27(2), pp. 621–636. doi: 10.1177/0956247815594532.

Telkom (2018) *Program CSR, Telkom Indonesia*. Available at: https://www.telkom.co.id/servlet/tk/about/id_ID/stockdetail/program-csr.html (Accessed: 20 January 2018).

Temper, L. *et al.* (2018) 'A perspective on radical transformations to sustainability: resistances, movements

and alternatives', *Sustainability Science*. Springer Japan, 13(3), pp. 747–764. doi: 10.1007/s11625-018-0543-8.

Temple, B. and Young, A. (2004) 'Qualitative Research and Translation Dilemmas', *Qualitative Research*, 4(2), pp. 161–178. doi: Article.

Tosics, I. (2004) 'European urban development: Sustainability and the role of housing', *Journal of Housing and the Built Environment*, 19, pp. 67–90. doi: 10.1023/B:JOHO.0000017707.53782.90.

Truffer, B. *et al.* (2010) 'Local strategic planning processes and sustainability transitions in infrastructure sectors', *Environmental Policy and Governance*, 20(4), pp. 258–269. doi: 10.1002/eet.550.

Truffer, B. and Coenen, L. (2012) 'Environmental Innovation and Sustainability Transitions in Regional Studies', *Regional Studies*, 46(1), pp. 1–21. doi: 10.1080/00343404.2012.646164.

Truffer, B., Murphy, J. T. and Raven, R. (2015) 'The geography of sustainability transitions: Contours of an emerging theme', *Environmental Innovation and Societal Transitions*, 17, pp. 63–72. doi: 10.1016/j.eist.2015.07.004.

Tukker, A. (2005) 'Leapfrogging into the future: developing for sustainability', *International Journal of Innovation and Sustainable Development*, 1(1/2), p. 65. doi: 10.1504/IJISD.2005.008087.

Turner, J. C. (1967) 'Barriers and Channels for Housing Development in Modernizing Countries', *Journal of the American Institute of Planners*, 33(3), pp. 167–181. doi: 10.1080/01944366708977912.

Turner, J. C. (1988) 'Kampung Banyu Urip, Surabaya. Indonesians participate in inner-city settlement improvement', in Turner, B. (ed.) *Building Community: a third world case book*. London: Building Community Books, pp. 67–74.

Turner, J. C. and Fichter, R. (1972) *Freedom to build: Dweller control of the housing process*. New York: The Macmillan Company.

Tuti, R. W. and Adawiyah, S. El (2020) 'Tri Rismaharani' s leadership as Surabaya mayor depicts an effective bureaucracy model', *Journal of Political Communication Science and Business Communication*, 4(1), pp. 73–82.

UN-HABITAT (2008) *Green and clean initiative*, *Best Practice*. Available at: http://mirror.unhabitat.org/bp/bp.list.details.aspx?bp_id=1217 (Accessed: 17 June 2019).

UN-HABITAT (2014) *A Practical Guide to Designing, Planning, and Executing Citywide Slum Upgrading Programmes*.

UN-HABITAT (2016a) *SLUM ALMANAC 2015-2016: Tracking improvement in the lives of slum dwellers*.

UN-HABITAT (2016b) *World Cities Report 2016: Urbanization and Development – Emerging Futures*. Nairobi. doi: 10.1016/S0264-2751(03)00010-6.

UN-HABITAT (2017) *Human Rights in Cities Handbook Series Volume I The Human Rights Based Approach to Housing and Slum Upgrading*. Nairobi.

UN-HABITAT (2018) *Best Practices*. Available at: https://unhabitat.org/urban-knowledge/best-practices/ (Accessed: 20 June 2019).

UN-HABITAT (2020) *Indicator 11.1.1: Proportion of urban population living in slums, informal settlements or inadequate housing*, *SDG Indicators: Metadata repository*. doi: 10.1007/978-94-017-8905-9_300375.

UN Women (2018a) *Making every woman and girl count - 2017 Annual Report*.

UN Women (2018b) *UN Women Annual Report 2017-2018*, *UN Women*. Available at: http://www2.unwomen.org/-/media/annual report/attachments/sections/library/un-women-annual-report-2017-2018-en.pdf?vs=2849.

UNCTAD (2018a) *Leapfrogging: Look before you leap*. United Nations.

UNCTAD (2018b) *Technology and Innovation Report 2018: Harnessing Frontier Technologies for Sustainable Development*, *Advances in Computer Vision and Pattern Recognition*. Switzerland. doi: 10.1007/978-1-4471-6699-3_9.

UNDP (2012) 'Jakarta, Indonesia. Case Study (Water)', pp. 1–9. Available at: http://www.esc-pau.fr/ppp/documents/featured_projects/indonesia.pdf.

UNDP (2014a) *Anti-corruption Strategies: Understanding what works, what doesn't and why?* Thailand.

UNDP (2014b) *Human Development Report 2014*.

UNESCO (2012) *Culture: a driver and an enabler of sustainable development*.

UNESCO (2014) *Green School Asia*. Jakarta, Indonesia.

UNESCO (2020) *Sustainable Development*. Available at: https://en.unesco.org/themes/education-sustainable-development/what-is-esd/sd (Accessed: 17 December 2020).

Unilever (2018) *Environment programme*, *Unilever Indonesia*. Available at: https://www.unilever.co.id/en/about/unilever-indonesia-foundation/environment-programme.html (Accessed: 12 May 2018).

United Nations (1987) *Report of the World Commission on Environment and Development: Our common future*. Oslo, Norway. doi: 10.1080/07488008808408783.

United Nations (2003) *The Challenge of Slums: Global Report on Human Settlements 2003*.

United Nations (2013) *World Economic and Social Survey 2013*, *New York: Department for Economic and Social Affairs*. New York. Available at: http://esa.un.org/wpp/documentation/pdf/WPP2012_ KEY FINDINGS.pdf.

United Nations (2015) *Transforming our world: the 2030 Agenda for Sustainable Development*, *A/RES/70/1*. Available at: https://www.globalamalen.se/.

United Nations (2017) *Principles and recommendations for population and housing censuses - Revision 3*.

United Nations (2018) *Ending Poverty*, *Global Issues Overview*. doi: 10.2139/ssrn.3297397.

United Nations (2019a) *The Future is Now: Science for Achieving Sustainable Development*.

United Nations (2019b) *The Sustainable Development Goals Report*.

United Nations (2019c) *World Urbanization Prospects: The 2018 Revision*. New York.

United Nations (2019d) *World Urbanization Prospects 2018, Highlights*, *ST/ESA/SER.A/421*. New York. Available at: https://population.un.org/wup/.

Unruh, G. C. and Carrillo-Hermosilla, J. (2006) 'Globalizing carbon lock-in', *Energy Policy*, 34(10), pp. 1185–1197. doi: 10.1016/j.enpol.2004.10.013.

Unruh, G. C. and Einstein, A. (2000) 'Understanding carbon lock-in', *Energy Policy*, 28, pp. 817–830. doi: 10.1016/S0301-4215(00)00070-7.

Urban Redevelopment Authority (2018) *Lee Kuan Yew World City Prize Laureates 2018 Special Mention: Surabaya*. Singapore. Available at: https://www.leekuanyewworldcityprize.com.sg/laureates/special-mentions/2018/2018-special-mentions/surabaya (Accessed: 5 September 2018).

Vandevyvere, H. and Nevens, F. (2015) 'Lost in transition or geared for the S-curve? An analysis of flemish transition trajectories with a focus on energy use and buildings', *Sustainability*, 7, pp. 2415–2436. doi: 10.3390/su7032415.

Versnel, H. and Colombijn, F. (2015) 'Rückert and Hoesni Thamrin Bureaucrat and Politician in Colonial Kampong Improvement', in Colombijn, F. and Cote, J. (eds) *Cars, Conduits, and Kampongs: The Modernization of the Indonesian City, 1920-1960*. Brill.

Visvanathan, C. (2012) 'Effective policy framework for the promotion of 3R technology transfer', *International Journal of Environmental Technology and Management*, 15(3–6), pp. 501–515.

Voß, J. and Kemp, R. (2006) 'Sustainability and reflexive governance: Introduction', in Voß, J., Bauknecht, D., and Kemp, R. (eds) *Reflexive Governance for Sustainable Development*. Cheltenham: Edward Elgar.

Voß, J. P., Smith, A. and Grin, J. (2009) 'Designing long-term policy: Rethinking transition management', *Policy Sciences*, 42(4), pp. 275–302. doi: 10.1007/s11077-009-9103-5.

Waddell, S. K. (2004) *The role of the 'legal rule' in Indonesian law: environmental law and reformasi of water quality management*. University of Sydney.

Wakely, P. (2018) *Housing in Developing Cities: experiences and lessons*, *(Rowe and Kan, 2014)*. New York: Routledge. doi: 10.4324/9781351212397.

Walker, G. *et al.* (2010) 'Trust and community: Exploring the meanings, contexts and dynamics of community renewable energy', *Energy Policy*. Elsevier, 38(6), pp. 2655–2663. doi: 10.1016/j.enpol.2009.05.055.

Wals of Wageningen, A. E. J. (2012) *Shaping the Education of Tomorrow: 2012 Full-length Report on the UN Decade of Education for Sustainable Development*.

Wang, H. and Kimble, C. (2011) 'Leapfrogging to electric vehicles: patterns and scenarios for China's automobile industry', *International Journal of Automotive Technology and Management*, 11(4), p. 312. doi:

10.1504/IJATM.2011.043164.

Wang, Z., Wei, S.-J. and Wong, A. (2010) *Does a leapfrogging growth strategy raise growth rate? Some international evidence*, *National Bureau of Economic Research*. Cambridge, Massachusetts. Available at: http://www.jstor.org/stable/1914364.

Waswa, P. M. B. and Juma, C. (2012) 'Establishing a space sector for sustainable development in Kenya', *International Journal of Technology and Globalisation*, 6(1/2), pp. 152–169. doi: 10.1504/IJTG.2012.045292.

Watson, J. and Sauter, R. (2011) 'Sustainable innovation through leapfrogging: A review of the evidence', *International Journal of Technology and Globalisation*, 5(3/4), pp. 170–189.

Weaver, P. M. and Rotmans, J. (2006) 'Integrated sustainability assessment: What is it, why do it and how?', *International Journal of Innovation and Sustainable Development*, 1(4), pp. 284–303. doi: 10.1504/IJISD.2006.013732.

van Welie, M. J. *et al.* (2018) 'Analysing transition pathways in developing cities: The case of Nairobi's splintered sanitation regime', *Technological Forecasting and Social Change*, 137, pp. 259–271. doi: 10.1016/j.techfore.2018.07.059.

WHO (2001) *Water for health: Taking charge*.

WHO (2005) *A Billion Voices: Listening and Responding to the Health Needs of Slum Dwellers and Informal Settlers in New Urban Settings*. Japan.

Wieczorek, A. J. (2018) 'Sustainability transitions in developing countries: Major insights and their implications for research and policy', *Environmental Science and Policy*. Elsevier, 84, pp. 204–216. doi: 10.1016/j.envsci.2017.08.008.

Wieczorek, A. J., Raven, R. and Berkhout, F. (2015) 'Transnational linkages in sustainability experiments: A typology and the case of solar photovoltaic energy in India', *Environmental Innovation and Societal Transitions*. Elsevier B.V., 17, pp. 149–165. doi: 10.1016/j.eist.2015.01.001.

Wijayanti, D. R. and Suryani, S. (2015) 'Waste Bank as Community-based Environmental Governance: A Lesson Learned from Surabaya', *Procedia - Social and Behavioral Sciences*. Elsevier B.V., 184, pp. 171–179. doi: 10.1016/j.sbspro.2015.05.077.

Williams, P. (2010) *Special Agents: The Nature and Role of Boundary Spanners. Paper to the ESRC research seminar series: Collaborative futures: new insights from intra and inter-sectoral collaborations.*

Withycombe Keeler, L. *et al.* (2016) 'Utilizing international networks for accelerating research and learning in transformational sustainability science', *Sustainability Science*, 11(5), pp. 749–762. doi: 10.1007/s11625-016-0364-6.

Wolfram, M. (2016) 'Conceptualizing urban transformative capacity: A framework for research and policy', *Cities*. Elsevier B.V., 51, pp. 121–130. doi: 10.1016/j.cities.2015.11.011.

Wolfram, M. (2017) 'Grassroots Niches in Urban Contexts: Exploring Governance Innovations for

Sustainable Development in Seoul', *Procedia Engineering*. The Author(s), 198(September 2016), pp. 622–641. doi: 10.1016/j.proeng.2017.07.116.

Wolfram, M. (2018) 'Cities shaping grassroots niches for sustainability transitions: Conceptual reflections and an exploratory case study', *Journal of Cleaner Production*. Elsevier Ltd, 173, pp. 11–23. doi: 10.1016/j.jclepro.2016.08.044.

Wolfram, M. and Frantzeskaki, N. (2016) 'Cities and systemic change for sustainability: Prevailing epistemologies and an emerging research agenda', *Sustainability (Switzerland)*, 8(2). doi: 10.3390/su8020144.

Wong, T. (2016) 'How developing cities can meet the challenges of the 21st century', *Asian Development Bank Blog*. Available at: https://blogs.adb.org/blog/how-developing-cities-can-meet-challenges-21st-century.

Wong, T. H. F. and Brown, R. (2009) 'The water sensitive city: Principles for practice', *Water Science and Technology*, 60(3), pp. 673–682. doi: 10.2166/wst.2009.436.

Wood, G. (2003) 'Staying Secure, Staying Poor: The "'Faustian Bargain"'', *World Development*, 31(3), pp. 455–471. doi: 10.1016/S0305-750X(02)00213-9.

Wood, G. and Gough, I. (2006) 'A Comparative Welfare Regime Approach to Global Social Policy', *World Development*, 34(10), pp. 1696–1712. doi: 10.1016/j.worlddev.2006.02.001.

World Bank (1974) *Appraisal of the Jakarta Urban Development Project in Indonesia*.

World Bank (1976) *Indonesia: Appraisal of the Second Urban Development Project*.

World Bank (1979) *Indonesia - Third Urban Development Project*. Washington, D.C.

World Bank (1990) *Indonesia - Third and Fourth Urban Development Projects (Project Completion Report)*. Washington, D.C. doi: 10.1179/136485908x337463.

World Bank (1992) *Fifth Urban Development Project*.

World Bank (1995) *Indonesia Impact Evaluation Report - Enhancing the Quality of Life in Urban Indonesia: The Legacy of Kampung Improvement Program*.

World Bank (2001) *Implementation Completion Report - Indonesia: Surabaya Urban Development Project*.

World Bank (2003) *Sustainable Development in a Dynamic World: Transforming Institutions, Growth, and Quality of Life*.

World Bank (2008) *Global Economic Prospects 2008*. doi: 10.1596/978-0-8213-7365-1.

World Bank (2012) *Energizing Green Cities in Southeast Asia*.

World Bank (2014) *Fostering Development through Opportunity, Inclusion, and Equity*, *The World Bank Legal Review, Volume 5*. Edited by H. Cisse et al. Washington, D.C.: International Bank for Reconstruction and Development, The World Bank. doi: 10.1596/0-8213-5064-1.

World Bank (2016a) *Indonesia National Slum Upgrading Project: P154782*. Jakarta, Indonesia. doi:

10.1515/9783866539686.335.

World Bank (2016b) *National Slum Upgrading Project*.

World Bank (2016c) *World Development Report 2016: Digital Dividends*.

World Bank (2018) *World Development Report 2018: Learning to Realize Education's Promise*. Washington, D.C. doi: 10.4000/ries.6107.

World Cities Summit (2018) 'World cities summit 2018: Embraces future-ready cities empowered by technology , innovation and collaboration', 20 July, pp. 1–5. Available at: https://www.worldcitiessummit.com.sg/media-releases/world-cities-summit-2018-embraces-future-ready-cities-empowered-by-technology-innovation-and-collaboration.

World Economic Forum and ADB (2017) *ASEAN 4.0: What does the Fourth Industrial Revolution mean for regional economic integration?* Available at: https://www.businessoffashion.com/community/voices/discussions/what-does-the-fourth-industrial-revolution-mean-for-fashion.

Yap, X. S. and Truffer, B. (2018) 'Shaping selection environments for industrial catch-up and sustainability transitions: A systemic perspective on endogenizing windows of opportunity', *Research Policy*. Elsevier, 48(4), pp. 1030–1047. doi: 10.1016/j.respol.2018.10.002.

Yin, R. (2018) *Case Study Research and Applications: Design and Methods*. 6th Ed. Sage Publications Inc.

Yu, Z. and Gibbs, D. (2018) 'Sustainability transitions and leapfrogging in latecomer cities: the development of solar thermal energy in Dezhou , China', *Regional Studies*. Taylor & Francis, 52(1), pp. 68–79. doi: 10.1080/00343404.2016.1260706.

Yusuf, S. (2013) *Five Cities Going Green: How Are They Doing It?* Washington, D.C.: The Growth Dialogue.

Zainul, M. (2017) *Kampung Kenjeran a form of multistakeholder collaboration in Surabaya*.

Zaky, I. (2012) *Low carbon in Surabaya City: Approaches and challenges*. Surabaya, Indonesia.

Zhang, F. (2014) 'Can solar panels leapfrog power grids? the World Bank experience 1992-2009', *Renewable and Sustainable Energy Reviews*. Elsevier, 38, pp. 811–820. doi: 10.1016/j.rser.2014.07.047.