REFLECTIONS ON GRASSROOTS PARTICIPATION IN KNOWLEDGE CO-PRODUCTION IN DAR ES SALAAM:

OPPORTUNITIES FOR TRANSFORMATIVE KNOWLEDGE BUILDING

A dissertation submitted in partial fulfilment of the requirements for the MSc Environment and Sustainable Development

10,957 words

Elizabeth Georgina Daley
Candidate number: NRVG2

Environment and Sustainable Development MSc
Supervisor: Dr Pascale Hofmann

Development Planning Unit, University College London
15th September 2021

A.5 Declaration of Ownership Form

DECLARATION OF OWNERSHIP AND COPYRIGHT FORM

1. DECLARATION OF COPYRIGHT

I confirm that I have read and understood the guidelines on plagiarism produced by DPU and UCL, that I understand the meaning of plagiarism as defined in those guidelines, and that I may be penalised for submitting work that has been plagiarised.

Unless not technically possible and with the prior agreement of the Programme Leader for my MSc programme, the dissertation report must be submitted electronically through TurnitinUK®. I understand that the dissertation cannot be assessed unless both a hard copy and an electronic version of the work are submitted by the deadline stipulated.

I declare that all material is entirely my own work except where explicitly, clearly and individually indicated and that all sources used in its preparation and all quotations are clearly cited using a recognised system for referencing and citation.

Should this statement prove to be untrue, I recognise the right of the Board of Examiners to recommend disciplinary action in line with UCL's regulations.

2. COPYRIGHT

The copyright of the dissertation report remains with me as its author. However, I understand that a copy may be given to my funders (if requested and if appropriate), alongside limited feedback on my academic performance.

I also understand that a copy may also be deposited in the UCL E-prints public access repository and copies may be made available to future students for reference.

Please write your initials in the box if you DO NOT want this report to be made available publicly either electronically or in hard copy. ☐

YOUR NAME:	Elizabeth Daley
MSC PROGRAMME:	Environment and Sustainable Development
SIGNATURE:	Lizbay Daley
DATE:	08/09/2021

ACKNOWLEDGEMENTS

I gratefully acknowledge my dissertation supervisor, Dr Pascale Hofmann, for her supportive guidance during the application for this fellowship and throughout the research process itself. Furthermore, I thank colleagues at the Centre for Community Initiatives in Tanzania and the Institute for the Environment and Development for making time to contribute to this work. Their unique experiences and insights have been invaluable in the production of this dissertation. Finally, I would like to thank my family, partner and friends for their unerring support during this challenging year of remote learning and the production of this dissertation.

ABSTRACT

With less than a decade left to deliver the Sustainable Development Goal of universal access to water and sanitation, innovative and inclusive new approaches are needed to address the ongoing challenge of urban Water Supply and Sanitation (WSS). WSS has long been misrecognised as a technical issue of facilities and infrastructure, obscuring the complex socio-political drivers that shape distributional injustices in service provision. Furthermore, marginalised groups disproportionately suffering WSS injustices, such as informal settlement residents, are typically excluded from the WSS decision-making that could alleviate their struggles.

The co-production of knowledge through partnerships with informal settlement residents is gaining interest as a potentially transformative method to address WSS injustices through improving recognition of the multifaceted and heterogeneous realities within informal settlements and empowering the political participation of informal settlement residents. Despite widespread academic enthusiasm, much of the literature remains broadly conceptual. This dissertation contributes to the debate by examining how knowledge co-production can help alleviate WSS service provision injustices through the specific case of the Centre for Community Initiative's activities in the informal settlements of Dar es Salaam, Tanzania. The combined theoretical lenses of environmental justice and Feminist Political Ecology deliver a nuanced perspective on knowledge co-production that emphasises the importance of local context, heterogeneity within and between informal settlements and the complexity of 'transformative change'.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ACRONYMS

CBO – Community Based Organisation
CCI – Centre for Community Initiatives
DAWASA – Dar es Salaam Water and Sanitation Authority
DAWASCO – Dar es Salaam Water and Sewerage Corporation
DPU – Development Planning Unit
DWSSP – Dar es Salaam Water Supply and Sanitation Project
FGD – Focus Group Discussion
FPE – Feminist Political Ecology
GPS – Global Positioning System
M&E – Monitoring and Evaluation
TSh – Tanzanian Shilling
TUPF – Tanzanian Urban Poor Federation
UCL – University College London

1. INTRODUCTION

At first glance, the global water supply and sanitation (WSS) issue would seem to be one of rural deprivation. In 2015, only 55% of the rural population accessed safely managed drinking water and only 50% accessed at least basic sanitation, compared to 85% and 83% of the urban population respectively (WHO and UNICEF, 2017). These statistics, however, are somewhat misleading.

Urban WSS problems are neither small, nor declining. The hazards associated with inadequate sanitation, such as faecal contamination of the environment, have widespread impacts. In urban areas, residential density likely results in a far higher share of households facing serious sanitary issues than the global statistic of 83% coverage would suggest (McGranahan *et al.*, 2016). Furthermore, rates of urbanisation have outstripped progress on urban sanitation, meaning that at least 200 million more urban dwellers now live without improved sanitation than in 1990 (McGranahan *et al.*, 2016). Over half the global population lives in cities and this proportion continues to rise (UN DESA, 2018). Urban WSS problems are an urgent priority.

Furthermore, there is a growing acknowledgement that the urban WSS challenge requires innovative new approaches. Traditional approaches have misrecognised the problem as predominantly a technical issue of facilities and infrastructure. In doing so, the structural drivers of distributional inequities, such socio-political marginalisation of informal settlement residents, have largely been obscured (McGranahan *et al.*, 2016). Informal settlement residents, despite suffering a disproportionate burden of WSS injustices, are excluded from the political spaces in which large-scale WSS policy decisions are made (Woodcraft *et al.*, 2020).

The co-production of knowledge through collaborative partnerships with informal settlement residents has recently emerged as a potential route towards alleviating WSS-related injustices by addressing underlying recognition and participation injustices (Mitlin and Bartlett, 2018). Given that knowledge co-production is often very time consuming, complex and challenging to evaluate, related literature is mostly conceptual (Simon *et al.*, 2018). This research contributes to the ongoing debate by situating a specific, ongoing knowledge co-production

effort within the theoretical discussion. Through examining the Centre for Community Initiatives (CCI) programmes of knowledge co-production with informal settlement residents, this research critically evaluates how grassroots involvement in the co-production of knowledge around WSS service provision can help alleviate WSS injustices in the informal settlements of Dar es Salaam, Tanzania. Two key questions guide this research:

1. *What insights can be gained on WSS service provision injustices from knowledge co-produced with informal, low-income communities?*
2. *How does the participation of informal, low-income communities in knowledge co-production transformatively address WSS service provision injustices?*

1.1. STRUCTURE, METHODOLOGY AND LIMITATIONS

This dissertation is organised into four chapters. This first chapter situates the research within the wider context and justifies the methodology. The second chapter leverages the theoretical lenses of environmental justice and Feminist Political Ecology to navigate the debates around WSS service provision in informal settlements, the relationship between power and knowledge and the role of empowering agency for transformational change. By layering these discussions, an analytical framework for examining the transformative potential of knowledge co-production is presented. In the third chapter, this conceptual framework is applied to the knowledge co-production activities coordinated by the Centre for Community Initiatives (CCI) in the informal settlements of Dar es Salaam, Tanzania. The final chapter reflects on the presented research, drawing out key conclusions and their implications of knowledge co-production research and practice.

Mitlin *et al.*, (2019) raise concerns that, by examining instances of co-production as 'case studies', academics risk undermining the significance of these efforts. Recognising this valid warning, this research leverages a single immersive example of knowledge co-production processes and outputs not minimise their efforts, but to highlight that issues of service injustices, structural inequality and agency are all inextricably embedded in their unique local context (Dill, 2009). Examining knowledge co-produced between CCI and local informal settlement residents provides an opportunity to examine how theories of knowledge co-production manifest in Dar es Salaam's specific socio-political context.

This is predominantly informed by secondary data analysis, with particular attention placed on published outputs from knowledge co-production projects in Dar es Salaam. The case study analysis was further supported by primary data collected via two remote Focus Group Discussions (FGDs). The first group consisted of three CCI staff members based in Tanzania and one UCL Development Planning Unit (DPU) academic based in the UK. The second group consisted of two researchers from the International Institute for the Environment and Development and the UCL DPU academic, all based in the UK. The participating individuals were selected for their personal involvement in knowledge co-production in Dar es Salaam's informal settlements.

Overall, the methodology employed allowed for a sensitive analysis of knowledge co-production, both theoretically and applied to a local context, however limitations undoubtedly exist. Limited research time constrained the number of FGDs that were feasible and the amount of primary data collected. Perhaps more significantly, interviews or FGDs were not conducted with residents of informal settlements in Dar es Salaam. While this may have strengthened this research, it was deemed unfeasible and unethical to approach individuals when this research is unlikely to offer significant immediate benefits to participants. As notions of empowerment and agency are discussed extensively throughout this dissertation, it is important to note that this research at no point attempts the impossible task of representing another's truth. Rather than estimate the extent of 'empowerment' felt by individuals, this research examines how knowledge co-production has occurred in the complex local socio-political context of Dar es Salaam's informal settlements.

2. CONCEPTUALISING THE TRANSFORMATIVE POTENTIAL OF KNOWLEDGE CO-PRODUCTION AROUND WSS SERVICE PROVISION INJUSTICES

Structured into four sections, this chapter provides the foundation to examine how grassroots involvement in the co-production of knowledge around service provision can help alleviate WSS service-provision injustices in Dar es Salaam's informal settlements. Firstly, theoretical discussions around environmental justice and Feminist Political Ecology (FPE) are explored to shape an inclusive conceptualisation of service injustices in informal settlements. Secondly, the nature of power and knowledge are discussed, demonstrating that recognition injustices in service provision are not merely technical oversights, but deeply political in origin. The potential for knowledge co-production to address recognition injustices as well as decolonise and democratise development planning is further examined. Thirdly, the process of knowledge co-production is critically unpacked to evaluate claims that participation delivers transformational shifts in power-relations through procedural justice. The final section synthesises and integrates the conceptual arguments presented around environmental justice, FPE, knowledge co-production and empowerment, establishing key parameters to guide the following case study analysis.

2.1. BEYOND DISTRIBUTION: RE-POLITICISING SERVICE INJUSTICES IN URBAN INFORMAL SETTLEMENTS

Based on clear material differences in how benefits and burdens manifest for different groups, scholars initially conceptualised justice "the appropriate division of social advantages" (Rawls, 1971, pp. 9–10). In the context of urban environmental injustices, however, a purely distributional understanding of justice under-emphasises the importance of social and political factors in shaping struggles around service access (Swyngedouw, 2009; Hofmann, 2018).

This dissertation leverages a recent conceptualisation of environmental justice as the product of distributional, recognition and procedural justice which re-politicises understandings of WSS service provision injustices. This framework posits that maldistribution, while important, is only

one element of environmental justice (Schlosberg, 2007). It highlights that both institutional failure to recognise the occurrence of injustice and inequitable procedures of environmental governance also constitute and cause environmental injustices (Whyte, 2017).

A key insight is that the components of environmental injustice "maintain and reinforce each other" (Bell and Carrick, 2017, p. 102). This is particularly evident in WSS provision in cities of the Global South where recognition and procedural injustices underpin and reinforce inequitable service distribution. Data around WSS service provision provided by official utilities companies is typically aggregated, masking differential service access, quality and affordability between neighbourhoods or social groups (Hofmann, 2020). Data on informal services is largely absent, despite the significance of this sector to the urban poor (Hofmann, 2020). As a result, the knowledge which informs service provision decisions poorly characterises the diverse realities of service provision experiences across time and space and for different people, constituting misrecognition of their struggles (Hofmann, 2020). Furthermore, those suffering the greatest WSS injustices are typically excluded from decision-making around service-provision and, therefore, unlikely to benefit from those decisions (Birkmann, 2007; Woodcraft *et al.*, 2020). Resultant distributional inequities may limit their resources, further inhibiting political participation (Bell and Carrick, 2017). Given the interconnected nature of justice, transformative action which advances recognition, procedural and distributional justice agendas is needed to alleviate service injustices (Bell and Carrick, 2017).

As a broad field united through the socio-political examination of environmental issues, Political Ecology provides a basis to further conceptualise how WSS service provision injustices manifest (Hanson and Buechler, 2015). In particular, Urban Political Ecologists have provided key insights into how uneven socio-spatial distribution of water-services across cities manifests through embedded power relations and hegemonic capitalism (Bakker, 2000; Kaika, 2003). Urban Political Ecology, however, tends to analyse inequalities at the city scale, focusing on socio-economic class as the explanatory factor (Truelove, 2011).

FPE is particularly useful in examining the everyday practices and intra-community differences rendered invisible in traditional data sets through its scholars' engagement with intersectional identities and scale. In their seminal work outlining the FPE position, Rocheleau, Thomas-

Slayter and Wangari (1996) identified that gender is a “critical variable in shaping resource access and control” (Rocheleau, Thomas-Slayter and Wangari, 1996, p. 4). Increasingly, however, scholars contest that considering social identities, such as class and gender, in isolation has limited explanatory power (Hofmann, 2017). In addition, grouping people by single social identities can lead to problematic assumptions of shared attributes and experiences (Yuval-Davis, 2006). While women within an informal settlement may share some experiences of WSS, such as disproportionate gendered responsibility for household water supply, their experiences are not identical. For example, wealth and tenure security can allow one woman to install onsite water provision, whereas another is unable to escape the injustices associated with accessing communal facilities (Hofmann, 2017). Gendered commonalities are layered with other social differences such that the service-related injustices experienced are unique and embedded in an individual’s spatial and temporal context. Categorising by single social identities neglects the nuances of lived experiences and risks marginalising those within the category that do not conform to the group stereotype (Dhamoon, 2011).

The conceptual field of intersectionality has emerged to analyse how social identities, including gender, class, race, age and ability, intersect to shape injustices (Symington, 2004; Dhamoon, 2011). An intersectional approach recognises the relational nature of social identities which are embedded in established power relations, thus providing a sensitive framework for understanding the dynamic socio-political underpinnings of material injustices (Dhamoon, 2011). By engaging with intersectionality, FPE rejects one-dimensional depictions of marginalised groups as homogenised sufferers of environmental injustice, instead embracing lived realities within complex landscapes of privilege and oppression (Truelove, 2011). In Dar es Salaam, individuals’ practices and experiences of WSS services are shaped by the practices of surrounding people, meaning that service (in)justices are produced through the interaction between multiple identities and social relations such as wife, daughter, neighbour and tenant (Hofmann, 2020). By neglecting these nuances, traditional data sets oversimplify and miss-recognise lived realities of WSS injustices (Gaventa and Cornwall, 2011).

Drawing on long-established feminist traditions of examining ‘everyday’ spaces and the ‘micropolitics’ that govern them (Elmhirst, 2011; Truelove, 2011), the second major conceptual contribution of FPE is an attention to scale. Through an FPE analysis of everyday WSS practices in Delhi’s informal settlements, Truelove (2011) demonstrates that women do not passively suffer externally imposed injustices, rather they navigate service inadequacies

through creative ‘compensation tactics’. While these tactics offer women control, they can also constitute and reinforce inequalities. For example, by securing payment in buckets of water during times of poor water service, women meet their water needs at the cost of devaluing their productive efforts in employment and reinforcing inequitable power dynamics between themselves and their employers (Truelove, 2011). Furthermore, traditional dualisms that dominate development policy and practice, such as formal-informal, poorly describe lived experiences (Truelove, 2019). In reality, “everyday water is procured and governed through a ‘gray zone’ of hybrid institutional and infrastructural arrangements” (Truelove, 2019, p. 1758). FPE analyses challenge scholars to reject traditional categories and engage with complex, political realities.

A critical FPE engagement with microscales also challenges problematic assumptions of harmony and homogeneous conditions within communities and even households (Rocheleau, 2008; Allen, Griffin and Johnson, 2017). Sen (1987) conceptualised the ‘cooperative conflicts’ which shape uneven intra-household distributions of resources, dismantling the myth that household units are characterised by mutually reciprocal shared interests. While households can seem harmonious, gendered power relations result in inequitable allocation of resources within the private sphere that are commonly overlooked in development policy and planning.

2.2. Power, knowledge and the case for addressing recognition injustices through knowledge co-production

Without doubt, knowledge and power are “inextricably intertwined” (Gaventa and Cornwall, 2011, p. 172) however the nature of that relationship is contentious (Gaventa and Cornwall, 2011). Scholars such as Lukes (1974) understood power as a resource, held by a few ‘elites’ and exercised over others. Gaventa (1993) further argued that powerful elites control the production of knowledge with the purpose of directing policy and selectively excluding participants in policy creation and implementation. In his seminal works, Freire (1970, 1981) contested that power is exercised through the control of knowledge which is internalised by the oppressed to produce a ‘culture of silence’, reinforcing the powerful status of elites.

Although understanding power as a commodity that “individuals can gain, hold and wield” (Gaventa and Cornwall, 2011, p. 176) has proven useful in understanding power and

knowledge, it has been critiqued for overly focusing on the 'power over' relationship, to the detriment of other forms of power, such as collaborative power ('power with') or agency ('power within') (Gaventa and Cornwall, 2011), in turn limiting the analysis of power and knowledge together. Foucault (1977) contested that power is not localised in elites, rather diffusely generated through the discourses, institutions and practices that shape how people come to understand and govern themselves. Therefore, "power and knowledge directly imply one another" (Foucault, 1977, p. 27). Chambers (1997) argues that people occupy multiple positions of relative domination and oppression depending on specific contexts. This relational and context-specific understanding of knowledge as power is particularly useful for examining the complexities every-day lived realities.

While these scholars may contest the location and nature of power, they agree that power is "embedded and reinforced" through the dominant system of positivist knowledge production. The creation, legitimisation and use of knowledge is highly politicised, thus recognition injustices are not apolitical 'mistakes', rather they are the product of strategic, institutionalised marginalisation (Gaventa and Cornwall, 2011, p. 180).

Firstly, positivism's preoccupation with objective 'proof' creates a significant bias in the types of knowledge that are legitimated which, in turn, biases the groups considered legitimate 'experts'. Technocratic, scientific knowledge is privileged, and alternative ways of knowing the city are marginalised (Gaventa and Cornwall, 2011). As a result, urban challenges are often presented in specific, depoliticised ways. For example, the urban poor are typically problematised based on reductionistic analyses of their informal settlements (May and Perry, 2017). Secondly, traditional positivist research methodologies, such as surveys and questionnaires, reinforce existing structural inequalities by casting people as research objects. Furthermore, the quantitative data often sought oversimplifies the lived experience (Gaventa and Cornwall, 2011). In the context of urban WSS services, survey or inspection data is often aggregated at regional levels and excludes informal service provision (Hofmann, 2020). Many now stress the need for novel and disaggregated data to reveal fine-scale WSS inequities in informal settlements (WHO/UNICEF, 2017). Given these kinds of data inform top-down policies, it is clear to see how recognition injustices arising from simplistic data and procedural injustices of exclusion from research procedures result in distributional injustices in WSS provision (Lawhon and Patel, 2013).

A range of alternative inclusive research methodologies have been proposed, including participatory research, action research and knowledge co-production (Anderson *et al.*, 2013). They share a common goal of “improving academic contributions to social justice through strengthening the voice of disadvantaged populations" (Mitlin *et al.*, 2019, p. 4), however, knowledge co-production, as the most recent iteration, is the focus of this dissertation.

Co-production initially emerged in response to failures of centralised, state-run services to adequately meet residents’ needs and pioneered service provision through collaborative partnerships between the state and the urban poor (Mitlin and Bartlett, 2018). Since then, the principle of deep collaboration with communities has also been extended to the co-production of knowledge (Mitlin and Bartlett, 2018).

What is understood by ‘knowledge co-production’ varies significantly, although, generally, it centres on the production of new knowledge through deep collaboration between multiple actors (Moser, 2016). For some, the presence of collaborative partnerships defines knowledge co-production, whereas others contest that inequitable power relations must be shifted in favour of traditionally disempowered groups for knowledge co-production to have occurred (Mitlin and Bartlett, 2018). Lines and Makau (2018) reject the need for formalised frameworks altogether, arguing that shifting Kenyan state policy and attitudes as a result of the grassroots activism of the Muungano wa Wanavijiji movement constitutes co-production. Defining knowledge co-production may even be counterproductive and in “contradiction of the inherent messiness that characterises inclusive processes embedded in local contexts” (Osuteye *et al.*, 2019, p. 11). Furthermore, a constraining definition risks replicating the problematic ‘best practices’ of positivism, and the recognition injustices arising from failure to embrace diversity (Culwick *et al.*, 2019).

The epistemological basis of knowledge co-production can be characterised without applying a restrictive definition. Firstly, it rejects the notion that there is a single way to understand the city, instead “embrac[ing] knowledge production borne of the confrontation and juxtaposition of multiple ways of living, working, and seeing the city" (Osuteye *et al.*, 2019, p. 5). The contribution of non-academics and, in particular, those about whom the knowledge is concerned, is essential to the social construction of knowledge that embraces plurality in knowledge forms (Mitlin *et al.*, 2019). Scholars argue that knowledge co-production advances

social justice by moving away from conventional, exclusive expert-led approaches (Woodcraft *et al.*, 2020), "destabili[sing] academia as a privileged site for the production and dissemination of knowledge" (Bell and Pahl, 2018, p. 105) and democratising knowledge production (Osuteye *et al.*, 2019).

Knowledge co-production aims to improve outcomes for marginalised groups by linking research more closely to the expressed preferences and needs of these groups, thus addressing the 'relevance gap' between research and contemporary problems (Durose *et al.*, 2012). WSS injustices can be considered 'wicked problems' as the interaction between material services and relational power dynamics results in multiple understandings and experiences of situations (Osuteye *et al.*, 2019). Rather than privileging one (technocratic) way of understanding a system, co-produced knowledge embraces plurality in perspectives and, therefore, inclusively characterises service injustices (Osuteye *et al.*, 2019). Furthermore, co-produced knowledge is extremely valuable in cities like Dar es Salaam, where formal data is absent, incomplete or unreliable (Woodcraft *et al.*, 2020). Even when formal data is available, co-produced data provides valuable subjective and experiential insights, enriching the knowledge available for policy makers (Woodcraft *et al.*, 2020). Co-producing knowledge between diverse stakeholders also offers the opportunity to integrate expertise and develop solutions to problems that cannot be overcome in isolation (Culwick *et al.*, 2019). Overall, knowledge co-production has the potential to address recognition injustices in service provision through rejecting the elitist and reductionistic understandings. Inclusive conceptualisations of WSS service inadequacies can form the basis of progressive and potentially transformative policies (Durose *et al.*, 2012).

2.3. KNOWLEDGE CO-PRODUCTION: EMPOWERING AGENCY FOR TRANSFORMATION?

Generally, scholars focus equally, if not more, on the process of knowledge co-production as the co-produced knowledge. Debate continues as to whether participation in knowledge co-production "empower[s] co-producers to shape the world in which they live" (Bell and Pahl, 2018, p. 107) or whether oppressive systems generating injustices are unopposed (Mitlin and Bartlett, 2018). With rhetoric around building agency and empowering collective action

common in co-production literature, these concepts should be critically evaluated. Riger (1992, p. 736) notes “intending to create social change is not assurance of actually doing so”.

Although knowledge co-production is novel, the rich conceptual debate around participation in development provides important insights into the transformative potential of empowering individual and collective agency. Firstly, agency is “the capacity of any social actor to act independently and choose freely” (Hofmann, 2018, p. 43). While some level of agency is considered inherent, the nature and extent of agency that any individual expresses is contingent on their unique context (Olsen and Garikipati, 2008). Scholars such as Bourdieu (see Walther, 2014) suggest that cultural norms and expectations shaping individuals’ behaviours, sometimes referred to as the ‘habitus’, severely constrain individuals’ agency. By contrast, Giddens (1986) is optimistic that empowering individuals to exert reflexive agency can overcome the habitus and thus be transformational.

Proponents claim that knowledge co-production arrangements empower communities, building collective agency to challenge systemic drivers of inequality (Mitlin, 2008). Drawing on a Foucauldian understanding of how knowledge constructs the narratives that govern people’s lives, Mitlin (2008) argues that co-production arrangements allow communities access to sites of epistemic power to create counter-hegemonic narratives. Appadurai (2012) argues that self-enumeration in informal settlements is a ritual of group formation which promotes the exercise of political agency, generating “deep democratisation” (Appadurai, 2012, p. 640).

That said, the extent to which participatory development activities, such as knowledge co-production, empowers collective agency to deliver wider benefits is likely to be contingent on the local socio-political and historical context. Appadurai (2012) probably draws his conclusions on community empowerment through self-enumeration from experiences within an Indian context (e.g. Appadurai, 2002). In contrast, Dill (2010) suggests that Tanzania’s unique history of colonial and post-colonial authoritarianism limits the efficacy of Community Based Organisations (CBOs) in delivering wider benefits. Furthermore, Dill (2009) challenges the assumption that organised community-based participation is inherently inclusive, reporting barriers to membership for the poorest residents of Tanzanian informal settlements, resulting in CBO’s representing a relatively elite minority. Firstly, even minimal membership fees are

unaffordable. Secondly, social norms can make individuals feel too poor or ill-educated to be welcome (Dill, 2009).

Furthermore, Steel (2012) cautions against over-emphasising collective agency as it risks homogenising communities and undervaluing the strength of individual agency. For example, in the Kenyan informal settlement of Korogocho, land owners opposed enumeration as documenting tenants disadvantaged them as landlords (Lines and Makau, 2018). The FPE approach draws attention to experiences at microscales within knowledge co-production, refuting the notion that everyone's experience of knowledge co-production is the same. Different perspectives within communities are embedded in intra-community power relations and, while relations may seem harmonious, the process and outputs may be influenced by invisible power dynamics (Sen, 1987; Dill, 2009). In particular, there is a risk of further silencing marginalised voices as participatory approaches based on consensus seeking potentially legitimise hegemonic community norms (Kesby, 2005). The extent to which empowering effects are felt by community members is likely influenced by micro-scale politics shaping their participation.

Mitlin and Bartlett (2018) suggest that co-production is transformative because it improves the relationship between the state and the urban poor, thus levelling power inequalities. Foucalt's understanding of power as diffuse, dynamic and relational helps examine under what conditions knowledge co-production arrangements could support transformational shifts in power. Galuszka (2019) argues that partnerships where decision-making power is shared between state and civil society are often established at the behest of the former. By allowing state actors to retain their 'power over' position and the ability to withdraw the shared power, this arrangement reproduces inequitable societal power relations within collaborative arrangements. As cities are commonly characterised by contested claims on land and resources, Galuszka (2019) notes that apparently harmonious relations between state and society can rapidly regress into traditional oppressive structures when disagreements cannot be resolved. Galuszka's (2019) argument suggests that, if informal settlement residents' power to generate legitimate knowledge is understood to originate from local authority invitation to knowledge co-production arrangements, inequitable power relations are maintained within such arrangements. By contrast, if informal settlement residents see their power to generate legitimate knowledge as inherent, it is possible that collaborations can address inequitable power relations. Overall, the extent to which knowledge co-production

arrangements transform inequitable state-civil society power relations depends on the nature of the process.

Knowledge co-production assumes that uneven power relations can be overcome through sustained cooperation and negotiation, however it cannot be assumed that all power relations are addressed (Simon *et al.*, 2018). For example, Mitlin *et al.*, (2019) suggest a collaborative encounter improved the relationship between the Ugandan state and local communities. The legitimisation of the community was attributed to the presence of an external British researcher, however, rather than the collaborative process. Community representatives' participation in a knowledge co-production arrangement with the local government helped to address uneven power relations between the state and the urban poor, however the nature and legitimacy of external 'expertise' was unchallenged (Mitlin *et al.*, 2019). This illustrates an important point: while participation in co-production may progress procedural justice, it does not necessarily deliver it in every dimension.

Overall, communities and the co-production process itself should not be romanticised as, while knowledge co-production may produce transformatively empowering effects, it is not guaranteed.

2.4. Considering knowledge co-production as a route to environmental justice: A framework for case study analysis

The environmental justice framework of distribution, recognition and procedure, highlights that distributional WSS inequalities are embedded in structural socio-political inequalities of recognition and procedure (Schlosberg, 2007; Whyte, 2017). Proponents claim that knowledge co-production can transformatively advance just service provision through addressing these recognition and procedural injustices (Osuteye *et al.*, 2019).

Firstly, traditional positivist knowledge generating mechanisms are deeply political, reinforcing existing, unjust power relations (Gaventa and Cornwall, 2011). Knowledge co-production rejects reductionistic ways of understanding service provision in favour of socially-produced knowledge that respects and embraces diversity in perspectives (Osuteye *et al.*, 2019). The

integration of an FPE lens directs attention to the micro-spaces of everyday politics, revealing the multifaceted ways in which heterogeneous communities suffer and negotiate these WSS injustices (Truelove, 2011, p. 2019). To examine the transformative potential of co-produced knowledge, therefore, the extent to which co-produced knowledge recognises this complexity must be evaluated.

Secondly, knowledge co-production arrangements are thought to democratise knowledge production, thus addressing procedural injustices. Participation in such collaborative arrangements may empower those involved and address structural drivers of marginalisation through improving relations between the state and the urban poor (Mitlin, 2008; Bell and Pahl, 2018). A key insight of this analysis, however, is that participation in knowledge co-production arrangements cannot be assumed to be transformative for communities and may depend on a number of factors. Intra-community power dynamics can shape the extent to which individuals participate in and, therefore, benefit from knowledge co-production (Steel, 2012; Lines and Makau, 2018). These dynamics also impact outcomes of knowledge co-production in complex ways (Cleaver, 2007). Overall, the extent to which participation in knowledge co-production arrangements challenges structural power relations is difficult to evaluate and likely context-dependent (Kesby, 2005; Galuszka, 2019).

The combined lens of environmental justice and FPE provides a sensitive analytical framework which embraces complexity within and between individuals, as well as through time. The application of this framework to the literature around service provision, knowledge co-production and empowerment has revealed a number of key considerations which will shape the case study analysis.

3. INVESTIGATING KNOWLEDGE CO-PRODUCTION IN PRACTICE: THE CENTRE FOR COMMUNITY INITIATIVES, DAR ES SALAAM

In this chapter, the conceptual findings of the previous chapter are applied to the knowledge co-production activities of Centre for Community Initiatives (CCI) in Dar es Salaam, Tanzania. The chapter has two major sections. The short first section provides a background to the case study, examining service provision injustices in Dar es Salaam and situating CCI within the socio-political history of grassroots political participation in the city. The larger second section examines the case study in detail. Firstly, the additional insights offered by co-produced data itself are examined through the lens of recognition justice. Secondly, the transformative potential of the process of knowledge co-production is discussed, with a particular emphasis on procedural justice at micro-scales. Finally, the major findings are summarised and integrated.

3.1. BACKGROUND: KNOWLEDGE, PARTICIPATION AND SERVICE PROVISION IN DAR ES SALAAM

3.1.1. SERVICE PROVISION INJUSTICES IN DAR ES SALAAM

Dar es Salaam was replaced by Dodoma as the capital of the United Republic of Tanzania in 1974, however it remains the country's economic and administrative hub (Hofmann, 2018). With an annual population growth rate of 5.8%, it will reach mega-city status within a decade (African Development Bank, 2014; Sturgis, 2015). Despite bringing undeniable economic opportunities, population growth has outstripped provision of adequate, affordable housing and essential services (Woodcraft *et al.*, 2020). Almost 80% of the population now live in unplanned or informal settlements which continue to grow twice as fast as the city average (Kombe, Ndezi and Hofmann, 2015; Hofmann, 2020). Poor service provision in informal settlements is partly shaped by German and British colonial policies of segregation and unequal infrastructure (Dill and Crow, 2014; Smiley, 2020). Recent pro-poor political rhetoric and legislation, however, such as the 2002 National Water Policy which characterises access

to water and sanitation as “a right of every Tanzanian” (Ministry of Water and Livestock Development, 2002, p. 40), have not yielded significant improvements (Woodcraft *et al.*, 2020).

Public WSS services are provided by the Dar es Salaam Water and Sanitation Authority (DAWASA), a parastatal organisation that has seen significant reform since its establishment in 1997 (Hofmann, 2018). The World Bank-funded Das es Salaam Water Supply and Sanitation Project (DWSSP) (2003-2010), shifted DAWASA’s role from service operator into asset holder and manager of the private operator, CityWater. Following failure to meet contractual obligations in 2005, the public Dar es Salaam Water and Sewerage Corporation (DAWASCO) replaced CityWater. DAWASCO was incorporated into DAWASA in 2018, marking a return to DAWASA’s original responsibilities of service operator (DAWASA, no date).

Official statistics indicate that DAWASA directly serves 76% of the city’s population with water via household connections and public water kiosks and 12% of the population with sewerage (EWURA, 2020) although official sources have overestimated coverage statistics in the past (Kjellen, 2006). The presence and quality of services are unevenly distributed across the city’s municipal sub-districts (wards). Informal settlements are predominantly located in wards with very limited or no water supply, leaving residents reliant on multiple, often expensive alternative sources (Smiley, 2013). The rich and politically powerful typically inhabit wards benefitting from 24-hour services (Hofmann, 2018). Drawing on the environmental justice framework, it is further evident that this distributional injustice is underpinned and reinforced by recognition and procedural injustices (Schlosberg, 2007; Hofmann, 2018).

Firstly, the service-related struggles of low-income groups living in informal settlements are misrecognised and obscured in official statistics, which translates into ineffective ‘pro-poor’ policies. Official data collection by the utilities or national census aggregate at ward level, obscuring differences in service access, quality and affordability between and within neighbourhoods (McGranahan *et al.*, 2016; Hofmann, 2020). Furthermore, official data excludes informal water and sanitation provision, despite evidence that low-income communities rely on these services where formal alternatives are absent or unreliable (Nganyanyuka *et al.*, 2014; Mapunda, Chen and Yu, 2018). An analysis of the DWSSP

programme also suggests that aggregated and inaccurate data on the needs of informal settlement residents resulted in interventions poorly serving the intended beneficiaries (Newborne, Tucker and Bayliss, 2012). For example, the first time connection fund, a scheme offering subsidised piped water installation, was only offered to households less than 20m from existing mains water pipes. This excluded many informal settlements lacking existing water infrastructure network and can hardly been seen as a pro-poor policy. Newborne, Tucker and Bayliss (2012) question whether the purpose was actually to increase water connections and therefore DAWASA's profitability. It is difficult to determine whether a lack of understanding of informal settlement realities was strategically used to design economically-motivated interventions that purported to address social issues, but it is clear that the DWSSP's pro-poor commitments were secondary to other objectives (Newborne, Tucker and Bayliss, 2012).

Secondly, despite some success in pro-poor participatory programmes, informal settlement residents remain largely excluded from WSS service-related decision making, constituting a procedural injustice. DAWASA and each municipal district operate Community Liaison Units (CLU's) to coordinate community-based activities however these committees are limited in size and scope (WSUP, 2015; Hofmann, 2018). In the DWSSP programme, only 2.3% of funding was allocated to the pro-poor CLU-coordinated Community Water Supply and Sanitation Programme (CWSSP) (Newborne, Tucker and Bayliss, 2012). Low-income households' participation options are further limited as DAWASA's accountability arrangements favour financial and technical indicators over customer satisfaction (Newborne, Tucker and Bayliss, 2012; McGranahan *et al.*, 2016). In Dar es Salaam, procedural and recognition injustices clearly compound each other and exacerbate distributional injustices, as hypothesised by Bell and Carrick (2017). In interviews, DAWASA staff suggested that water kiosks were ineffective in informal settlements, based on a failed DWSSP roll-out. By contrast, Focus Group Discussions (FGDs) with low-income groups revealed that the DWSSP kiosk project had been ill-informed and poorly executed, and water kiosks remained a preferred option for low-income communities. Clearly, lack of community participation in the kiosk roll-out and its evaluation has led to a misrecognition of their needs and preferences in DAWASA, which is likely to negatively impact future pro-projects (Newborne, Tucker and Bayliss, 2012).

3.1.2. Participatory knowledge generation in contemporary Dar es Salaam: situating the Centre for Community Initiatives

Dar es Salaam has a rich history of collective grassroots participation in politics, development and, more recently, in knowledge generation around service provision injustices. The colonial regime encouraged low-income groups to organise into associations in a misguided attempt to maintain authority. Associations became the hubs of the nationalist movement culminating in independence in 1961 (Dill, 2009). Fearing grassroots politics, the post-colonial administration sought to disband associations and monitor all citizen political participation through government-mandated spaces. More recently, Dar es Salaam has seen a resurgence of associations and CBOs as international development ideology has increasingly favoured community-based development. CBOs are seen as the vehicle of community participation in development which is, in turn, assumed to deliver good governance and poverty alleviation (Dill, 2009). While associations and now CBOs are common in Dar es Salaam and participate in development projects, Dill (2010, 2013) argues that the legacy of authoritarian suppression of grassroots political activity can still be seen in the relatively poor success of CBOs in mobilising resources for development or facilitating the wider political participation of low-income groups.

In present-day Dar es Salaam, a variety of methods of community participation in data collection and knowledge generation around WSS injustices are occurring under the umbrella of participatory development. In Section 2.2., it was noted that knowledge co-production cannot be strictly defined but is characterised by principles of inclusivity, deep collaboration and challenging hegemonic power dynamics (Moser, 2016; Osuteye *et al.*, 2019). Many practices underway in Dar es Salaam cannot be considered knowledge co-production, further highlighting that even within programmes purporting to deliver 'participatory knowledge generation', a spectrum of transformative potential exists.

The World Bank's 2015 Ramani Huria (Swahili for "Dar open map") project trained local students and community members in GPS technology to collect data for open-source maps of flood-prone areas, particularly informal settlements (World Bank, 2018). While this programme undoubtedly improved understanding of flooding in informal settlements, it cannot be considered knowledge co-production and its transformative potential is arguably limited. Firstly, the mapping methodology was not collaboratively produced with local informal

settlement residents, rather residents provided labour to deliver a predetermined project. Secondly, the data collected, including settlement features and flood extent, was entirely technical in nature and therefore merely serves to further advance technocratic, apolitical understandings of informal settlement problems (World Bank, 2018). And finally, although open-source data is typically seen as a positive movement in academia, Mitlin *et al.*, (2019) note that community rights over data are not always respected in secondary analysis. The Ramani Huria data has since been used to demonstrate the potential for community-collected data to support flood modelling in data-scarce cities, without further collaboration with the community participants (Petersson *et al.*, 2020). With community-collected data released open-source, it is very easy for balance between the procedural justice benefits to the communities participating in data collection and the practical benefits of additional data to be lost. This risks instrumentalising low-income communities in extractive methodologies masquerading as 'participatory knowledge generation'.

With the historical context of grassroots participation and the contemporary context of the spectrum of 'participatory knowledge generation' set, the case study under analysis in this dissertation is the knowledge co-production activities undertaken by the Centre for Community Initiatives (CCI) in Dar es Salaam.

CCI is a local NGO, established in 2004, with the mission of building capacity in communities of the urban poor predominantly through promoting membership and supporting the activities of the Tanzanian Urban Poor Federation (TUPF) (Hofmann, Ndezi and Makoba, 2019). TUPF is a community-based savings and credit organisation which helps low-income people, especially women, access vital financial services but also plays a significant role in community mobilisation for collective objectives (Yap and Mills, 2013). TUPF is affiliated with Slum/Shack Dwellers International (SDI), a network of community-based organisations which operates on the premise that the urban poor are active agents, not passive recipients of development assistance (Yap and Mills, 2013). As of 2015, TUPF's Dar es Salaam membership was 4,300, constituting 0.7% of the informal settlement population (McGranahan, 2015).

A key component of CCI's work is supporting self-enumeration, community profiling and settlement mapping in low-income and informal settlements (CCI, no date). They co-produce action-oriented knowledge with informal settlement residents that challenges institutional

assumptions (Yap and Mills, 2013). In contrast to DAWASA and the Ramani Huria programme, CCI does not approach issues of service injustices from a purely technical perspective, rather it engages with the socio-political context in which these injustices arise, are perpetuated and may be addressed. For example, CCI has examined how micro-politics of landlord-tenant relationships impact how sanitation injustices manifest for individuals (Stephen, 2013).

Typically, CCI conducts knowledge co-production by formulating a research team composed of CCI staff and some local residents who then conduct activities such as household surveys and GPS technology-mediated settlement mapping (CCI Community Engineer, 2021). Local residents are often also invited to FGDs, facilitated by CCI staff (CCI Community Engineer, 2021). In line with SDI self-enumeration methodology, CCI also presents the data collected back to research participants for discussion and analysis (CCI Community Engineer, 2021). CCI has a long history of collaborating with national and international organisations to deliver their activities. The following section predominantly focuses on CCI's co-production of knowledge around WSS provision injustices in collaboration with the following researchers and institutions:

- Dr Pascale Hofmann, PhD research
- The International Institute for the Environment and Development (IIED), project entitled "Connecting Cities to Basins"
- The UCL DPU and the Institute for Global Prosperity, project entitled "Knowledge in Action for Urban Equality" (KNOW)

3.2. Reflections on pursuing just service provision in Dar es Salaam's informal settlements through knowledge co-production

3.2.1. Recognising everyday realities: insights from co-produced knowledge

CCI undertakes knowledge co-production within informal settlements, which allows for a level of disaggregation beyond what is produced through official channels. For example, by physically mapping water provision facilities in two informal settlements, Tungi and Kombo, important nuances are revealed (Hofmann, 2020). Firstly, there are significant differences

between the two, such as that Kombo benefits from a greater range and number of water facilities, probably due to the relative proximity of the existing water utility network. Secondly, facilities are unevenly distributed within settlements too (see Figure 1), resulting in longer distances and queue times in poorly served areas (Hofmann, 2020). Uneven distribution of infrastructure shapes present-day service injustices, but also impacts residents' options for the future. Distance from the existing utility network prevents the majority of Kombo residents and all Tungi residents from potentially installing private water connections. By simply mapping facilities within informal settlements, this co-produced knowledge already provides detailed insights into the nature of present injustices and potential constraints on future improvements.

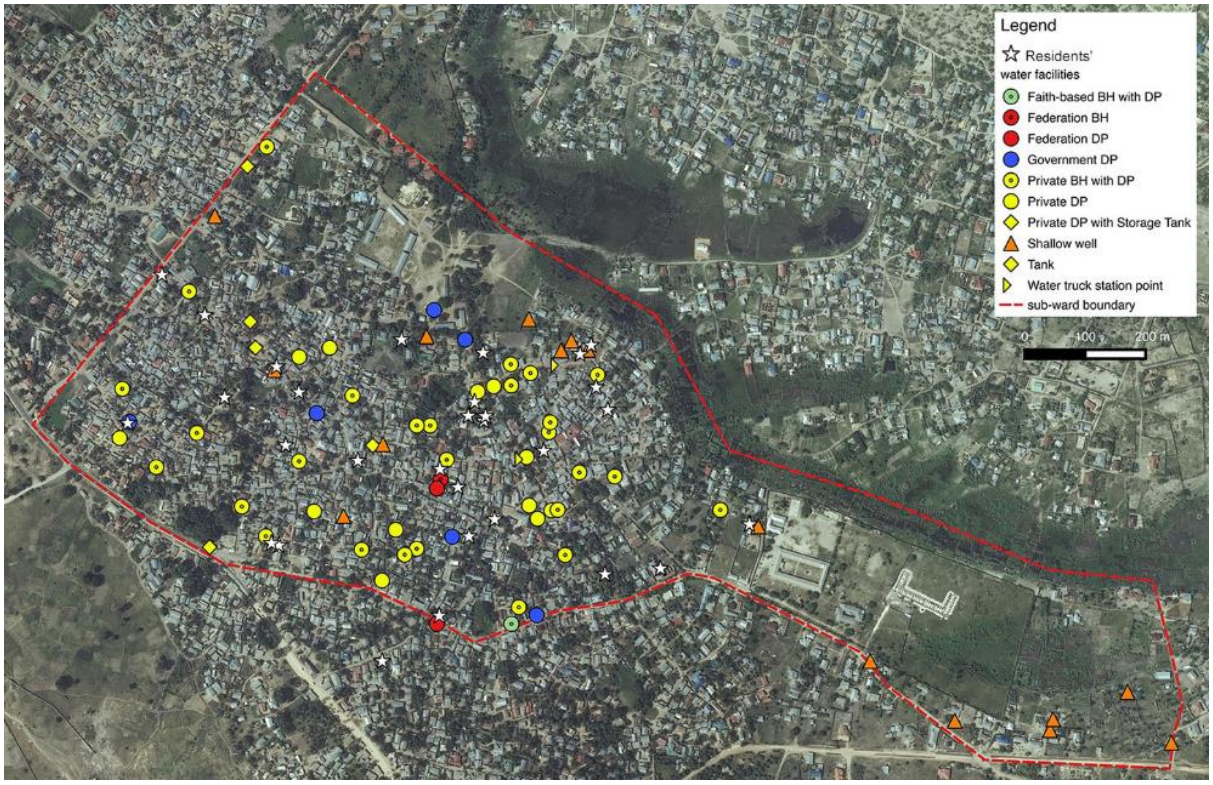

Figure 1: Uneven distribution of water supply facilities in Tungi informal settlement

Map reproduced from Hofmann (2020), formulated with co-produced data from CCI and TUPF (2016)

Knowledge co-produced between CCI and local residents does not merely extend the range and depth of official data sets, however, it adds new dimensions which layer together, generating a multifaceted recognition of how injustices manifest. Unlike DAWASA and other official channels, co-production arrangements do not preferentially examine 'formal' service modalities over 'informal'. As such, the knowledge generated on the range and significance of 'informal' practices, from unlicensed water vendors to the purchasing of water from neighbours

with household connections, is both novel and vitally important. By collaboratively exploring everyday practices and experiences regardless of their formality, Hofmann (2020) evidences Truelove's (2019) argument that the traditional dualism of formal / informal is meaningless. Residents of Tungi and Kombo dynamically utilise both formal and informal water sources with reliance on the latter often prompted by poor quality or interrupted service from the former. Furthermore, some 'formal' channels of service provision can be operated 'informally'. For example, private operators of DAWASA-owned water distribution points often set their own prices, despite DAWASA instructions (Hofmann, 2020). By revealing traditionally-obscured so-called 'informal' everyday practices, this challenges traditional assumptions of formality and demonstrates that city-wide policies are often distorted at local levels.

CCI's knowledge co-production also embraces non-traditional knowledge forms, such as personal narratives. These approaches draw attention to heterogeneity in service provision injustices through time, space and between individuals. In particular, Hofmann (2018) revealed that individuals all experience their own trajectories in and out of water poverty over time. Although the trajectories of individuals are influenced by settlement-wide trajectories, such as installation of public infrastructure, they are also shaped by the specific interactions with those around them, such as their husbands, parents and landlords. It is important not to oversimplify these relations, however. While, on balance, tenants seem less able to exert agency over their service provision, not all landlords are able to alleviate their water poverty. For example, Joseph, a 74-year-old landlord, reported that the smell from nearby wastewater stabilisation ponds makes his property unattractive to tenants, further exacerbating the financial instability preventing him improving his service (Hofmann, 2018). Through these life-histories, Hofmann (2018) promotes a counter-hegemonic narrative of low-income communities as active and resourceful individuals that renegotiate service provision injustices within constraints placed on them, such as lack of access to finance, land and knowledge.

Demonstrating heterogeneity between and within settlements and their diverse residents indicates that official data often misrepresents lived realities and may poorly guide progress. As part of the IIED Connecting Cities to Basins project, CCI coordinated the co-production of an alternative to the Joint Monitoring Programme (JMP) ladder of improved water and sanitation provision with low-income communities in the informal settlements of Mtoni, Kombo and Tungi (Walnycki and Skinner, 2017). The findings contributed to the long-standing criticism of Millennium Development Goals' indicators (see Weststrate *et al.*, 2019). While some of these critiques have been somewhat addressed in the Sustainable Development

Goals, the co-produced ladder still raises troubling challenges to the updated JMP ladder. The co-produced ladder disagreed with the JMP definition of improved sanitation excluding any form of facility shared with more than two households (Figure 2, highlighted orange). In Dar es Salaam's informal settlements, compound living with multiple households is very common and, therefore, sharing facilities is deemed more acceptable than the JMP suggests (Walnycki and Skinner, 2017). Although shared facilities do tend to be associated with a number of sanitation-related issues including cleanliness and length of queue times, considering all shared facilities unimproved misrepresents the sanitation problem in Dar es Salaam as primarily one of lack of facilities (McGranahan *et al.*, 2016). There are concerns that the prevalence and acceptance of these definitions may be discouraging the Tanzanian government from seeking better information (Smiley, 2016). Erroneously focusing on shared facilities may obscure the larger issue of unsafe faecal sludge management in Dar es Salaam's informal settlements (Yap and Mills, 2013) and result in policies addressing the former rather than addressing the expressed preferences of the informal settlement residents themselves (McGranahan *et al.*, 2016).

	UNACCEPTABLE	ACCEPTABLE	IDEAL
	Unlined / poorly lined pit-latrines	Soak-away pit / pit latrine & squatting pan stopping disease transmission	Sewer connections / septic tank / vacuum tank emptying
ENVIRONMENT	Wastewater flows to immediate environment	No impact on immediate environment	Toilet is well constructed; wastewater does not contaminate environment
CLEANLINESS	Full pit, causes back flow, dirty toilet, poor ventilation, damp, fungus and mould	Clean inside and easy to keep clean	Cleanable floor and tiles, with tools and products available for cleaning; hand washing facility
STRUCTURE	Uses cloth, sacks, tree branches etc.	Roof, walls and door; lined with bricks or blocks	Brick, well built, with opening for ventilation, door for privacy
WASTE REMOVAL	Manual emptying; flooding of pit during the rainy season; abandoning pits	Safe emptying without polluting the environment; no manual emptying	Waste removal safe, affordable and appropriate to local context
SHARING	More than five families sharing	2-4 households sharing; 8-20 people	No more than one family or 5-6 people sharing
COST	Usually more than TSh2 million (excessive cost); lower than TSh400,000 indicates poor quality toilet	For households to build new toilet: TSh1–1.5 million (high cost due to need to dig pit and buy tank)	For households to build new toilet: TSh600,000-800,000
WATER FOR SANITATION	Men should use between 20 and 5l; women between 30 and 10l	Water needed, same as for ideal (20–30l)	Men approximately 20l; women 20–30l
PRIVACY	No door, no privacy	Lockable door	Men: inside / outside toilet but tank/pit should be outside; women: inside toilet preferred unless plot is fenced

Figure 2: Co-produced ladder of sanitation facilities

Tsh500,000 equivalent to US$225 (January 2017) (Walnycki and Skinner, 2017)

In contrast to the sector-specific information provided by DAWASA, co-produced knowledge in Dar es Salaam's informal settlements provides a greater and more relevant insight into how various service related injustices intersect to shape settlements' and individuals' experiences. While the siloed approach to city management is arguably ineffective for all cities, it is particularly inappropriate in informal settlements due to the unplanned development that characterises these spaces (Kyessi, 2005; McGranahan *et al.*, 2016). FGDs articulated how electricity outages in the dry seasons compromise water provision from public utility distribution points, resulting in local water shortages (Hofmann, 2018). The lived reality of this intersection also depends on the range of coping mechanisms available to individuals and households. Similarly, land tenure security and sanitation issues often intersect, with tenants typically less able to upgrade their sanitation facilities (Hofmann, 2020). The KNOW project's work demonstrates this point even more emphatically. To better understand local priorities, local residents co-produced a conceptual model of context-specific components of prosperity (translated as *maisha bora*, or 'the good life'). Co-producing a local understanding of prosperity based on lived experience clearly demonstrates that, while essential services are an integral part of prosperity, they cannot be considered in isolation. A range of other social, economic and political factors contribute towards maisha bora and all factors are interrelated, such that progress in one dimension is profoundly impacted by conditions in another (Woodcraft *et al.*, 2020). This holistic perspective provides an opportunity to plan and implement interventions that transformatively embrace complexity and respond to the reality of interrelated problems in informal settlements.

The knowledge that CCI co-produces with local low-income communities has not simply improved understanding of existing situations, it can also underpin transformative action. In contrast to the one-size-fits all approach of DAWASA's pro-poor action which homogenises the urban poor, co-produced knowledge embraces diversity and nuance (Hofmann, 2020). For example, the IIED co-produced ladders revealed the many pathways to community-desired progress. Furthermore, the respective roles and responsibilities of local informal settlement residents, the utilities providers and the municipality were defined in relation to these dimensions. Action in some areas, such as the installation of toilet locks, is understood to be a private responsibility whereas improvements in water and wastewater infrastructure are the utilities' responsibilities (Walnycki and Skinner, 2017). Ensuring that co-produced knowledge actively supports action to improve local lives is a key priority of CCI and therefore FGDs tend to be solutions-focused (CCI Co-founder and Director, 2021). One informal settlement resident who participated in an earlier CCI community mapping exercise said of the process that it had "opened and empowered us to do anything now. It showed us a way." (Glöckner, Mkanga and

Ndezi, 2005, p. 197). Furthermore, the CCI Co-founder and Director (2021) described a snowball effect under which local residents acting to implement solutions co-produced with CCI and partners often attract additional support and funding from external organisations, allowing co-produced knowledge and solutions to be implemented at greater scale. This takes knowledge co-production from a self-help scheme to a transformative way to inform and generate meaningful change, tied to lived realities and expressed preferences.

3.2.2. Pursuing procedural justice through knowledge co-production

Before examining the transformative potential of CCI's knowledge co-production process, it is important to reiterate that this research does not attempt the impossible task of representing another's reality. As the very notion of empowerment implies a personal, internal process (Olsen and Garikipati, 2008), it is impossible and unethical to judge how an individual has been 'empowered' through co-production. This research, therefore, examines features of the knowledge co-production process to draw conclusions on how it supports transformative change to address WSS-related injustices.

Proponents of participatory processes such as knowledge co-production often claim that spaces of participation are arenas for challenging oppressive structures (Cornwall, 2005; Cleaver, 2007). Many informal settlement residents participants report the desire to express their political voice as a key motivator for partaking (CCI M&E Officer, 2021). The opportunity is particularly attractive when compared with the limited formal options for political participation. Ward and Sub-Ward officials are only mandated to deliver four formal community meetings per year and time constraints often leave many without the opportunity to participate (CCI M&E Officer, 2021). The smaller group sizes of FGDs or mapping teams offer the opportunity for everyone to speak, and are spaces where normal social hierarchies are somewhat disbanded. Hofmann (2018) noted that local Sub-Ward officials chose to forgo their status of 'key informants' to take a more active role in settlement mapping teams. Just as this allowed Sub-Ward officials an unprecedented understanding of their settlement, it surely also gives local residents unprecedented access to the officials themselves. Furthermore, there are examples of residents strategically leveraging spaces of knowledge co-production to exert political influence (DPU Associate Professor, 2021). In a CCI-coordinated workshop, Kombo residents seized the opportunity to directly challenge local health officials over their denial of access to existing wastewater stabilisation ponds that could improve sanitation facilities.

Interestingly, the request had been dismissed by local officials, however, features of this space, possibly the presence of CCI staff and foreign academics, allowed residents to powerfully exert their political agency (DPU Associate Professor, 2021). Eventually, and after concerted effort by CCI and local residents, access was granted to the stabilisation ponds via a simplified sewerage network (CCI, 2020). Overall, it seems that knowledge co-production offers a rare platform for informal settlement residents to express their political agency both through generating knowledge and through influencing local officials.

Participation in knowledge co-production appears to accrue benefits to both individuals and collectives. Individually, participants seem motivated by the skills gained, such as technologically-supported mapping, increased access to information and status within the community (CCI M&E Officer, 2021). Participants also report pride to have undertaken 'research', an activity typically reserved for external experts (CCI Co-Founder and Director, 2021). As one of CCI's primary purposes is to support TUPF, knowledge co-production spaces are also sometimes used to encourage federation recruitment. Federation members can then access TUPF's capacity building activities, as well as their core financial services (CCI, no date).

Without inputs from informal settlement residents, it is challenging to evidence Appadurai's (2012) theory that self-enumeration acts as a ritual of community formation and political empowerment in this context. The legacy of Dar es Salaam's unique political history must be considered. The post-independence authorities enforced a unification agenda that prohibited discussion of divisive topics including ethnic identity and ongoing suspicion of grassroots political activity prompts CBOs to be studiously apolitical (Dill, 2009). CCI is no exception, and facilitators typically avoid contentious political topics in FGDs (CCI Co-Founder and Director, 2021). Participants may, therefore, be cautious to be political in knowledge co-production. Participants do express pleasure at better understanding their community and settlement, both through the knowledge outputs and the discussions of settlement history (CCI Community Engineer, 2021). Furthermore, the co-produced knowledge does tend to underpin material improvements for collectives as well as individuals, such as the installation of the simplified sewerage network reducing environmental pollution. As Hofmann (2018) notes, however, it is hard to determine whether collective action is taken for collective or individual benefits. This particularly the case for sanitation interventions as an individual's sanitation-related injustices are also related to wider settlement conditions (DPU Associate Professor, 2021). For example, many surrounding households could be exposed to contamination from a single leaking pit

latrine (McGranahan, 2015). An FPE approach suggests that distinguishing between collective action produced through individual versus agency is not only of academic interest, but may have a profound influence on the micro-politics shaping collective action.

Although there are clear benefits to the knowledge produced and the process of knowledge co-production, it is important to critically evaluate under what circumstances and to whom these benefits accrue. Some level of selection bias in the informal settlement residents participating in knowledge co-production is difficult to avoid. Firstly, limited resources leads CCI to commonly recruit existing federation members (CCI Community Engineer, 2021). As fewer than 1% of informal settlement residents are federation members (McGranahan, 2015), their realities are probably overrepresented in co-produced knowledge. More generally, Hofmann (2018) notes an inherent bias towards older, wealthier residents with the time and resources to participate, possibly also leading to the reported overrepresentation of landlords (IIED Researcher, 2021). Dill (2009) critiques participatory development via CBOs, such as federations, in Dar es Salaam, in part for the assumption that a handful of CBO members can act as representatives for the whole settlement. Although this critique has merits, the WSS-related injustices of informal settlements are so institutionally misrecognised even a handful of resident voices surely deliver improvements. Furthermore, the methodology is not inherently exclusionary. For example, Hofmann (2018) actively recruited non-federation participants and documented the ages, gender, tenure-status and occupations of participating individuals, ensuring that findings are not generalised inappropriately. Overall, while it is important to critically evaluate the inclusivity of knowledge co-production, it is also important not to lose sight of the established norm and recognise where progress has been won.

Spaces of knowledge co-production should not be romanticised as established social norms and power relations influence the nature and extent of participation, with complex implications for individual agency (Cleaver, 2007). For example, tenants are often reluctant to discuss sanitation problems with landlords present for fear of straining that relationship. Similarly, many are unwilling to admit to poor sanitation facilities in the presence of local officials who may seek them or their landlords out later to issue fines (CCI M&E Officer, 2021). To encourage open discussion and protect individuals from the potential consequences of disclosing personal information, CCI typically runs FGDs separated along common lines of tension, such as women and men, landlords and tenants and in the presence and absence of local officials. An FPE lens highlights that individuals are not defined by single social categories, however, and managing individuals' multiple roles within the community can be

challenging (Symington, 2004; Dhamoon, 2011). An individual may attend and contribute as a landlord, but act later on the knowledge they have gained in the capacity of local health official (DPU Associate Professor, 2021).

Even within these separated FGDs, skilled facilitation is needed to manage the micro-scale power relations shaping different people's contributions. CCI facilitators are trained to actively encourage quieter participants (CCI M&E Officer, 2021) however, a quieter individual is not necessarily an inactive participant. In village meetings in Tanzania, Cleaver and Kaare (1998) report that apparent gendered differences in contribution to the discussion were actually predominantly underpinned by women's preference to articulate interests through nominated eloquent individuals. The women's success in shaping decision-making highlights the nuances of social relations and indicates that agency can be exerted without being overt. Perhaps most importantly, CCI facilitators avoid allowing power relations to influence the knowledge generated, where possible. Instead of attempting to resolve conflicts, CCI facilitators document and treat all perspectives equally (CCI M&E Officer, 2021). This is potentially very transformative as traditional knowledge building often seeks consensus which usually merely inappropriately universalises and legitimises the opinion of the most powerful (Kesby, 2005). In CCI coordinated knowledge co-production discussions, inherent power relations are recognised and managed, where possible, to actively deliver procedural justice for those involved.

The primary purpose of knowledge co-production for CCI is to deliver meaningful change in informal settlements (CCI Co-Founder and Director, 2021). To do so, however, CCI must navigate a balance between legitimising co-produced knowledge in the eyes of the local government and DAWASA and maintaining a strong line of downwards accountability to their grassroots origins (IIED Senior Researcher, 2021). Local government has been receptive to co-produced knowledge, with ward and sub-ward officials even participating. By contrast, DAWASA has not engaged with co-produced knowledge and has not attended CCI-run municipal workshops presenting co-produced findings (DPU Associate Professor, 2021). At present, CCI is developing a new engagement methodology which involves local officials throughout the process to promote institutional buy-in (CCI Community Engineer, 2021). CCI will have to remain cautious of the impacts of having officials present in co-production spaces, however this methodology has the potential to transform local policy making. Interventions implemented in informal settlements could become informed and co-designed with the

residents to respond to their everyday realities and help reframe the relationship between the state and the urban poor.

Knowledge co-production and its impacts are highly context-specific, deeply political and complex. As Mitlin *et al.*, (2019) powerfully argue, sweeping conclusions on transformational or empowering impacts produced through a specific interaction or at a specific moment in time are likely to be erroneous. Even within CCI's experiences, there have been moments when knowledge co-production has been less successful due to context specific factors. For example, after government-mandated evictions, local informal settlement residents were reluctant to participate in knowledge co-production, fearing that the findings would be exploited to justify further evictions (CCI M&E Officer, 2021). Similarly, Glöckner, Mkanga and Ndezi (2005) described participation fatigue in some residents due to the perceived failure of previous participatory engagements to produce material improvements. Furthermore, improvements due to co-production are not always sustained. For example, the simplified sewerage network in Kombo was initially rolled out based on a co-produced understanding of local residents ability to pay. Over time, the inclusive pro-poor co-produced pricing structure was abandoned by DAWASA in favour of cost-recovery (DPU Associate Professor, 2021). Although it seems that knowledge co-production can help alleviate service-related injustices, clearly the relationship is not linear and sustained effort is needed even when progress does not seem apparent. CCI are, arguably, the best placed to coordinate this effort as, unlike international organisations, they are not constrained by project cycles. They are able to benefit from partnerships with external groups and funding without limiting the scale and duration of their engagement and remain deeply embedded in the unique context of Dar es Salaam's informal settlements.

3.3. SEEKING JUST SERVICE PROVISION THROUGH RECOGNITION AND PARTICIPATION

Overall, CCI's efforts in Dar es Salaam's informal settlements provide compelling evidence that knowledge co-production has significant potential to ameliorate WSS provision injustices.

Co-produced knowledge challenges the homogenising and reductionist statistics of DAWASA, instead offering a rich and complex picture of lived realities. By celebrating qualitative and experiential insights, the extent to which national and international institutions misunderstand residents' needs is clear. Furthermore, co-produced knowledge is action-oriented by default and inherently cross-sectoral. As such, the knowledge CCI has co-produced with local informal settlements advances recognition justice by revealing daily struggles and through creating an impetus for change.

Although it is difficult to claim that participation in knowledge co-production has empowered individuals or collectives to alleviate WSS injustices, it is clear that the process offers a rare opportunity for residents to exert political voice and benefits are felt by individuals and collectives. This offers hope that knowledge co-production could support transformational change for informal settlements, however the process should not be romanticised. Knowledge co-production is rarely inclusive of all, complex social relations must be navigated throughout and progress is often uncertain. Furthermore, CCI faces an uphill battle to ensure that informal settlement communities, and their knowledge, are accepted and respected by the local government and DAWASA. That said, the institutional relationships between CCI, TUPF and the wider SDI offer the best possible opportunity for CCI to continue to advance the cause of environmental justice for informal settlement residents.

4. CONCLUSIONS AND IMPLICATIONS

This dissertation has situated knowledge co-production in Dar es Salaam's informal settlements and the coordinating role of CCI within wider debates around the transformational potential of knowledge co-production to alleviate WSS service injustices. The key analytical lenses of environmental justice and FPE supported a sensitive investigation, focusing on lived experiences of service injustices and the co-production process, itself. In Dar es Salaam, there is evidence to suggest that knowledge co-production has the potential to transformatively alleviate WSS service provision injustices, through addressing underlying recognition and participation issues. It is important not to romanticise this process, however, as perhaps the key finding of this research is that the benefits and transformative potential of the process are heavily contingent on how it is conducted. CCI's careful attention to intra-community power relations and sustained partnerships with informal settlement residents stand in stark contrast to other local examples, such as the World Bank's Ramani Huria project, which are, at best, somewhat performative. Based on this analysis, three important conclusions can be drawn, with implications for research and practice.

Firstly, the importance of local context in shaping the transformative potential of knowledge co-production cannot be overstated. At the city level, Dar es Salaam's unique post-independence history of partial oppression of grassroots political activity clearly has implications for the nature of community political empowerment supported by knowledge co-production and CBO activity (Dill, 2009). Intra-city nuances, such as a recent local history of evictions, also shape the potential of knowledge co-production within localised contexts of individual informal settlements (CCI M&E Officer, 2021). The major implication of recognising the importance of local context to knowledge co-production practice is emphasising that the organisations coordinating co-production should be capable of navigating this complexity. Through their relationship to TUPF, CCI is embedded in Dar es Salaam's informal settlements (CCI, no date). Their long history of sustained engagement leaves CCI far more capable of coordinating knowledge co-production than any external organisation. This finding has widespread implications as many cities host analogous relationships between local NGOs and federations of the urban poor (Yap and Mills, 2013). As the majority of knowledge co-production academic literature is conceptual (Simon *et al.*, 2018), this research challenges scholars to localise knowledge co-production and embrace the messy and equivocal reality of such projects. Grounding knowledge co-production literature in a greater appreciation of geographic and social heterogeneity would help caution against notions of community and

empowerment composed in one location being uncritically applied in other, potentially inappropriate, contexts.

Secondly, a call to action is inherent within knowledge co-production's transformational potential. Not only does the data produced better recognise lived struggles than conventional sources, it also offers a better foundation on which to build context-specific and nuanced solutions that respond to local realities and preferences. Although the progression from co-producing knowledge to co-designing and delivering solutions seems logical, the challenges are significant. In Dar es Salaam, DAWASA's lack of engagement with co-produced knowledge remains a key barrier to addressing WSS issues identified (DPU Associate Professor, 2021). Furthermore, significant challenges exist in WSS solution co-design and delivery. Partnerships between state actors and local communities are not always sustained, typically leaving communities to manage facilities without sufficient post-installation support (Allen *et al.*, 2016). Unpredictable and variable success can also lead to participation fatigue in informal settlement residents (Glöckner, Mkanga and Ndezi, 2005). On the other hand, significant collaboration between low-income communities and local authorities have resulted in greater inclusion and participation of the former in political processes and decision-making (Banana *et al.*, 2015). Although co-produced knowledge represents significant and important progress towards tackling recognition and procedural injustices, it is vitally important that these gains are translated into effective action. This action must deliver material WSS improvements and continue to challenge systematic marginalisation as the underlying cause of distributional inequities.

Finally, evaluating the transformative potential of knowledge co-production calls for a balance between critical evaluation and celebration of progress. Over its history, development research and practice has suffered a tendency to romanticise certain groups and practices, to the detriment of project efficacy. For example, 'communities' have been stereotyped as harmonious units and the practice of community-based development has been romanticised as inherently effective and inclusive. Many scholars have raised concerns over the lack of nuance in this depiction, not least because it ignores intra-community tensions and power relations (Cornwall, 2000; Platteau, 2003; Mansuri and Rao, 2004). On the other hand, however, academics have been accused of excessive and unproductive critique without proposing alternatives (Braun, 2015). This dissertation has attempted to navigate the thin line of nuanced reality that exists between romanticising knowledge co-production and excessive criticism that does not recognise the progress it offers compared to established practices. In

this balance, a nuanced argument can emerge. Knowledge co-production has the potential to transformationally alleviate WSS service provision injustices however, it cannot assume to automatically do so. While the practice offers progress and hope for inclusive development, it should not be considered a silver bullet for solving WSS injustices. Going forward, knowledge co-production should be celebrated for this transformational potential, but this celebration should not devolve into an uncritical, romanticised depiction of the process.

APPENDIX

A.1. LIST OF INTERVIEWEES

CCI Co-Founder and Director (2021), Focus Group Discussion 1, conducted 16/08/21

CCI Monitoring and Evaluation (M&E) Officer (2021), Focus Group Discussion 1, conducted 16/08/21

CCI Community Engineer (2021), Focus Group Discussion 1, conducted 16/08/21

DPU Associate Professor, UCL (2021), Focus Group Discussion 1 & 2, conducted 16/08/21

IIED Senior Researcher (2021), Focus Group Discussion 2, conducted 16/08/21

IIED Researcher (2021), Focus Group Discussion 2, conducted 16/08/21

A.2. BIBLIOGRAPHY

African Development Bank (2014) *Tracking Africa's Progress in Figures*.

Allen, A. *et al.* (2016) 'Water trajectories through non-networked infrastructure: insights from peri-urban Dar es Salaam, Cochabamba and Kolkata', *http://dx.doi.org/10.1080/17535069.2016.1197306*. Routledge, 10(1), pp. 22–42. doi: 10.1080/17535069.2016.1197306.

Allen, A., Griffin, L. and Johnson, C. (2017) 'Environmental justice and urban resilience in the global south', *Environmental Justice and Urban Resilience in the Global South*, pp. 1–307. doi: 10.1057/978-1-137-47354-7.

Anderson, P. M. L. *et al.* (2013) 'Brokering communities of knowledge and practice: Reflections on the African Centre for Cities' CityLab programme', *Cities*. Elsevier Ltd, 32, pp. 1–10. doi: 10.1016/j.cities.2013.02.002.

Appadurai, A. (2002) 'Deep democracy: Urban governmentality and the horizon of politics', *Public Culture*, 14(3), pp. 21–27. doi: 10.1215/08992363-14-1-21.

Appadurai, A. (2012) 'Why enumeration counts', *Environment and Urbanization*, 24(2), pp. 639–641. doi: 10.1177/0956247812447511.

Bakker, K. J. (2000) 'Privatizing Water, Producing Scarcity: The Yorkshire Drought of 1995', *Economic Geography*. Routledge, 76(1), pp. 4–25. doi: 10.1111/j.1944-8287.2000.tb00131.x.

Banana, E. *et al.* (2015) 'Sharing reflections on inclusive sanitation', *Environment and Urbanization*, 27(1), pp. 19–34. doi: 10.1177/0956247815569702.

Bell, D. and Carrick, J. (2017) 'Procedural environmental justice', in *The Routledge Handbook of Environmental Justice*. doi: 10.4324/9781315678986.

Bell, D. M. and Pahl, K. (2018) 'Co-production: towards a utopian approach', *International Journal of Social Research Methodology*. Routledge, 21(1), pp. 105–117. doi: 10.1080/13645579.2017.1348581.

Birkmann, J. (2007) 'Risk and vulnerability indicators at different scales:. Applicability, usefulness and policy implications', *Environmental Hazards*, 7(1), pp. 20–31. doi: 10.1016/J.ENVHAZ.2007.04.002.

Braun, B. (2015) 'From critique to experiment? Rethinking political ecology for the Anthropocene', in *The Routledge Handbook of Political Ecology*. Routledge, pp. 124–136. doi: 10.4324/9781315759289-17.

CCI (2020) *Water Supply Programme*.

CCI (no date) *Centre for Community Initiatives (CCI)*. Available at: https://ccitanzania.org/# (Accessed: 25 August 2021).

Chambers, R. (1997) *Whose reality counts? Putting the first last.* London: Intermediate technology publications.

Cleaver, F. (2007) 'Understanding Agency in Collective Action', *Journal of Human Development*, 8(2), pp. 223–244. doi: 10.1080/14649880701371067.

Cleaver, F. and Kaare, B. (1998) *Social Embeddedness and Project Practice: A Gendered Analysis of Promotion and Participation in HESAWA Programme Tanzania*. University of Bradford, Development and Project Planning Centre.

Cornwall, A. (2000) 'Missing men? Reflections on men, masculinities and gender in GAD', *IDS Bulletin*, 31(2), pp. 18–27. doi: 10.1111/j.1759-5436.2000.mp31002003.x.

Cornwall, A. (2005) 'Spaces for transformation? Reflections on issues of power and difference in participation for development', in *Participation: From tyranny to transformation: Exploring new approaches to participation in development*. London: Zed Books, pp. 75–91.

Culwick, C. *et al.* (2019) 'CityLab reflections and evolutions: nurturing knowledge and learning for urban sustainability through co-production experimentation', *Current Opinion in Environmental Sustainability*. Elsevier B.V., 39(July), pp. 9–16. doi: 10.1016/j.cosust.2019.05.008.

DAWASA (no date) *Dar-es-salaam Water Supply and Sanitation Authority: History*. Available at: https://www.dawasa.go.tz/en/pages/historia (Accessed: 24 August 2021).

Dhamoon, R. K. (2011) 'Considerations on mainstreaming intersectionality', *Political Research Quarterly*, 64(1), pp. 230–243. doi: 10.1177/1065912910379227.

Dill, B. (2009) 'The paradoxes of community-based participation in Dar es Salaam', *Development and Change*, 40(4), pp. 717–743. doi: 10.1111/j.1467-7660.2009.01569.x.

Dill, B. (2010) 'Community-Based Organizations (CBOs) and Norms of Participation in Tanzania: Working against the Grain', *African Studies Review*, 53(2), pp. 23–48. doi: 10.1353/arw.2010.0019.

Dill, B. (2013) *Fixing the African State*, *Fixing the African State*. doi: 10.1057/9781137281418_6.

Dill, B. and Crow, B. (2014) 'The colonial roots of inequality: access to water in urban East Africa', *Water International*. Routledge, 39(2), pp. 187–200. doi: 10.1080/02508060.2014.894212.

Durose, C. *et al.* (2012) *Towards Co-Production in Research with Communities*, *Connected communities*.

Elmhirst, R. (2011) 'Introducing new feminist political ecologies', *Geoforum*. Elsevier Ltd, 42(2), pp. 129–132. doi: 10.1016/j.geoforum.2011.01.006.

EWURA (2020) *Water utilities performance review report for FY 2018/19: Regional and national project water utilities*.

Foucault, M. (1977) *Discipline and punish: The birth of the prison*, *London: Allen Lane*.

Freire, P. (1970) *Pedagogy of the oppressed.* London, UK: Penguin Books Ltd.

Freire, P. (1981) *Education for Critical Consciousness*. doi: 10.1177/074171367402400405.

Galuszka, J. (2019) 'What makes urban governance co-productive? Contradictions in the current debate on co-production', *Planning Theory*, 18(1), pp. 143–160. doi: 10.1177/1473095218780535.

Gaventa, J. (1993) 'The powerful, the powerless, and the experts', in Park, P. et al. (eds) *Voices of Change: Participatory Research in the United States and Canada*. OISE Press, pp. 21–40.

Gaventa, J. and Cornwall, A. (2011) 'Power and Knowledge', in *The SAGE Handbook of Action Research*. SAGE Publications Ltd, pp. 172–189.

Giddens, A. (1986) *The constitution of society: outline of the theory of structuration*. [First pap. Cambridge: Polity Press.

Glöckner, H., Mkanga, M. and Ndezi, T. (2005) 'Local empowerment through community mapping for water and sanitation in Dar es Salaam', *Environment and Urbanization*, 16(1), pp. 185–197. doi: 10.1630/095624704323026241.

Hanson, A. M. and Buechler, S. (2015) 'Introduction: Towards a feminist political ecology of women, global change, and vulnerable waterscapes', in *A Political Ecology of Women, Water and Global Environmental Change*. Taylor and Francis, pp. 22–34. doi: 10.4324/9781315796208.

Hofmann, P. (2017) 'Multi-layered Trajectories of Water and Sanitation Poverty in Dar es Salaam', in, pp. 103–118. doi: 10.1007/978-3-319-42686-0_7.

Hofmann, P. (2018) *The Dialectics of Urban Water Poverty Trajectories: Policy-driven and Everyday Practices in Dar es Salaam*.

Hofmann, P. (2020) 'Meeting WASH SDG6: insights from everyday practices in Dar es Salaam', *Environment and Urbanization*, 33(1), pp. 173–192. doi: 10.1177/0956247820957280.

Hofmann, P., Ndezi, T. and Makoba, F. (2019) *Trajectories of sanitation poverty in Dar es Salaam*, *Dialogues in Urban Equality Webinar Series*. Available at: https://www.urban-know.com/events (Accessed: 9 August 2021).

Kaika, M. (2003) ‘Constructing scarcity and sensationalising water politics: 170 Days that shook Athens’, *Antipode*, 35(5), pp. 919–954. doi: 10.1111/j.1467-8330.2003.00365.x.

Kesby, M. (2005) ‘Retheorizing Empowerment-through-Participation as a Performance in Space: Beyond Tyranny to Transformation’, *Signs: Journal of Women in Culture and Society*, 30(4), pp. 2037–2065.

Kjellen, M. (2006) *From Public Pipes to Private Hands : Water Access and Distribution in Dar es Salaam, Tanzania*. Stockholm University, Department of Human Geography.

Kombe, W., Ndezi, T. and Hofmann, P. (2015) *Translocal Learning for Water Justice: Peri-Urban Pathways in India, Tanzania and Bolivia. Water Justice City Profile Dar es Salaam, Tanzania*.

Kyessi, A. G. (2005) ‘Community-based urban water management in fringe neighbourhoods: the case of Dar es Salaam, Tanzania’, *Habitat International*. Pergamon, 29(1), pp. 1–25. doi: 10.1016/S0197-3975(03)00059-6.

Lawhon, M. and Patel, Z. (2013) ‘Scalar Politics and Local Sustainability: Rethinking Governance and Justice in an Era of Political and Environmental Change’:, *Environment and Planning C: Government and Policy*. SAGE PublicationsSage UK: London, England, 31(6), pp. 1048–1062. doi: 10.1068/C12273.

Lines, K. and Makau, J. (2018) ‘Taking the long view: 20 years of Muungano wa Wanavijiji, the Kenyan federation of slum dwellers’, *Environment and Urbanization*, 30(2), pp. 407–424. doi: 10.1177/0956247818785327.

Lukes, S. (1974) *Power: a radical view*. London: Macmillan (Papermac (London, England)).

Mansuri, G. and Rao, V. (2004) ‘Community-based and -driven development: A critical review’, *World Bank Research Observer*, 19(1), pp. 1–39. doi: 10.1093/wbro/lkh012.

Mapunda, D. W., Chen, S. S. and Yu, C. (2018) ‘The role of informal small-scale water supply system in resolving drinking water shortages in peri-urban Dar Es Salaam, Tanzania’, *Applied Geography*. Pergamon, 92, pp. 112–122. doi: 10.1016/J.APGEOG.2018.02.001.

May, T. and Perry, B. (2017) ‘Knowledge for just urban sustainability’, *Local Environment*. Taylor & Francis, 22, pp. 23–35. doi: 10.1080/13549839.2016.1233527.

McGranahan, G. (2015) ‘Realizing the Right to Sanitation in Deprived Urban Communities: Meeting the Challenges of Collective Action, Coproduction, Affordability, and Housing Tenure’, *World Development*. Elsevier Ltd, 68, pp. 242–253. doi: 10.1016/j.worlddev.2014.12.008.

McGranahan, G. *et al.* (2016) *Universalising water and sanitation coverage in urban areas: From global targets to local realities in Dar es Salaam, and back.*, *IIED Working paper*. London.

Ministry of Water and Livestock Development (2002) ‘United Republic of Tanzania National Water Policy’.

Mitlin, D. (2008) ‘With and beyond the state - Co-production as a route to political influence, power and transformation for grassroots organizations’, *Environment and Urbanization*, 20(2), pp. 339–360. doi: 10.1177/0956247808096117.

Mitlin, D. *et al.* (2019) *Knowledge matters: the potential contribution of the co-production of research to urban transformation*, *GDI Working Paper 2019-039*. Manchester. doi: 10.2139/ssrn.3225770.

Mitlin, D. and Bartlett, S. (2018) ‘Editorial: Co-production – key ideas’, *Environment and Urbanization*, 30(2), pp. 355–366. doi: 10.1177/0956247818791931.

Moser, S. C. (2016) ‘Can science on transformation transform science? Lessons from co-design’, *Current Opinion in Environmental Sustainability*. Elsevier B.V., 20, pp. 106–115. doi: 10.1016/j.cosust.2016.10.007.

Newborne, P., Tucker, J. and Bayliss, K. (2012) *Strengthening pro-poor targeting of investments by African utilities in urban water and sanitation - the role of the International Development Association of the World Bank*.

Nganyanyuka, K. *et al.* (2014) ‘Accessing water services in Dar es Salaam: Are we counting what counts?’, *Habitat International*. Pergamon, 44, pp. 358–366. doi: 10.1016/J.HABITATINT.2014.07.003.

Olsen, W. and Garikipati, S. (2008) ‘The Role of Agency in the Development Process and Development Planning’, *International Journal of Development Planning*, 30:4, pp. 327–338. Available at: https://www.research.manchester.ac.uk/portal/en/publications/the-role-of-agency-in-the-development-process-and-development-planning(02b77010-60b0-488f-baac-193aac47cd89).html (Accessed: 29 August 2021).

Osuteye, E. *et al.* (2019) *Knowledge co-production for urban equality*, *KNOW (Knowledge in Action for Urban Equality) working paper series*.

Petersson, L. *et al.* (2020) ‘Community Mapping Supports Comprehensive Urban Flood Modeling for Flood Risk Management in a Data-Scarce Environment’, *Frontiers in Earth Science*, 8(July), pp. 1–15. doi: 10.3389/feart.2020.00304.

Platteau, J. (2003) *Community-Based Development in the Context of Within Group Heterogeneity*.

Rawls, J. (1971) *A Theory of Justice*. Harvard University Press. doi: 10.2307/j.ctvjf9z6v.

Riger, S. (1992) ‘Epistemological debates, feminist voices: Science, social values, and the study of women’, *American Psychologist*. American Psychological Association Inc., 47(6), pp. 730–740. doi: 10.1037/0003-066X.47.6.730.

Rocheleau, D. E. (2008) ‘Political ecology in the key of policy: From chains of explanation to webs of relation’, *Geoforum*, 39(2), pp. 716–727. doi: 10.1016/j.geoforum.2007.02.005.

Rocheleau, D., Thomas-Slayter, B. and Wangari, E. (1996) ‘Gender and Environment: A Feminist Political Ecology perspective’, in *Feminist political ecology: Global issues and local experiences*, pp. 3–26.

Schlosberg, D. (2007) ‘Distribution and Beyond: Conceptions of Justice in Contemporary Theory and Practice David’, in *Defining Environmental Justice: Theories, Movements, and Nature*, pp. 11–41. doi: 10.1093/acprof.

Sen, A. (1987) ‘Gender and cooperative conflicts’, *Working Papers - World Institute for Development Economics Research, Helsinki*, 18.

Simon, D. *et al.* (2018) ‘The challenges of transdisciplinary knowledge production: from unilocal to comparative research’, *Environment and Urbanization*, 30(2), pp. 481–500. doi: 10.1177/0956247818787177.

Smiley, S. L. (2013) ‘Complexities of water access in Dar es Salaam, Tanzania’, *Applied Geography*. Pergamon, 41, pp. 132–138. doi: 10.1016/J.APGEOG.2013.03.019.

Smiley, S. L. (2016) 'Water Availability and Reliability in Dar es Salaam, Tanzania', *Journal of Development Studies*. Routledge, 52(9), pp. 1320–1334. doi: 10.1080/00220388.2016.1146699.

Smiley, S. L. (2020) 'Heterogeneous water provision in Dar es Salaam: The role of networked infrastructures and alternative systems in informal areas', *Environment and Planning E: Nature and Space*, 3(4), pp. 1215–1231. doi: 10.1177/2514848620908194.

Steel, G. (2012) 'Whose paradise? Itinerant street vendors' individual and collective practices of political agency in the tourist streets of Cusco, Peru', *International Journal of Urban and Regional Research*. Wiley Online Library, 36(5), pp. 1007–1021.

Stephen, S. (2013) *Landlords and Tenants Relationship in Improving Sanitation: a Case of Keko Machungwa Settlement Dar Es Salaam*.

Sturgis, S. (2015) 'Tanzania's Dar es Salaam Is on Track to Become One of Africa's Most Important Megacities', *Bloomberg CityLab*, 25 February. Available at: https://www.bloomberg.com/news/articles/2015-02-25/tanzania-s-dar-es-salaam-is-on-track-to-become-one-of-africa-s-most-important-megacities (Accessed: 24 August 2021).

Swyngedouw, E. (2009) 'The Political Economy and Political Ecology of the Hydro-Social Cycle', *Journal of Contemporary Water Research & Education*, 142(1), pp. 56–60. doi: 10.1111/j.1936-704x.2009.00054.x.

Symington, A. (2004) 'Intersectionality: A Tool for Gender and Economic Justice Intersectionality', *Women's Rights and Economic Change*, (9), pp. 1–8.

Truelove, Y. (2011) '(Re-)Conceptualizing water inequality in Delhi, India through a feminist political ecology framework', *Geoforum*. Elsevier Ltd, 42(2), pp. 143–152. doi: 10.1016/j.geoforum.2011.01.004.

Truelove, Y. (2019) 'Gray Zones: The Everyday Practices and Governance of Water beyond the Network', *Annals of the American Association of Geographers*. Routledge, 109(6), pp. 1758–1774. doi: 10.1080/24694452.2019.1581598.

UN DESA (2018) *World Urbanization Prospects*, *Demographic Research*. New York.

Walnycki, A. and Skinner, J. (2017) *Connecting cities to basins: Meeting the water and sanitation SDG targets at scale: a focus on Dar es Salaam*, *IIED*. Available at: https://www.iied.org/connecting-cities-basins (Accessed: 3 June 2021).

Walther, M. (2014) 'Bourdieu's theory of practice as theoretical framework', in *Repatriation to France and Germany*. Springer, pp. 7–23.

Weststrate, J. *et al.* (2019) 'The Sustainable Development Goal on Water and Sanitation: Learning from the Millennium Development Goals', *Social Indicators Research*. Springer Netherlands, 143(2), pp. 795–810. doi: 10.1007/s11205-018-1965-5.

WHO/UNICEF (2017) *Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and SDG Baselines*. Geneva.

WHO and UNICEF (2017) *Progress on Drinking Water, Sanitation and Hydiene*, *Who*. Geneva.

Whyte, K. (2017) 'The recognition paradigm of environmental injustice', in *The Routledge Handbook of Environmental Justice*. doi: 10.4324/9781315678986.

Woodcraft, S. *et al.* (2020) 'Pathways to the "good life": Co-producing prosperity research in

informal settlements in Tanzania', *Urban Planning*, 5(3), pp. 288–302. doi: 10.17645/up.v5i3.3177.

World Bank (2018) *Ramani Huria: The Atlas of Flood Resilience in Dar es Salaam*. Washington, D.C.

WSUP (2015) *Stand-alone unit or mainstreamed responsibility? How can water utilities serve low-income communities?*

Yap, C. and Mills, J. E. (2013) *Water and sanitation action research in the City of Dar es Salaam: Community mapping towards inclusive development*.

Yuval-Davis, N. (2006) 'Intersectionality and feminist politics', *European Journal of Women's Studies*, 13(3), pp. 193–209. doi: 10.1177/1350506806065752.