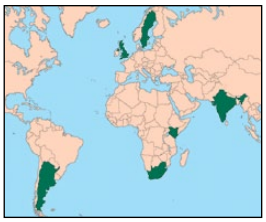
The challenges of transdisciplinary knowledge production: from unilocal to comparative research



The challenges of transdisciplinary knowledge production: from unilocal to comparative research

DAVID SIMON, HENRIETTA PALMER, JAN RIISE, WARREN SMIT AND SANDRA VALENCIA

David Simon is Director of Mistra Urban Futures and Professor of Development Geography, Royal Holloway, University of London.

Address: Chalmers University of Technology, SE-412 96, Sweden; e-mail: david.simon@chalmers.se

Henrietta Palmer is Deputy Scientific Director of Mistra Urban Futures and Artistic Professor, Chalmers University of Technology.

Address: e-mail: henrietta.palmer@chalmers.se

Jan Riise is Manager for Engagement, Mistra Urban Futures.

Address: e-mail: jan.riise@chalmers.se

Warren Smit is Research Director, African Centre for Cities, University of Cape Town, and Director of the Mistra Urban Futures Cape Town Local Interaction Platform.

Address: e-mail: Warren.Smit@uct.ac.za

Sandra Valencia is Lead Researcher on the Mistra Urban Futures comparative project on implementation of the New Urban Agenda and Urban Sustainable Development Goal.

Address: e-mail: sandra.valencia@chalmers.se

ABSTRACT This reflective paper surveys the lessons learnt and challenges faced by the Mistra Urban Futures (MUF) research centre and its research platforms in Sweden, the UK, South Africa and Kenya in developing and deploying different forms of transdisciplinary co-production of knowledge. Considerable experience with a distinctive portfolio of such methods has been gained and reflective evaluation is now under way. While it is important to understand the local context within which each method has evolved, we seek to explain the potential for adaptation in diverse contexts so that such knowledge co-production methods can be more widely utilized. Furthermore, the current phase of MUF's work is undertaking innovative comparative transdisciplinary co-production research across its research platforms. Since the specific local projects differ, systematic thematic comparison requires great care and methodological rigour. Transdisciplinary co-production is inherently complex, time consuming and often unpredictable in terms of outcomes, and these challenges are intensified when it is undertaken comparatively.

KEYWORDS comparative urban research / co-production / Mistra Urban Futures / transdisciplinarity / transdisciplinary urban co-production

I. INTRODUCTION: FROM UNILOCAL TO COMPARATIVE TRANSDISCIPLINARY CO-PRODUCTION OF KNOWLEDGE

Co-production (also known as co-creation or co-design[1]) as an approach has evolved since the 1980s. The objective has been to bring different stakeholder groups together in an attempt to overcome often-longstanding antagonisms and wide asymmetries of power by working or researching together to improve outcomes, whether of services or research, and their legitimacy.[2]

Essentially, the many modes of co-production constitute more sustained and coherent forms of the diverse participatory research and consultation methods developed to engage with local communities, research subjects, or the intended beneficiaries of development or service investments. There is no clear boundary between co-production and participation – when the intention is to increase diverse stakeholders' power. Indeed, for instance, participatory budgeting, of the kind initiated in Porto Alegre (Brazil) and subsequently applied in diverse cities,[3] has many attributes of co-production.

Environment & Urbanization Copyright © 2018 International Institute for Environment and Development (IIED).
Vol 30(2): 481–500. 10.1177/0956247818787177 www.sagepublications.com

Globally, co-production has most commonly involved local authorities and other public-sector institutions engaging with residents and organized community groups, often in relation to service provision.[4] Nevertheless, the term applies also to diverse forms, partnerships and applications nowadays, including, for instance, in relation to global change research and peri-urban disaster risk reduction.[5] The literature demonstrates how challenging, time consuming and sometimes unpredictable genuine co-production of knowledge and understanding can be in terms of outcomes. Perhaps unsurprisingly, therefore, the now-considerable literature on this form of co-production around the world is overwhelmingly conceptual or based on research in one location. It also tends to assume – usually implicitly since these issues are rarely addressed – that power differentials among co-production participants and their respective institutions can be overcome and that consensus can be achieved through sustained negotiation.

Co-produced research, like the co-production of services, can sometimes also be transdisciplinary. Although this latter term is sometimes used synonymously with interdisciplinary to refer to the crossing of academic disciplines, here we adopt the more conventional current usage denoting the collaboration of academics and practitioner/practice-oriented researchers from different disciplines and/or backgrounds. Transdisciplinary co-produced research emphasizes inclusiveness and iterative, deliberative negotiation as the mechanism for building shared understandings as a precondition for making progress jointly. As such, it involves a team made up of practitioners and academics, creating a fundamentally different epistemology of social science knowledge production from the conventional linear, positivist and expert-led model that still underpins most urban research worldwide.

This paper provides initial reflections on the innovative agenda of Mistra Urban Futures (MUF) as it undertakes a coherent programme of international comparative and transdisciplinary co-productive research.[6] The overarching objective of our approach to transdisciplinary comparative research is to analyse how key themes relating to urban sustainability and justice are understood and operationalized in different contexts, thus helping to open up more possibilities for change. The ultimate objective is to ensure the realization of just and sustainable cities in these different contexts (e.g. by learning from the positive and negative experiences of other cities, and developing trans-local links).

The paper is divided into four sections. Following this introduction, Section II provides an overview of lessons derived from the first phase of MUF's research, in which transdisciplinary co-produced studies were undertaken within individual cities. Section III then examines the challenges involved in moving from this foundation to comparative transdisciplinary co-produced research, while Section IV assesses the early lessons emerging from the current suite of comparative projects. Section V addresses the important agenda of engagement and societal impact, which are fundamental to MUF's approach to responsible research and innovation. The final section provides a concluding discussion and assessment of the paper's contribution.

Established in Gothenburg, Sweden, in 2010, MUF is an international urban research centre ("the Centre" in this paper) promoting urban sustainability by means of the transdisciplinary co-production of knowledge, undertaken in a series of Local Interaction

1. These terms tend to be used interchangeably in much of the literature, although the shift towards co-creation or co-design is intended to emphasize the more holistic process of undertaking all stages of a project jointly, even implementation, and to distinguish this latter from forms of co-production in which one stakeholder defines and sometimes designs a project, with joint work commencing with the actual research activity. MUF follows this holistic approach [Mistra Urban Futures (2015), *Strategic Plan 2016 – 2019*, Gothenburg, available at http://www.mistraurbanfutures.org], although still often using the term co-production for reasons of familiarity.

2. For example, Jasanoff, S (2004), "The idiom of co-production", in S Jasanoff (editor), *States of Knowledge: The Co-Production of Science and Social Order*, pages 1–12, Routledge, London; also Joshi, A and M Moore (2004), "Institutionalised co-production: unorthodox public service delivery in challenging environments", *Journal of Development Studies* Vol 40, No 1, pages 31–49; 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* Vol 20, No 2, pages 339–360; and Polk, M (editor) (2015a), *Co-producing Knowledge for Sustainable Cities: Joining Forces for Change*, Routledge, Abingdon and New York.

3. Cabannes, Y (2004), "Participatory budgeting: a significant contribution to participatory democracy", *Environment and Urbanization* Vol 16, No 1, pages 27–46; also Cabannes, Y (2015), "The impact of participatory budgeting on basic services: municipal practices and evidence from the field", *Environment and Urbanization* Vol 27, No 1, pages 257–284.

4. For example, see reference 2, Polk (2015a); also Polk, M (2015b), "Transdisciplinary co-production: designing and

Platforms (LIPs). These have been formed through bottom-up local initiatives that lead to formal partnerships among groups of academic and practice-oriented institutions in Gothenburg (Sweden), Sheffield/Greater Manchester (UK), Cape Town (South Africa), and Kisumu (Kenya). These partnerships came together to form what became Mistra Urban Futures. In 2016/17, a LIP was also established in the Swedish cities of Malmö and Lund in southern Sweden (SKåne LIP) in order to join the Centre; and a smaller partnership in Stockholm is currently in a similar process. The formal nature of all these partnerships is important in terms of their capacity to attract political and financial support, as well as the backing provided to the individual researchers comprising the respective project teams.[7]

These partnerships are diverse in terms of the number of institutional partners, their contractual and governance arrangements, their operating mechanisms, and the types of co-production undertaken. However, all have one or more universities and local authorities as members, thus constituting a particular kind of university–local government partnership.[8] All LIP partners share the underlying desire to collaborate on mutually defined applied research priorities in the belief that this offers greater prospects for appropriate and practicable interventions and outcomes than traditional, expert-led research. The Swedish LIPs operate as consortia under a multi-year agreement and are hosted by local universities. The Kisumu LIP (KLIP) is constituted as a registered trust under Kenyan law with its own premises, while the Cape Town and Sheffield–Manchester LIPs (called CTLIP and SMLIP respectively) are university-based partnerships operating by means of bilateral collaboration agreements with local/regional authority partners.[9]

MUF is distinctive as a Centre, comprising a Secretariat in Gothenburg and this series of LIP hubs, along with the smaller partnership just established in Stockholm and project-based collaborations in Dehradun and Shimla (India) and Buenos Aires (Argentina). It thus straddles four continents, deliberately embracing the challenges of urban sustainability across the increasingly artificial global North/South divide that still bedevils the United Nations and many other bi- and multi-lateral initiatives. Core funding is provided by the Swedish Foundation for Strategic Environmental Research (Mistra), the Swedish International Development Cooperation Agency (Sida) and the Gothenburg Consortium of seven partners, which include universities, local and regional authorities and research institutes, with additional local funding in other LIPs and competitive project-based funds from diverse sources.

Until the end of Phase 1 of the Centre's funding in December 2015, each LIP experimented with its own forms of transdisciplinary knowledge co-production, suited to the particular context and blend of academic and practitioner partners and their respective priorities. These experiences and key lessons are drawn together in the next section.[10] Among the most important of these experiences are the breaking down of often-longstanding barriers and forging of trust; identification of suitable champions within each institution (ideally at both political and professional levels); development of common approaches to the research; and the role of the LIPs as "safe spaces" for experimentation away from the constraints and habitual practices of each institution. Considerable effort has been devoted to learning about the experiences using

testing a transdisciplinary research framework for societal problem solving", *Futures* Vol 65, pages 110–122, available at http://dx.doi.org/10.1016/j.futures.2014.11.001; Durose, C and L Richardson (2016), *Designing Public Policy for Co-production: Theory, Practice and Change*, Policy Press, Bristol; Tabory, S H (2016), "Co-production and enterprise culture: negotiating local urban development culture in Santo Domingo's 'barrios populares'", Unpublished MA thesis, University of Texas at Austin; and Wolf, G and N Mahaffey (2016), "Designing difference: co-production of spaces of potentiality", *Urban Planning* Vol 1, No 1, pages 59–67.

5. Mauser, W, G Klepper, M Rice, B S Schmalzbauer, H Hackmann, R Leemans and H Moore (2013), "Transdisciplinary global change research: the co-creation of knowledge for sustainability", *Current Opinion in Environmental Sustainability* Vol 5, Nos 3–4, pages 420–431; also Schaer, C and E Komlavi Hanonou (2017), "The real governance of disaster risk management in peri-urban Senegal: delivering flood response services through co-production", *Progress in Development Studies* Vol 17, No 1, pages 38–53.

6. An earlier version of this paper was presented at the conference of the African Centre for Cities, University of Cape Town, 1–3 February 2018.

7. See reference 1, Mistra Urban Futures (2015); also Palmer, H and H Walasek (editors) (2016), *Co-production in Action*, Mistra Urban Futures, Gothenburg, available at http://www.mistraurbanfutures.org/en/annual-conference/conference-book; and Perry, B, Z Patel, Y Norén Bretzer and M Polk (2018), "Organising for co-production: Local Interaction Platforms for urban sustainability", Politics and Governance Vol 6, No 1, pages 188-198.

8. Trencher, G, X Bai, J Evans, K McCormick and M Yarime (2014), "University partnerships for co-designing and co-producing urban sustainability",

transdisciplinary co-produced research.[11] The Governance and Policy for Sustainability (GAPS) project attempted to examine the experiences across the LIPs comparatively during Phase 1. However, governance and funding setbacks made the process difficult, which resulted in platform-specific analyses rather than comparative ones.[12]

The second phase of Mistra and Sida funding (2016–2019) has enabled the introduction of systematic comparative research projects as a novel and world-leading dimension to MUF's work. A typology of forms or models of comparison was developed, representing a spectrum in terms of the degree of central versus local (bottom-up) design, implementation and control (see Section IV). Altogether 12 transdisciplinary comparative projects (including one centred on PhD studentships) have been initiated to date; they are diverse and represent most of the models in the typology (Table 1). Despite this variety, all these applied social scientific comparative projects are very different from natural or life science comparative projects, which would require identical and reproducible local projects. As such, they also face distinctive challenges. Because the comparative dimensions of these projects are still at an early stage, our reflections later in the paper are a preliminary assessment of what we believe to be the first time that such an exercise has been undertaken. As such, we draw on our leadership roles within the Centre, as coordinators of subsets of comparative projects, as Director of one LIP, and as lead researcher on the Urban SDG/New Urban Agenda comparative project. These roles involve regular dialogue, coordination and evaluative discussions and interactions, both formal and informal, with the respective project teams and other stakeholders.

II. LESSONS LEARNT FROM UNILOCAL TRANSDISCIPLINARY CO-PRODUCED RESEARCH

This section synthesizes some of the key achievements, constraints and generalizable principles based on the experience in the respective LIPs during the first phase of Mistra Urban Futures. It draws in part on Palmer and Walasek[13] and Perry et al.[14] As emphasized in the previous section, one of the key features of the LIPs is their diverse history, structure, number, and range of partner institutions and activities.

The first important lesson reflects this: namely that a prerequisite for success is being locally appropriate and embedded, so as to be, and be seen to be, responsive to local conditions and flexible in adapting to evolving agendas. Attempting to establish a suite of "identikit" LIPs to undertake transdisciplinary research co-production in different contexts would simply not work.

Second, in their operations, the LIPs act as "active intermediaries"[15] between global agendas and local contexts and concerns. This bidirectional role and relationship adds considerable value both ways. On the one hand, the individual cities have been able to understand and learn from experiences elsewhere and from global initiatives on urban sustainability in tackling similar problems. Conversely, Mistra Urban Futures uses the transdisciplinary co-production experiences in the individual cities to inform wider global policy debates and agendas for practice.

A third lesson is that the partners need to operate through thorough reflexivity, with openness to change and renewal.[16] A perennial challenge

Global Environmental Change Vol 28, pages 153–165.

9. See reference 1, Mistra Urban Futures (2015); also see reference 7, Palmer and Walasek (2016); and reference 7, Perry et al. (2018).

10. For a fuller exposition, see reference 7, Palmer and Walasek (2016), pages 24–31.

11. See reference 2, Polk (2015a); also see reference 4, Polk (2015b); reference 7, Palmer and Walasek (2016); Westberg, L and M Polk, M (2016), "The role of learning in transdisciplinary research: moving from a normative concept to an analytical tool through a practice-based approach", *Sustainability Science* Vol 11, No 3, pages 385–397; and Polk, M (2014), "Achieving the promise of transdisciplinarity: a critical exploration of the relationship between transdisciplinary research and societal problem solving", *Sustainability Science* Vol 9, No 4, pages 439–451, available at http://dx.doi.org/10.1007/s11625-014-0247-7. For diverse approaches to urban experimentation, compare these to Evans, J, A Karvonen and R Raven (editors) (2016), *The Experimental City*, Routledge, Abingdon and New York. More generally, see Simon, D and F Schiemer (2015), "Crossing boundaries: complex systems, transdisciplinarity and applied impact agendas", Current Opinion in Environmental Sustainability Vol 12, pages 6–11, available at http://dx.doi.org/10.1016/j.cosust.2014.08.007.

12. *Local Environment: International Journal of Justice and Sustainability* (2017), Vol 22, No S1, "The future of sustainable cities: governance, policy and knowledge", Open access issue, available at https://www.tandfonline.com/toc/cloe20/22/sup1.

13. See reference 7, Palmer and Walasek (2016).

14. See reference 7, Perry et al. (2018).

15. May, T and B Perry (2011), "A way forward: active intermediaries", in T May and B Perry (editors), *Social Research and Reflexivity: Content,*

TABLE 1
International comparative projects of Mistra Urban Futures

Project (project period)	Actors involved[a] (typology)[b]	Actions taken	Aim of interventions (SDG 11 target)[c]	Where
Realising Just Cities (2017–2019)	All platforms (1+4)	Workshop organized in March 2018. Four levels identified: evaluations of LIP-specific projects, comparative projects, platforms and international partnerships.	Contributing to realizing just cities by organizing knowledge through local platforms, generating new urban knowledge through co-production and conducting place-specific comparative research. (11.1, 11.2, 11.3, 11.7, 11.a)	Cape Town for project lead; all other platforms and partners for comparative work. Generalized to globally relevant knowledge.
Implementing the New Urban Agenda and the SDGs: Comparative Urban Perspectives (2017–2019)	All platforms + Shimla and Buenos Aires (4)	Formation of city-wide working groups in each city. Small sample of SDG 11 indicators (indicators 11.1.1 and 11.6.2) tested and reported for each city.	Analysing implementation of the global agendas with the cities, facilitating cross-city learning and interaction. Contributing to UN revisions of targets, indicators and NUA reports (all).	Buenos Aires, Cape Town, Gothenburg, Kisumu, Malmö, Sheffield and Shimla. Relevance: global.
Participatory cities (2017–2019)	CT, G, K, S-M, Sk (1)	Sub-themes on co-production and participation; participatory planning; role of intermediaries; policy briefings.	Discussion paper, anthology of cases, mapping of differences, reflections, synthesis of results and academic articles. Reports at the 2019 MUF conference. (11.3.2)	Empirical: across all platforms. Relevance: global.
Cultural Heritage and Just Cities (2017–2019)	CT, G, K, S-M (3)	Development of planning, assessment and mapping tools, position paper.	Role and value of cultural heritage in the Realising Just Cities context. (11.4)	Empirical: UK, Kenya, Sweden, South Africa. Relevance: global.
Knowledge Transfer Programme (2017–2019)	CT, K, S-M, Sk (2)	Knowledge exchange meetings in 2018 on embedded research and other transfer-oriented initiatives.	Create a programme for knowledge exchange in Malmö. Co-authored articles and comparative reflection on embedded research. (11.b)	Cape Town and Malmö. Also in Sheffield–Manchester, Kisumu. Relevance: global.
Migration and Urban Development (2018–2019)	G, K, S-M, Sk (1)	Output defined at the project meeting in May 2018.	Addressing migration and urbanization from an integrated theoretical perspective. (11.a)	Participating cities/countries, generalized results on a global scale.
Urban Food Security and Value Chain (2017–2019)	G, K, S-M, Sk (1+2)	Builds on existing projects on urban food security and food value chains, adds various comparative elements, e.g. around examining different concepts and methodologies used in different projects/cities.	Contributions to theory through publications, and to policy making through policy briefs and policy workshops. Applied food plan for Gothenburg. New business models for local production. (11.6 and 11.a)	Participating platforms. Global relevance for theoretical contributions.

(Continued)

TABLE 1 (CONTINUED)

Project (project period)	Actors involved[a] (typology)[b]	Actions taken	Aim of interventions (SDG 11 target)[c]	Where
Neighbourhood Transformation and Housing Justice (2017–2019)	G, S-M, Sk (1)	Planning for learning exchange in 2018 based on an initiative in Sheffield.	Develop empowering and affordable models for housing low-income urban residents.	Participating cities – Gothenburg, Sheffield, Malmö
Transportation and Urban Development (2017–2019)	CT, G, K (1+2)	Workshops planned for 2018, first in May.	Identification of themes for the comparative research. (11.2, 11.6, 11.b)	Participating cities, methods and experiences of general interest.
Solid Waste Management (2017–2018)	K, Sk (1)	Knowledge transfer, review of relevance.	Changing behaviour, attitudes and collaboration in the value chain. (11.6)	Testbed: Kisumu, Kenya. Relevance: primarily global South.
Urban Public Finance (2017–2019)	CT, K, Centre (6)	Research activities, crowdfunding conference in London, April 2018.	PhD theses and publications. Capacity development activities for officials, enabling cities to rethink revenue raising and expenditure portfolios.	Empirical studies in Kisumu and Cape Town. Relevance: global and diverse.
PhD collaborative project (2014–2021)	G, K (6)	Doctoral research and workshops.	PhD theses and publications, evaluations of action research.	Cape Town, Gothenburg, Kisumu.

NOTES:

[a]CT=Cape Town, G=Gothenburg, K=Kisumu, S-M=Sheffield–Manchester, Sk=Skåne.

[b]See Section IV.

[c]The SDG 11 targets are listed at https://medium.com/sdgs-resources/sdg-11-indicators-5a613061b3dc.

in any large institution, but one that is magnified in transdisciplinary partnerships, is the difficulty of maintaining continuity, consistency and momentum in the face of ongoing changes in key personnel in one or more partners. A change in mayor, chief executive, or even line manager of a particular institutional representative can change priorities, power relations within and across partner institutions, political and/or financial support, or even enthusiasm to participate. New team members often raise new questions and may challenge previous decisions or have different priorities, and the renegotiations involved can be draining, even when there is agreement in principle to abide by previous decisions.

Another important lesson is that much depends on who the individual researchers are. It is essential to identify and recruit researchers who can straddle disciplines and bridge the divide between academia and policy/practice, since these are extremely difficult challenges and not everybody has the right skills, experience and personality. A related lesson is that different stakeholders often have diverse perspectives and conflicting agendas. People involved in transdisciplinary research need good facilitation skills (or need to be able to draw on people with good facilitation skills) as they attempt to reconcile these perspectives.

Experience from each LIP shows that it is possible to have a significant impact on policy and practice through the transdisciplinary co-production of knowledge. For example, co-production processes that brought together different stakeholders in Kisumu resulted in the planning of a range of physical upgrading projects for the city and the implementation of a number of significant initiatives, such as an ecotourism project.[17] Several processes have also brought together officials and researchers to co-produce new policies, such as a new policy framework to guide state investment in human settlements in the Western Cape (where Cape Town is located) and a new climate change strategy for Gothenburg. Through exposing practitioners to a range of new perspectives, new *"communities of knowledge and practice"* have been created, with changes in the mindsets and actions of many practitioners.[18]

A final key lesson is that there is no one right way of approaching the transdisciplinary co-production of knowledge. The method that works best can vary considerably from topic to topic and from place to place, depending on who the stakeholders are, how contested that particular issue is, and what the existing body of knowledge on that particular topic in that particular place is. The only commonality in our various transdisciplinary co-production processes was that they all involved extensive engagement over a sustained period of time with a range of stakeholders (especially city officials, academic researchers and civil society) to attempt to better understand and address the real challenges facing the city.[19]

III. THE CHALLENGES OF COMPARATIVE TRANSDISCIPLINARY CO-PRODUCTION

a. Reasons for comparing

At the beginning of Phase 2, MUF sharpened its focus on how to transition towards sustainable cities, by suggesting comparative transdisciplinary research as a possible approach to tackle wicked problems[20] of urban

Consequence and Context, SAGE, London.

16. See reference 15; also May, T and B Perry (2018), *Reflexivity: The Essential Guide*, SAGE, London; and Voss, J P and P Bornemann (2011), "The politics of reflexive governance: challenges for designing adaptive management and transition management", *Ecology and Society* Vol 16, No 2, pages 9–32.

17. Onyango, G M and B O Obera (2015), "Tracing Kisumu's path in the co-production of knowledge for urban development", in M Polk (editor), *Co-producing Knowledge for Sustainable Cities: Joining Forces for Change*, Abingdon, Routledge, pages 73–97.

18. Anderson, P M L, M. Brown-Luthango, A Cartwright, I Farouk and W Smit (2013), "Brokering communities of knowledge and practice: reflections on the African Centre for Cities' CityLab programme", *Cities* Vol 32, pages 1–10.

19. See reference 18; also Anderson, P and T Elmqvist (2012), "Urban ecological and social-ecological research in the city of Cape Town: insights emerging from an Urban Ecology CityLab", *Ecology and Society* Vol 17, No 4, Article 23; Brown-Luthango, M (2013), "Community-university engagement: the Philippi CityLab in Cape Town and the challenge of collaboration

injustices. With the previous and diverse experiences from the set of secondary cities where the LIP-involved stakeholders were already experienced in co-production, there was good potential also to contribute to knowledge about what constitutes a just city and how to achieve it in varying urban contexts.

Sustainable development is a contested term, and conflicts can appear in determining what might be a socially, economically and ecologically desirable urban condition.(21) The question of *development for whom?* emerges sooner or later. For all the research conducted within the Centre (i.e. Mistra Urban Futures), urban justice was an embedded objective. Within the three broad themes of socio-spatial, socio-ecological and socio-cultural transformations, three core attributes were considered to characterize just and sustainable cities – namely that they should be fair, green and accessible.(22) Since comparative transdisciplinary co-produced research has the potential to catalyse both new knowledge and new behaviours, this comparative component was introduced to extend the Centre's research as much as possible. Existing comparative urban concepts such as *twinning* have already created comparative exchanges between city officials for mutual learning about, for example, planning mechanisms. City branding listings, where urban qualities such as liveability are measured to compete for the same group of investors, represent another form of comparison.(23) There is also a new wave of theoretically inspired comparative urban studies linked to debates about global urbanism.(24) But this trend largely omits decades of comparative research and does not engage with the methodological issues addressed here.

Indeed, comparing transnational research on how to realize just cities implies an agenda that cannot "belong" to the interest of any particular stakeholder group or practice only, nor to one single geographical context. All perspectives, conflicting as well as aligned, ultimately contribute to the production of a richer body of knowledge on what urban justice could look like, and how it might be imagined, operationalized and achieved. Since each of the comparative projects has formulated its own rationale for comparison, deploying the typology of models of comparison as a structure (see Section IV), Mistra Urban Futures has set up an overall comparative project, entitled Realising Just Cities. This project aims to produce meta-knowledge, considering how all the different comparative projects together create societal impact in terms of organizational changes and policy effects, along with changed social behaviours and societal visions, all contributing to the realization of just cities.(25)

b. Learning from comparative co-produced research

As has been pointed out elsewhere within the work of MUF,(26) different organizational setups contribute to different kinds of knowledge production. Consequently, as part of a comparative learning process, the differing organizational project arrangements could also be compared, along with the different co-production methods applied at similar stages of the respective processes in the varying contexts. Both these objectives would feed into the cross-context learning on how to achieve just cities. Hierarchies that might exist in one context, and that could effectively prohibit deliberative co-production, might

across boundaries", *Higher Education* Vol 65, No 3, 309–324; Greyling, S, Z Patel and A Davison (2017), "Urban sustainability disjunctures in Cape Town: learning the City inside and out", *Local Environment: International Journal of Justice and Sustainability* Vol 22, No S1, pages 52–65, available at https://doi.org/10.1080/13549839.2016.1223621; Patel, Z, S Greyling, S Parnell and G Pirie (2015), "Co-producing urban knowledge: experimenting with alternatives to 'best practice' for Cape Town, South Africa", *International Development Planning Review* Vol 37, No 2, pages 187–203; Patel, Z, S Greyling, D Simon, H Arfvidsson, N Moodley, N Primo and C Wright (2017), "Local responses to global sustainability agendas: learning from experimenting with the urban Sustainable Development Goal in Cape Town", *Sustainability Science* Vol 12, No 5, pages 785–797; Miszczak, S and Z Patel (2018), "The role of engaged scholarship and co-production to address urban challenges: a case study of the Cape Town Knowledge Transfer Programme", *South African Geographical Journal* Vol 100, No 2, pages 233–248; Smit, W, A de Lannoy, R V H Dover, E V Lambert, N Levitt and V Watson (2014), "'Good houses make good people': making knowledge about health & environment in Cape Town", in B Cooper and R Morrell (editors), *Africa-Centred Knowledges: Crossing Fields and Worlds*, James Currey, Woodbridge, pages 142–162; and Smit, W, M Lawhon and Z Patel (2015), "Co-producing knowledge for whom, and to what end? Reflections from the African Centre for Cities in Cape Town", in M Polk (editor), *Co-producing Knowledge for Sustainable Cities: Joining Forces for Change*, Routledge, Abingdon, pages 47–69.

20. "Wicked problems" are those complex, hard to define problems that do not lend themselves to simple, permanent technical solutions.

21. Campbell, S (1996), "Green cities, growing cities, just

be understood in light of shared experiences from other situations, where structures of power would take different forms. In this manner, the methods and organizational structures applied could develop and become more robust. This, in turn, would contribute further insights into transdisciplinary knowledge production and more sustainable processes of co-production.

Another objective underlying the comparative co-produced research is to mirror the way different problems are manifested in their respective local contexts in order to deepen our understanding of the problem at hand. Highlighting differences or similarities, or embracing a diversity of knowledge cultures, allows for an expanded understanding of the problem – which a single context could not produce. In other situations, a crucial problem might be suppressed and hence become "nonexistent" within an agenda promoting urban justice. Transnational comparative and co-produced research, with its multitude of stakeholders, could shed light on and highlight such an issue. A striking example is the way the #MeToo movement, addressing the matter of silenced sexual abuse, has, through experimential knowledge and an international *co-acknowledgement*, been brought forward as a parallel to discourse in diverse contexts around the world.

In MUF's comparative agenda, the current 12 projects resulting from the previous three broad themes of socio-spatial, socio-ecological and socio-cultural transformations cover an urban ground of great variety – from food production to migration (Table 1). While using these different topic-lenses to understand how urban justice might be achieved, a further outcome would be to detect the direction and intensity of ongoing change in each local context. How change is taking place, and how it could be directed towards more just urban conditions through different vehicles of transformation, would be explored at a comparative meta level traceable across the full set of projects. Here each context would provide valuable insights on mechanisms for transformation towards urban justice, and how they play out in relation to different citizen groups. Co-produced research, unlike "traditional" research, has the advantage of already including some of the actors with planning roles or mandates (like city officials and councillors). This means that the research, in addition to pointing to evidence and results, actually becomes a catalyst itself, impacting behavioural changes as part of the research process (see Section IVa with respect to the Centre's project on the New Urban Agenda and Sustainable Development Goals). With different stakeholders engaged in the *comparative issue*, conversations are generated from stakeholder to stakeholder across geographical contexts. In the process, the comparative issue becomes *nested* in a number of cross-national conversations that, however difficult to foresee, would undoubtedly impact each local environment.

c. Early assumed outcomes

Clearly, outcomes and impacts are difficult to specify at this early a stage in this ambitious programme, and can as yet merely be envisioned. However, this in itself is worth commenting on, since outcomes point towards an expansion of a research culture as such, which in itself is a transformative tool for societal change. The researchers and practitioners involved foresee

cities: urban planning and the contradiction of sustainable development", *Journal of the American Planning Association* Vol 62, Article 3; also Simon, D (editor) (2016), *Rethinking Sustainable Cities: Accessible, Green and Fair*, Policy Press, Bristol, available at https://oapen.org/search?identifier=613676;keyword=Rethinking%20Sustainable%20Cities.

22. See reference 1, Mistra Urban Futures (2015); also see reference 21, Simon (2016).

23. For example, Giap, T K, W W Thye and G Aw (2014), "A new approach to measuring the liveability of cities: the Global Liveable Cities Index", *World Review of Science, Technology and Sustainable Development* Vol 11, No 2, pages 176–196, available at https://pdfs.semanticscholar.org/9d3c/581a17f587406eddb988f346d4180e6e6cba.pdf.

24. For example, Robinson, J (2011) "Cities in a world of cities: the comparative gesture", *International Journal of Urban and Regional Research* Vol 35, No 1, pages 1–23; also Robinson, J (2016), "Comparative urbanism: new geographies and cultures of theorising the urban", *International Journal of Urban and Regional Research* Vol 40, No 1, pages 187–199; and Schmid, C and Brenner, N (2015) "Towards a new epistemology of the urban?", *CITY: Analysis of urban trends, culture, theory, policy, action* Vol 19, Nos 2–3, pages 151–182.

25. The project Realising Just Cities includes comparative inquiries at each LIP, examining LIPs' role as active intermediaries and the importance of reflexivity in seeking to detect the so-called second- and third-order effects mentioned above. It includes further components than the 12 comparative projects only, hence its full structural framework is not entirely relevant to describe in this context of comparative project methodology.

26. See reference 7, Palmer and Walasek (2016).

an extended research activity that will enable a joint space for discussion. The comparative issue is also envisioned as an "arena" into which different stakeholders are invited to test new thinking and where new knowledge could be produced. The LIPs have proved before to provide "safe spaces" for non-traditional research practices (see Section II). Ultimately this exploration and production of knowledge will broaden the bases for decisions and for policies and new research to follow.

IV. EARLY EXPERIENCES IN COMPARATIVE TRANSDISCIPLINARY KNOWLEDGE CO-PRODUCTION

At the start of Phase 2 of MUF, we developed a typology of six possible models of how comparative transdisciplinary knowledge co-production could take place across multiple cities:

1) *Local projects retrofitted*: where existing research projects on a particular theme in different cities need some retrofitting, or perhaps just a specific comparative "add-on", to facilitate drawing conclusions about that particular theme from multiple contexts.
2) *Local projects replicated*: where particular successful projects initiated in individual cities have been, or are intended to be, replicated in other cities, thus opening up possibilities for cross-city comparison.
3) *Trans-locally clustered comparative research projects*: developing new clusters of projects by topic across multiple cities to produce new knowledge and insights.
4) *Internationally initiated projects with local co-production*: internationally conceived through co-design, with co-production undertaken by local teams in each city (but with central coordination).
5) *International projects with trans-local co-production*: where completely trans-local teams work across cities.
6) *PhD studentships linked to co-production processes*: this can take the form of either students from one city doing research on another city in collaboration with local students, or students doing comparative research on a number of cities. This model is distinct from types 1–5 in that, as the projects are led by PhD students, the project also includes an educational element.

These models provide a spectrum of central versus diverse local design and implementation, and were intended to help us in planning for the comparative projects in Phase 2 of MUF. It was resolved at the outset not to be prescriptive or proscriptive. So examples of several models were expected to emerge according to the nature of the initial impetus in each case, the subject matter and degree of diversity or uniformity in relevant local projects, and the number of LIPs participating in each theme.

The foci for the comparative research have emerged from an iterative process of negotiation among the LIPs and Secretariat. This negotiation sought to ensure overall coverage of the three broad themes into which the Phase 2 research agenda on Realising Just Cities has been divided (socio-spatial, socio-ecological and socio-cultural transformations), along with the cross-cutting "core processes" of urban change, urban knowledge and urban governance (Figure 1).

FIGURE 1
Diagram of Mistra Urban Futures' research themes and core processes related to co-production of knowledge

The LIPs discussed potential comparative projects of mutual interest and engaged on an opt-in basis. As explained in Section III above, comparative studies operate mainly by comparing locally prioritized projects in each participating city in terms of thematic foci, the respective research processes, outputs, outcomes and broader impacts, using systematic frameworks. However, one of the projects constitutes a single two-city comparative study. Hence, the initial expectation of a diversity of comparative models has been borne out in that examples of five of the categories (1–4 and 6) are currently being carried out. It is only the fifth category (international projects with trans-local co-production) that turned out to be unfeasible given budgetary and capacity limitations, as everybody in the project team for these projects would need to spend a significant amount of time in every city involved. Not only would this be prohibitively expensive, but most researchers, especially from non-academic partners, would have difficulty in getting a leave of absence for the extended periods required.

Two of the 12 comparative projects (Table 1) have been adopted by consensus as universal, in which all LIPs are participating, and these represent different comparative models. The more advanced project at this stage is a centrally designed but locally adapted and implemented project on how the respective cities engage with and implement (or not) UN-Habitat's New Urban Agenda (NUA) and the Sustainable Development Goals (SDGs), and especially the Urban SDG (Goal 11). This project also involves MUF's new project-focused partnerships in Shimla (India) and Buenos Aires (Argentina). This project is outlined briefly in Section IVa.

The second universal project, entitled Realising Just Cities (deliberately echoing the name of the Phase 2 research framework), involves reflexive research by each LIP team regarding how its diverse activities and projects are advancing MUF's core objectives of urban sustainability and justice. As such, it represents a kind of meta-learning process rather than a specific comparative project type.

The other 10 comparative project themes are Food Value Chain and Consuming Urban Poverty; Solid Waste Management; Cultural Heritage and the Just City; Participatory Cities; Migration and Urban Development; Transportation and Urban Development; Socially Sustainable Neighbourhoods; Urban Public Finances; Knowledge Transfer Programme; and PhD Collaborations.

Each comparative project has different origins and numbers of participating LIPs. For instance, the comparative food research cluster has grown out of several comparative food projects involving the African Centre for Cities/Cape Town LIP and Kisumu LIP, including the Consuming Urban Poverty and the Hungry Cities Partnership, so considerable comparative quantitative and qualitative research work had already been undertaken in those projects.[27] The focus has been broadened somewhat to accommodate other LIPs, particularly the Gothenburg LIP and Sheffield–Manchester LIP, where interests focus on allotment cultivation and augmentation of urban food supply; urban commoning; active engagement of refugees with agricultural skills and the need to earn livelihoods; and reduction of food miles. These therefore represent a trans-locally clustered comparative project, which, along with solid waste management, constitutes the social-ecological theme of the Centre's research. Public finance is currently the smallest comparative project, having grown out of a comparative PhD project comparing the municipal financial systems in the cities of Cape Town and Kisumu. Malmö may still join this project to add a European dimension.

The model based on transnational PhD collaboration has its very successful forerunner in a model set up with special funding from Sida, as a mutual learning process between PhD students at the Gothenburg and Kisumu research platforms. The four Swedish and three Kenyan PhD students, together with their supervisors, co-developed an innovative but complex learning and research process. This had both cross-national co-production, as a basis for some of the PhD projects, and cross-national comparison and learning among the PhD students themselves, in the form of common seminars, courses, exchanges, etc. Besides the development of the seven theses, the participants and tutors have also been developing reflexive work on the process itself.[28]

Taken together, these projects and their themes represent a good amalgam of the respective LIPs' particular local priority projects and broad coverage of the Realising Just Cities agenda. Reassuringly, they also correspond well to emerging comparative research themes identified in the literature.[29]

a. Profile of the NUA/Urban SDG project

The Sustainable Development Goals (SDGs), with the dedicated urban goal (SDG 11), and the New Urban Agenda represent an acknowledgement

27. https://www.mistraurbanfutures.org/en/project/food-value-chain.

28. Jernsand, E-M and H Kraff (2016), "Collaborative PhDs: new approaches, challenges and opportunities", Chapter 6 in H Palmer and H Walasek (editors) (2016), *Co-production in Action*, Mistra Urban Futures, Gothenburg, pages 76–83, available at http://www.mistraurbanfutures.org/en/annual-conference/conference-book.

29. For example, Clarke, S E (2010), "Emerging research

agendas in comparative urban research", Paper presented to the Political Studies Association Annual Conference, Edinburgh, available at https://www.researchgate.net/profile/Susan_Clarke10/publication/228377415_Emerging_Research_Agendas_in_Comparative_Urban_Research/links/55628e0108ae86c06b65f46c/Emerging-Research-Agendas-in-Comparative-Urban-Research.pdf.

of the critical role of cities in achieving sustainability. Both the SDGs and NUA will require the engagement of local governments and citizens to be successful. MUF started a comparative project in mid-2017 to follow and support the understanding, engagement and implementation of these two global agendas at the city level. The project includes seven cities from small to medium size, including all of MUF's LIPs (Cape Town, Gothenburg, Kisumu, Malmö and Sheffield), plus Shimla in India and Buenos Aires in Argentina through new partnerships with the social enterprise Nagrika and the New School's Observatory on Latin America, respectively. The project, which falls under Model 4 of the typology described in Section IV, was conceptualized and designed centrally, which included a guiding framework, timeline and deliverables. A local researcher (or group of researchers) has been appointed in each city to co-produce the research by involving city officials and other city actors in adapting and implementing the project locally.

Analyses and outputs are being prepared for each city and also comparatively with the involvement of team members from all cities. At least two workshops with representatives from all cities are also planned to facilitate cross-city learning. Transdisciplinary co-production is taking shape uniquely in each city. In Gothenburg, for example, the researcher has been integrated into a group of public officials at the City Executive Board (*Stadsledningkontoret*), tasked with assessing how the SDGs relate to the city's ongoing activities and how to integrate them into the city's operations. The group and other city departments adapted the project's guiding framework to map how relevant the SDGs are to the city's budget and main strategies, and how the city's current budget goals and strategies can contribute to the SDGs. The Executive Board mapping exercise resulted in a report that was presented and approved by the elected Executive Board and was, at the time of writing, being presented to the City Council for approval. In Cape Town, an agreement has been signed between the City and the University of Cape Town to embed a researcher into the city's Organisational Policy and Planning Department to engage and work directly with city officials on adapting these agendas. In Shimla, the Municipal Corporation agreed to be part of the project as long as it can be connected to and complement its current Smart City and Disaster Risk Reduction and Resilience programmes. In Buenos Aires, the team of researchers has set a working plan with the General Directorate of Strategic Planning of Buenos Aires City Government, the office in charge of the SDGs, where tasks are divided between the researchers and city officials, and later reviewed in monthly meetings. In Kisumu, a working team has been formed, which involves researchers and city and county officials. Officials from the national level (Kenya National Bureau of Statistics and the Ministry of Planning and Devolution) are participating in meetings with the local working team three times a year.

A crucial ingredient in all cities is to find a champion, or preferably a group of key actors, who see the potential benefit in engaging with these agendas. A challenge, however, is determining how to anchor the project so that it survives political cycles and associated potential shifts in priorities and power relations. In Kisumu and Shimla, for example, the start of the project was delayed due to elections and changing key staff. With or without formal agreements, key personnel changes create the need for familiarization anew and accommodation to possible changing

circumstances within one or more institutions. In Malmö, contractual issues delayed the start of the local research and thus co-production arrangements were set up later. In Sheffield, where the municipality has not yet started to engage actively with these agendas, setting up a co-production team is more challenging. Thus the first step consisted of raising awareness about what these agendas can contribute to city planning, in an effort to galvanize a willingness to participate in the project. A key ingredient of the comparative element of the project is monthly virtual meetings so that the local researchers can share experiences not only on what their cities are doing regarding the SDGs and the NUA, but also on methodological challenges and opportunities in carrying out co-production with actors with different levels of awareness and engagement in these global agendas.

V. THE ROLE OF "ENGAGEMENT" IN COMPARATIVE RESEARCH

The nature of MUF's formal city-based institutional partnerships reflects the ambition to undertake rigorous research that addresses locally defined problems of urban sustainability, as identified by some or all of the partners. Following directly from this is a commitment to engaging all participating partners throughout the research, reflecting on the research practice as a learning process, and maximizing the overall value and both institutional and wider societal impacts of the research.

The term "engagement" has been used for about two decades in the field of science communication.(30) It covers a wide range of activities undertaken to expand and improve the relationship between research and the public – hence the term "public engagement" – as well as diverse other relationships between researchers and policymakers, politicians, industry leaders, activists and NGOs, and professionals in public administration, not least urban planning and development. It is about creating trust and mutual learning and benefits for those involved, but also to reach wider audiences and achieve larger impact. As such, "engagement" is also closely related, for instance, to the European Union's efforts to open up science through Responsible Research and Innovation (RRI).(31)

Engagement is crucial to comparative co-produced projects that span two or more local research platforms. Bringing together a range of stakeholders, understanding the common issue(s), designing and supporting the co-production of knowledge, and implementing the results for mutually beneficial outcomes and impacts requires support in terms of ongoing communication, events, activities and encouragement. Thus, "engagement", as part of the process of mutual learning and ownership, has to be built into the design and implementation process of each comparative project. This should be done as needed if the co-production work encounters difficulties, e.g. in understanding each stakeholder's professional reference frameworks or in representing the actual knowledge produced in a way that is beneficial for all parties. This includes the necessity of representing the same body of knowledge in different ways: through academic articles as well as blog posts, policy briefs, reports, events and social media entries. Furthermore, a transnational dimension needs to be included as an additional perspective, almost certainly also

30. For example, House of Lords (2000), "Engaging the public", Chapter 5 in *Third Report of the House of Lords Select Committee on Science and Technology*, available at https://publications.parliament.uk/pa/ld199900/ldselect/ldsctech/38/3807.htm.

31. Responsible Research and Innovation (RRI) is an approach developed by the European Union for collaboration during the entire research and innovation process. When researchers, citizens, policymakers, industry and societal organizations work together on the research, the process and outcomes are better aligned with the values, needs and expectations of society. As such, RRI can be seen as a wide umbrella, covering different aspects of the relationship between research and innovation and society: public engagement, open access, gender equality, science education, ethics, and governance. https://ec.europa.

eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation; https://www.rri-tools.eu/about-rri.

implying different engagement and communication approaches that are centrally coordinated.

Engagement as a key component of the comparative projects is expressed in different ways, depending on context and project objectives and design. The following examples illustrate the diversity:

- The Culture and Urban Development project, investigating how culture and cultural activities can contribute to realizing just cities, aims at adding to the existing theoretical work and academic discourses, as well as shaping the debate and narratives on culture and development. For the latter part, tools and instruments like policy briefs, film and video clips, podcasts and collation of exemplars will be used to engage with stakeholders and other groups.
- The Urban Food Chain project is investigating how urban–rural linkages and food distribution can be used as levers for social inclusion and sustainable development. It encourages the development of digital tools for engagement and participation, such as wikis for community contributions, apps and maps for easier access to food chains, and distribution services and digital platforms that are self-sustaining in the longer term and accessible for everyone with a smartphone.
- The Urban Public Finance comparative project is exploring a growing field of interest – the local funding of infrastructure and other investments in sustainable urban development. Novel elements include extensive local-level scanning of innovative initiatives and programmes, including public funding and public finance architecture as well as crowdfunding and "neighbourhood" finances. Engagement models and tools will be developed to include the concerns and needs of the cities taking part, but also of the communities, neighbourhoods, citizens and other stakeholders.

Because of the novelty of comparative research using transdisciplinary co-production, the Mistra Urban Futures projects may also contribute significant experiences and knowledge within the field of engagement in transdisciplinary and collaborative processes. This, in turn, contributes to the ability to determine downstream societal impact, a particularly challenging task with all the complexities and uncertainties inherent in transdisciplinary co-production and sustainability research.[32]

32. See reference 11, Simon and Schiemer (2015); also Darby, S (2017), "Making space for co-produced research 'impact': learning from a participatory action research case study", *Area* Vol 49, No 2, pages 230–237.

VI. DISCUSSION AND CONCLUSIONS

All international comparative research is challenging, but attempting to undertake it in countries in both the global North and South adds a challenge since relative priorities may differ considerably. For example, in relation to food, reducing obstacles for informal retailers and dealing with the implications of supermarketization are priority issues in the global South, whereas the priority food issues in the global North are about enhancing local production of healthy food and reducing the consumption of unhealthy foods, as well as cutting transportation distances.

Such challenges are amplified when the global comparative research is undertaken using transdisciplinary co-production rather than conventional academic research teams that to a greater or lesser extent share epistemological and methodological understandings, despite often-profound differences in institutional, resourcing and local contextual circumstances, practices and power relations. Groups of transdisciplinary co-production teams seeking to compare locally defined and appropriate projects and research processes within the same research theme in each participating LIP face several additional internal and external challenges. Some of these challenges reflect the locally specific nature of transdisciplinarity in each LIP, while others pertain to possible differences in the numbers of partners undertaking the co-production, the particular methods used, differences in the nature of the respective empirical projects, and power differentials both within and across the respective research teams. This does not mean there is no role for comparative research or that the challenges outweigh the benefits of such endeavours. It just calls for a different approach, focusing on understanding the different perspectives and methodologies in different contexts, and making those understandings a core of the research process and outputs. Here we suggest five distinct but overlapping categories of challenge and opportunity, comprising combinations of internal and external elements:

1) *Project narratives*: While the different projects in the participating LIPs match each other thematically, their empirical foci often differ and they might have different origins. While in some cases, cross-LIP comparison formed part of the logic from the start, in others, comparative work was not part of the initial project narrative. It may be difficult in rewriting the project rationale to motivate participants to undertake this expanded mission. Comparative work inevitably adds to overall complexity and effort, for benefits that may be uncertain, especially in terms of feedback and tangible local gains. At the same time, the empirical foci and methodologies in one LIP can serve as inspiration in another and form the basis of the comparison.
2) *Time*: Time constraints increase in complexity and extent when many partners are involved in one location, and even more for international comparative research. Academic, public-sector, civil society (NGO) and private-sector partners operate with different calendars, budget cycles, time pressures and degrees of flexibility over their timetables. In a North–South comparative context, differences in annual calendars, workloads, the adequacy of salary levels, facilities and infrastructure, performance and assessment criteria can prove challenging both for the same kinds of stakeholders and across stakeholder groups. For instance, collective teamwork between Swedish and Kenyan PhD students was hampered by such differences, with the Kenyans having to juggle research and thesis writing on top of fulltime academic posts, while Swedish students were able to devote far more of their working time to their studies.[33] Setting up clear and realistic goals that can adapt to local constraints, as well as planning in advance the expected times for engagement between the international

33. See reference 28; also Simon, D, D McGregor, K Nsiah-Gyabaah and D Thompson (2003), "Poverty elimination,

North-South research collaboration and the politics of participatory development", *Development in Practice* Vol 13, No 1, pages 40–56.

partners, may not eliminate these challenges but may reduce misunderstandings and facilitate collaboration.

3) Funding: Different funding sources have different durations, stipulations about the extent of paid employment required or permitted, and demands on results. While common co-funding from a large multi-year programme, such as MUF, is invaluable in enabling work on a common agenda, it cannot fully overcome the kinds of often-sharp differences outlined in these paragraphs. The contemporary requirements by funders and some host institutions to demonstrate direct downstream or societal impact within specific timeframes are particularly challenging in inter- and transdisciplinary sustainability research.[34]

34. See reference 32, Darby (2017); also see reference 33, Simon et al. (2003).

4) *Culture and power*: Cultures of decision making (hierarchies, traditions, gender relations, levels of formal educational attainment, attitudes to age differences and the like) and communication (formal and interpersonal communication, different forms of knowledge, methods of interpretation and ways of knowing, the ability and willingness to have a voice in research team discussions) differ considerably across and within countries and regions. Indeed, these dimensions are intertwined, complex, and often implicit and subtle, making actual change difficult to engender in practice, even when all agree it is appropriate.[35] Yet failure to bridge such differences could reduce the value and quality of both the outputs and processes of mutual learning. These differences require careful and respectful exploration, discussion and resolution, with mindfulness of asymmetrical power relations. Beyond these principles of good practice, and making use of any institutional codes of ethics, anti-discrimination and harassment policies and the like, there is no simple toolkit for addressing such entrenched and often-emotive issues. If all else fails, existing complaints procedures have to be used as frequently and strongly as possible as a way to address issues.

35. See reference 28; also see reference 33, Simon et al. (2003).

5) *Governance*: The outputs and outcomes of transdisciplinary comparative work are subject to expectations of different kinds, based not only on the actual setups of the respective projects themselves but also on the relevant governance structures of the participating organizations and institutions in each LIP. The same work may be assessed very differently when the focus is usability in the local context, and when it is analytical depth and diversity. To address this concern, research teams may need to produce outputs and interventions in different formats for the respective institutions and audiences, both in any one location and across the research locations.

Finally, all this underscores the importance of effective ongoing engagement throughout each project's life in order to address the needs and priorities of often-diverse participating organizations, and to maximize the effective external communication and dissemination of outputs and outcomes to different stakeholder groups and audiences, from the local to the global. This is also essential for maximizing the overall impact of transdisciplinary co-produced knowledge.

ORCID IDs

David Simon https://orcid.org/0000-0002-3164-4138
Henrietta Palmer https://orcid.org/0000-0003-4359-7380
Warren Smit https://orcid.org/0000-0003-4757-168X

REFERENCES

Anderson, P and T Elmqvist (2012), "Urban ecological and social-ecological research in the city of Cape Town: insights emerging from an Urban Ecology CityLab", *Ecology and Society* Vol 17, No 4, Article 23.

Anderson, P M L, M. Brown-Luthango, A Cartwright, I Farouk and W Smit (2013), "Brokering communities of knowledge and practice: reflections on the African Centre for Cities' CityLab programme", *Cities* Vol 32, pages 1–10.

Brown-Luthango, M (2013), "Community-university engagement: the Philippi CityLab in Cape Town and the challenge of collaboration across boundaries", *Higher Education* Vol 65, No 3, 309–324.

Cabannes, Y (2004), "Participatory budgeting: a significant contribution to participatory democracy", *Environment and Urbanization* Vol 16, No 1, pages 27–46.

Cabannes, Y (2015), "The impact of participatory budgeting on basic services: municipal practices and evidence from the field", *Environment and Urbanization* Vol 27, No 1, pages 257–284.

Campbell, S (1996), "Green cities, growing cities, just cities: urban planning and the contradiction of sustainable development", *Journal of the American Planning Association* Vol 62, Article 3.

Clarke, S E (2010), "Emerging research agendas in comparative urban research", Paper presented to the Political Studies Association Annual Conference, Edinburgh, available at https://www.researchgate.net/profile/Susan_Clarke10/publication/228377415_Emerging_Research_Agendas_in_Comparative_Urban_Research/links/55628e0108ae86c06b65f46c/Emerging-Research-Agendas-in-Comparative-Urban-Research.pdf.

Darby, S (2017), "Making space for co-produced research 'impact': learning from a participatory action research case study", *Area* Vol 49, No 2, pages 230–237.

Durose, C and L Richardson (2016), *Designing Public Policy for Co-production: Theory, Practice and Change*, Policy Press, Bristol.

Evans J, A Karvonen and R Raven (editors) (2016), *The Experimental City*, Routledge, Abingdon and New York.

Giap, T K, W W Thye and G Aw (2014), "A new approach to measuring the liveability of cities: the Global Liveable Cities Index", *World Review of Science, Technology and Sustainable Development* Vol 11, No 2, pages 176–196, available at https://pdfs.semanticscholar.org/9d3c/581a17f587406eddb988f346d4180e6e6cba.pdf.

Greyling, S, Z Patel and A Davison (2017), "Urban sustainability disjunctures in Cape Town: learning the City inside and out", *Local Environment: International Journal of Justice and Sustainability* Vol 22, No S1, pages 52–65, available at https://doi.org/10.1080/13549839.2016.1223621.

House of Lords (2000), "Engaging the public", Chapter 5 in *Third Report of the House of Lords Select Committee on Science and Technology*, available at https://publications.parliament.uk/pa/ld199900/ldselect/ldsctech/38/3807.htm.

Jasanoff, S (2004), "The idiom of co-production", in S Jasanoff (editor), *States of Knowledge: The Co-Production of Science and Social Order*, pages 1–12, Routledge, London.

Jernsand, E-M and H Kraff (2016), "Collaborative PhDs: new approaches, challenges and opportunities", Chapter 6 in H Palmer and H Walasek (editors) (2016), *Co-production in Action*, Mistra Urban Futures, Gothenburg, pages 76–83, available at http://www.mistraurbanfutures.org/en/annual-conference/conference-book.

Joshi, A and M Moore (2004), "Institutionalised co-production: unorthodox public service delivery in challenging environments", *Journal of Development Studies* Vol 40, No 1, pages 31–49.

Local Environment: International Journal of Justice and Sustainability (2017), Vol 22, No S1, "The future of sustainable cities: governance, policy and knowledge", Open access issue, available at https://www.tandfonline.com/toc/cloe20/22/sup1.

Mauser, W, G Klepper, M Rice, B S Schmalzbauer, H Hackmann, R Leemans and H Moore (2013), "Transdisciplinary global change research: the

co-creation of knowledge for sustainability", *Current Opinion in Environmental Sustainability* Vol 5, Nos 3–4, pages 420–431.

May, T and B Perry (2011), "A way forward: active intermediaries", in T May and B Perry (editors), *Social Research and Reflexivity: Content, Consequence and Context*, SAGE, London.

May, T and B Perry (2018), *Reflexivity: The Essential Guide*, SAGE, London.

Mistra Urban Futures (2015), *Strategic Plan 2016 – 2019*, Gothenburg, available at http://www.mistraurbanfutures.org.

Miszczak, S and Z Patel (2018), "The role of engaged scholarship and co-production to address urban challenges: a case study of the Cape Town Knowledge Transfer Programme", *South African Geographical Journal* Vol 100, No 2, pages 233–248.

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* Vol 20, No 2, pages 339–360.

Onyango, G M and B O Obera (2015), "Tracing Kisumu's path in the co-production of knowledge for urban development", in M Polk (editor), *Co-producing Knowledge for Sustainable Cities: Joining Forces for Change*, Abingdon, Routledge, pages 73–97.

Palmer, H and H Walasek (editors) (2016), *Co-production in Action*, Mistra Urban Futures, Gothenburg, available at http://www.mistraurbanfutures.org/en/annual-conference/conference-book.

Patel, Z, S Greyling, D Simon, H Arfvidsson, N Moodley, N Primo and C Wright (2017), "Local responses to global sustainability agendas: learning from experimenting with the urban Sustainable Development Goal in Cape Town", *Sustainability Science* Vol 12, No 5, pages 785–797.

Patel, Z, S Greyling, S Parnell and G Pirie (2015), "Co-producing urban knowledge: experimenting with alternatives to 'best practice' for Cape Town, South Africa", *International Development Planning Review* Vol 37, No 2, pages 187–203.

Perry, B, Z Patel, Y Norén Bretzer and M Polk (2018), "Organising for co-production: Local Interaction Platforms for urban sustainability", *Politics and Governance* Vol 6, No 1, pages 188–198.

Polk, M (2014), "Achieving the promise of transdisciplinarity: a critical exploration of the relationship between transdisciplinary research and societal problem solving", *Sustainability Science* Vol 9, No 4, pages 439–451, available at http://dx.doi.org/10.1007/s11625–014–0247–7.

Polk, M (editor) (2015a), *Co-producing Knowledge for Sustainable Cities: Joining Forces for Change*, Routledge, Abingdon and New York.

Polk, M (2015b), "Transdisciplinary co-production: designing and testing a transdisciplinary research framework for societal problem solving", *Futures* Vol 65, pages 110–122, available at http://dx.doi.org/10.1016/j.futures.2014.11.001.

Robinson, J (2011) "Cities in a world of cities: the comparative gesture", *International Journal of Urban and Regional Research* Vol 35, No 1, pages 1–23.

Robinson, J (2016), "Comparative urbanism: new geographies and cultures of theorising the urban", *International Journal of Urban and Regional Research* Vol 40, No 1, pages 187–199.

Schaer, C and E Komlavi Hanonou (2017), "The real governance of disaster risk management in peri-urban Senegal: delivering flood response services through co-production", *Progress in Development Studies* Vol 17, No 1, pages 38–53.

Schmid, C and N Brenner (2015) "Towards a new epistemology of the urban?", *CITY: Analysis of urban trends, culture, theory, policy, action* Vol 19, Nos 2–3, pages 151–182.

Simon, D (editor) (2016), *Rethinking Sustainable Cities: Accessible, Green and Fair*, Policy Press, Bristol, available at https://oapen.org/search?identifier=613676;keyword=Rethinking%20Sustainable%20Cities.

Simon, D and F Schiemer (2015), "Crossing boundaries: complex systems, transdisciplinarity and applied impact agendas", *Current Opinion in Environmental Sustainability* Vol 12, pages 6–11, available at http://dx.doi.org/10.1016/j.cosust.2014.08.007.

Simon, D, D McGregor, K Nsiah-Gyabaah and D Thompson (2003), "Poverty elimination, North-South research collaboration and the politics of participatory development", *Development in Practice* Vol 13, No 1, pages 40–56.

Smit, W, A de Lannoy, R V H Dover, E V Lambert, N Levitt and V Watson (2014), "'Good houses make good people': making knowledge about health & environment in Cape Town", in B Cooper and R Morrell (editors), *Africa-Centred Knowledges: Crossing Fields and Worlds*, James Currey, Woodbridge, pages 142–162.

Smit, W, M Lawhon and Z Patel (2015), "Co-producing knowledge for whom, and to what end? Reflections from the African Centre for Cities in Cape Town", in M Polk (editor), *Co-producing Knowledge for Sustainable Cities: Joining Forces for Change*, Routledge, Abingdon, pages 47–69.

Tabory, S H (2016), "Co-production and enterprise culture: negotiating local urban development culture in Santo Domingo's 'barrios populares'", Unpublished MA thesis, University of Texas at Austin.

Trencher, G, X Bai, J Evans, K McCormick and M Yarime (2014), "University partnerships

for co-designing and co-producing urban sustainability", *Global Environmental Change* Vol 28, pages 153–165.

Voss, J P and P Bornemann (2011), "The politics of reflexive governance: challenges for designing adaptive management and transition management", *Ecology and Society* Vol 16, No 2, pages 9–32.

Westberg, L, M Polk, M (2016), "The role of learning in transdisciplinary research: moving from a normative concept to an analytical tool through a practice-based approach", *Sustainability Science* Vol 11, No 3, pages 385–397.

Wolf, G and N Mahaffey (2016), "Designing difference: co-production of spaces of potentiality", *Urban Planning* Vol 1, No 1, pages 59–67.