

Rethinking the Science-Policy Interface in South Africa: Experiments in Co-Production of Knowledge at Different Scales¹

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Introduction

The role of academic researchers (or scientists/experts broadly defined) in processes to formulate policies about sustainability has become a subject of increasing interest from two different perspectives that may at first glance appear to be either mutually exclusive. Inspired mainly by the iconoclastic work of Maarten Hajer, one group is interested in a reflexive approach that critically deconstructs these roles in order to reveal the advocacy roles researchers play but rarely admit (Hajer 1995; Hajer 2003; Hajer 2005). The second group works with theories of transdisciplinary research to develop a normative approach that intentionally promotes researchers as an active “co-producers” of problem-solving knowledge about more sustainable use of resources and/or less damaging environmental impacts (Lang *et al* 2012; Scholz 2011). While both traditions favour the active engagement of researchers in policy processes in different ways, they are concerned with very different dimensions of these somewhat controversial practices. However, it can also be argued that they could also benefit from each other. The reflexive approach could benefit from a greater appreciation of the practical methodologies and methods of co-production, while the transdisciplinary approach could be more reflexive about the consequences (and potential dangers) of combining researcher and advocacy roles in the “dramaturgy” of co-production in the real messy world of engagements between players who do not have equal capacity to perform in settings that are rarely their own choosing. This synthesis of the reflexive and transdisciplinary approaches is used to reflect on three case studies from the South African context that reveal the dynamics of the so-called science-policy interface within the wider context of the search for sustainable solutions (Burns & Weaver 2008; Swilling & Annecke 2012).

Reflexive Approach

Since 1994 it has become common practice for scientists, academics and professional researchers to be drawn into the policy formation process in two primary capacities: as drafters of policy documents (e.g. White Papers, strategies) and as drafters of the background ‘research papers’ that are then used as the basis for ‘formulating the policy’. The primary stated purpose is usually the need for ‘expertise’ and quite often the resulting policy is often justified on the grounds that the policy formulation process was legitimate precisely because the inputs were not simply the subjective perspectives of stakeholders and politicians but also objective analyses of scientists and researchers who are presumed to have a more ‘balanced view’. Fortunately, recent research has started to raise questions about the validity of this discourse (Naicker 2012). Like many others

¹ . I want to acknowledge the work of John Van Breda from the TsamaHub at Stellenbosch and Isayvani Naicker who have both produced work on that has influenced my thinking (see Naicker 2012; van Breda N.D.).

interested in problematizing the role of scientists/experts in policy processes, Naicker draws on Maarten Hajer's influential work (1995; 2003; 2005).

Hajer is not only interested in problematizing the role of experts in policy processes; he also questions the assumptions underlying the entire tradition of stakeholder participation in policy-making (Hajer 2005). Instead accepting at face value the supposed truism that participation of stakeholders and experts by definition improves the policy content that emerges from the process, he deploys a constructivist approach to question what he calls the "staged performances" (Hajer 2005: 630) put on by policy managers who are obliged by their political and managerial masters to produce consensual outcomes. Usually this means setting up processes in ways that reinforce consensus and suppress conflict and the so-called 'difficult questions'. In reality, however, policy formulation processes are not managed within stable institutional contexts but often play themselves out "in between orders or indeed in new political spaces outside these orders" (Hajer 2005: 630). Hajer's reflexive alternative to the naïve assumptions built into the participatory policy making approach is what he calls "deliberative policy making". This approach recognises the "performative dimension of policy deliberation". Like staging a dramatic production, the policy manager is effectively the orchestrator of a process that not only has a "script", but also a physical "setting" (a venue organised in a certain way, for example) within which a production is "staged" (by a party mandated to organise the process), and a particular pattern of "performances" (chaired/facilitated, for example, in a certain way in a certain language) that are all equally important in shaping the final outcome and, in particular, who can and cannot participate or whose voice carries more weight. To focus only on the script is to miss the full significance of what is going on. This is what Hajer calls the "dramaturgy" of the policy deliberation process (Hajer 2005). This is useful not only because it helps us to understand why formalistic participatory processes are often meaningless because stakeholders simply play out predetermined roles as defined by the script, setting and stage managing, it also helps us to understand how "even with the same cast policy deliberation can change face through experiments with new settings and stagings" (Hajer 2005:642).

Anyone who has managed - or participated in - a policy process in the new democratic South Africa since 1994 will recognise what Hajer is referring to here. And in so doing, this will be a reflexive act that contextualises the scripts, settings, stagings and performances at the interface between science/expertise and policy formation. But once this reflexive attitude is in place, it becomes necessary to figure out appropriate methods for executing these "experiments with new settings and stagings". They do not just happen because there are skilled facilitators in place or if there is an improved capacity to be reflexive. They may have a better chance of happening if informed by particular methodologies and methods for the co-producing knowledge within particular contexts. This is where a transdisciplinary research approach may have a key role to play.

Transdisciplinary Approach

Transdisciplinarity has emerged as a new mode of knowledge co-production with – rather than for – society in order to deal with complex societal problems that can no longer be approached and solved by mono-disciplinary approaches only (for the most significant contributions see Hadorn & Pohl 2008; Hirsch-Hadorn *et al* 2006; Lang *et al* 2012; Regeer & Bunders 2009; Scholz & Tietje 2002; Scholz 2011; Thompson-Klein 2004). As a new mode of knowledge production, transdisciplinarity has been conceptualised as being capable of producing both practical, useful knowledge for solving real-

world problems as well as theoretical, scientific knowledge for better understanding our complex world. Global warming and climate change; natural resource depletion; soil degradation; pollution; food security; increasing poverty; water and energy crises, are just a few examples of such complex societal problems warranting a transdisciplinary response. These problems are complex because they are truly planetary-level problems, existing simultaneously at the global and local scales. But they are also complex because they are being produced by both nature and society, and therefore also have far-reaching long-term consequences for both nature and society. These are 'entangled' or 'hybrid' problems that can no longer be approached in terms of the two-world theory and disciplinary divide of separating the 'natural' from the 'social' as supposedly two fundamentally different and unconnected realities that can only be worked on separately by the natural and social science in isolation of society. Attempts to work within this double disciplinary and science vs. society divide can only result in the single disciplines producing partial knowledge of these hybrid problems; whereas the need today is clearly for integrated solutions based on integrated knowledge (Morin 1999).

In order to justify its claim as a new mode of knowledge co-production, capable of producing both scientific and practical knowledge, it has been critical for transdisciplinarity to establish itself within the scientific community as a credible scientific mode of knowledge production. To publicly demonstrate that the process of starting with shared real-world problem statements can be translated into scientific problem statements and research questions, which, in turn, can be worked on and transformed into scientific knowledge, the emphasis has very much been on the discovery, design and production of appropriate transdisciplinary methods that are replicable in different contexts. To be sure, transdisciplinarity has not seen itself as being in the business of producing more quantitative, qualitative or transformative methods, thereby hoping to add to an already extensive list of existing disciplinary research methods. On the contrary, whilst accepting the role and function of the latter, the focus has rather been on producing replicable integrative methods. In other words, transdisciplinary methods which can successfully integrate quantitative and qualitative theoretical knowledge, on the one hand, with socially generated transformative knowledge, on the other hand – with the overall aim of producing knowledge which is both 'scientifically valid' and 'socially useful'.

A Reflexive Note

Three cases from the South African context have been selected to highlight both the need for co-production of knowledge to address real-world problems, and the need for critical reflexivity about the practices of engagement. I declare up front that I was involved in all three as both a researcher and as a policy advocate. The first case is about a process of formulating a ten year policy framework for the National Department of Science and Technology (NDST) which is a department mandated to invest in science and technology research. Five Grand Challenges were formulated that defined priority areas for investment, one of which was the Global Change Grand Challenge. I was involved in the conceptualisation and drafting of the Global Change Grand Challenge policy framework and then competed for funding when the call for proposals was subsequently issued. The second case refers to an initiative by the Western Cape Provincial Government (WCPG) which is headquartered in Cape Town. As the owner of a large stock of buildings in this city, the WCPG decided that it had *locus standi* to initiate an ambitious urban regeneration strategy for the city. The four Western Cape Universities (Universities of Cape Town, Western Cape and Stellenbosch plus Cape Peninsula

University of Technology) coordinate their activities via a non-profit they established some years ago called the Cape Higher Education Consortium (CHEC). The WCPG decided to partner with CHEC to formulate this regeneration strategy. I was part of the team that coordinated this work. Finally, the third case addresses the challenge of incremental upgrading of informal settlements. Approximately 25% of South African urban households live in informal structures of various kinds, despite a massive house building programme since 1994. However, in recent years government has shifted the emphasis from building new structures in greenfield sites on the urban peripheries to so-called incremental in situ upgrading of informal settlements where they are more or less currently located. However, it is unclear what this means in practice because the regulatory and financial framework still favours development of new structures in greenfield sites. In practice, *incremental upgrading* means waiting for the electricity and water grid to arrive, which can take on average 8 years. In the meantime, shackdwellers are asked to wait. Using an ecological design approach, the iShack project based in Stellenbosch (a University town near Cape Town) developed an approach that provides shackdwellers with immediate solutions that can improve their lives *before* electricity and water grids are installed. I was the overall project coordinator of a multi-disciplinary team of postgraduate researchers who conceptualised and implemented the iShack project.

In all three cases I was involved as a researcher with specific knowledge expertise, but I was also an advocate: I strongly supported the need for government to invest in global change research over the long term; I also supported the policy intent of the WCPG with respect to urban regeneration in Cape Town, and I have for many years been concerned about the negative political consequences of the 'wait-for-the-grid' approach to in situ upgrading of informal settlements.

Case 1: Global Change Grand Challenge

The Department of Science and Technology (DST) is a National Government Department responsible for the formulation of long-term policies and strategies aimed at supporting the transition from a resource-intensive to a knowledge-based economy. In the first few years of the democratic era (which began in 1994), the DST was a minor player with a miniscule budget and minimal influence. However, over the years it has been able to systematically forge a relatively coherent policy language and configuration of institutions that has begun to make a major impact on South Africa's capacity for innovation. By building on – and assisting to transform – South Africa's highly developed University infrastructure and state-controlled 'science councils', the DST has been able to position itself as the leading policy actor with regard to public investments in knowledge development and innovation. Originating in the 1996 *White Paper on Science and Technology*, the subsequent *National Research and Development Strategy* (2002) and the 2007 Ten-Year Innovation Plan (which led to the 2008 Technology Innovation Act), significant progress was made in establishing a National System of Innovation (NSI). Due to the fact that different science councils fall under the control of different national departments, institutional dysfunctionality persists thus far preventing the consolidation of a fully-fledged integrated NSI.

In its long-term policy framework for accelerating innovation entitled *Innovation Towards a Knowledge-Based Economy 2008-2018*, the DST defined five so-called 'grand challenges' that would then guide future investments in science and technology. These were as follows:

- 'Farmer to pharma' value chain which is, in essence, about promoting biotechnologies;

- Space science and technology for further developing satellite-based communications, observation and engineering technologies;
- Energy security which involves support for the diversification of energy supply beyond reliance on coal to include renewable energies, nuclear power and the 'hydrogen economy';
- Global change science with a focus on climate change and a broader interest in transition to a more sustainable mode of economic production and consumption;
- Human and social dynamics with special reference to social dynamics of economic growth, development and poverty eradication.

In general, these grand challenges and the Ten Year Plan express a conventional conception of the relationship between science and development. Development is assumed to be a linear modernization process and the role of science is to service this process with 'relevant' knowledge and appropriate technological innovations. There is no reference to the obduracy of incumbent socio-technical regimes that are locked into – and therefore seek to reproduce - particular knowledge sets and related infrastructures. By contrast, in recent years researchers have quite thoroughly documented how the “mineral-energy complex” locks South Africa into a particular resource- and energy-intensive growth path that retards the development of new job-creating innovation-driven value-chains (Fine & Rustomjee 1996; Mohamed 2010; Swilling & Annecke 2012- see chapter 4).

While the biotechnology, space and energy grand challenges are by definition locked into particular technology clusters and associated research networks, the mandates of the global change and human/social dynamics grand challenges were more open-ended and untied to a particular technology research agenda. However, although there is a long tradition of funding for human/social dynamics research (including via the state-controlled Human Sciences Research Council), the inclusion of sustainability in the global change grand challenge reflects a realisation that global change, sustainability and climate change will shape South Africa's future developmental trajectories and must, therefore, become a key component of future research investments. The adoption in 2008 by the Cabinet of the *National Framework for Sustainable Development* (NFSD) and the *Long-Term Mitigation Scenarios* (LTMS) expressed this new policy commitment and set in motion a train of related policy processes (for a review of the emergence of sustainability thinking in South African policy discourse see Chapter 8 - Swilling & Annecke 2012).

Significantly, the document entitled *Global Change Grand Challenge National Research Plan, South Africa* that was completed in June 2009 contains the following key sentence:

“An inclusive process involving a wide cross-section of the science and policy communities in South Africa was followed to develop a detailed implementation plan for the first of these, i.e. enhancing our scientific understanding. This process has culminated in the development of this 10-year national research plan for the Global Change Grand Challenge (the Global Change Research Plan).”

Unfortunately, this “inclusive process” is not discussed any further. The assumption created is that the Global Change Grand Challenge (GCGC) unproblematically reflects a consensus reached by “the science and policy communities” that participated in the various levels of engagement, i.e. the “lead editors” who wrote the document, the “editorial panel” comprising eminent academics who played

an oversight role, and the “contributing authors”. The key actors were drawn from the Council for Scientific and Industrial Research (CSIR) (which is a government controlled and funded ‘science council’); the National Research Foundation (NRF) which is a government agency that manages government funding for scientific research undertaken mainly by Universities (specifically the South African Environmental Observation Network); officials from the DST; and academics from a select group of Universities (with the Universities of Cape Town, Stellenbosch and Witwatersrand playing leading roles).

The four-person drafting team comprised three people from the CSIR and one from NRF/SAEON. A DST official was supposed to be part of this drafting team, but for practical reasons this did not materialise. The Editorial Panel comprised ten leading academics, 1 from University of Johannesburg, 1 from University of Pretoria, 5 from University of Cape Town, 1 from University of KwaZulu-Natal, and 1 each from the University of the Witwatersrand and SAEON/NRF. Contributing researchers (which included some members of the Panel) included 9 researchers from the CSIR, 2 from the University of the Witwatersrand, 9 from University of Cape Town, 4 from SAWS, 3 from Stellenbosch University, 1 from HARTROA, 1 from the Sharks Board, 2 from University of Pretoria, 2 from Rhodes University, 2 from University of the Western Cape, 2 from the South African National Biodiversity Institute, 2 from Hermanus Magnetic Observatory, 1 from Geological Research Council and 2 from ORI. In short, 20 out of 36 were from established research institutes at Universities and the remainder came from public research entities. A CSIR-centred network of researchers who had collaborated in one way or another for a number of years constituted the intellectual core of this group.

The ten month process over 2008/2009 involved the following:

- intensive initial meetings between DST and CSIR to finalise a Terms of Reference;
- a series of facilitated consultative discussions and workshops involving about 50 scientists, most of whom were drawn from the CSIR, but with significant involvement by academics from various Universities;
- submissions of written proposals from most of the participants, mostly referring to general conceptual issues but also practical implementation challenges related to expenditure and integration;
- intensive cycles of drafting and redrafting following comments submitted by participants;
- final approval by the DST and Minister of Science and Technology.

The end result was research framework divided into four themes as depicted in diagram below:

Understanding a changing planet	Reducing the human footprint	Adapting the way we live	Innovation for sustainability
1. Observation, monitoring and adaptive management	1. Waste minimisation methods and technologies	1. Preparing for rapid change and extreme events	1. Dynamics of transition at different scales - mechanisms of innovation and learning
2. Dynamics of the oceans around southern Africa	2. Conserving biodiversity and ecosystem services, e.g. clean drinking water	2. Planning for sustainable urban development in a South African context	2. Resilience and capability
3. Dynamics of the complex internal earth systems	3. Institutional integration to manage ecosystems and ecosystem services	3. Water security for South Africa	3. Options for greening the developmental state
4. Linking the land, air and sea		4. Food and fibre security for South Africa	
5. Improving model predictions at different scales			

Significantly, the ‘Understanding a changing planet’ and ‘Reducing the human footprint’ themes reflected the research foci of the natural scientists and there were already substantial funding pipelines in place for this research. The other two themes were unfunded and reflected the perspectives of those mainly interested in the economic and social dimensions of sustainability transitions (for an articulation of this perspective see Swilling & Annecke 2012). The calls for proposals referred to below were thus aimed at these two new components of the global change research agenda.

After the policy was approved, a budget was allocated to the NRF which, in turn, issued a call for proposals during the course of 2011 for projects aligned with Themes 3 and 4 of the framework. Towards the end of 2011 the first grants were distributed for 3 year research projects, followed by a larger set of grants that were made in 2012 for a set of endowed Chairs across a range of fields related to global change. These grants represent the first significant investments by government in a coherent targeted set of research projects related to the global change theme, with special reference to sustainability.

The process described above that led up to the formulation of the GCGC plan cannot be described as a research-based policy formulation process. Nor did it come remotely close to the notion of co-produced knowledge to address a real world problem as envisaged by the transdisciplinary approach. It was, instead, more like a policy negotiation process to put in place a formal framework that would protect and enlarge existing funding flows for Themes 1 and 2 and create new funding flows for Themes 3 and 4. Themes 1 and 2 summarize the essence of the earth system science portfolio managed largely but not exclusively by the Applied Center for Climate and Earth Systems Science (ACCESS) which is, in turn, managed by the CSIR (see www.access.ac.za). As a major consortium of Universities and state-controlled research agencies/councils, ACCESS is South Africa’s pre-eminent global change initiative within the natural sciences. It aims to secure an annual budget of Euro 10 million. However, it does not address Themes 3 and 4. Hence those interested in opening up new funding flows to address the issues raised under Themes 3 and 4 needed to mount convincing arguments about the need to extend the scope of Global Change research beyond the

traditional boundaries of earth system science as articulated by Clark, Rockstrom and others (see references below).

Besides the key point about the link between funding flows and policy arguments, there were four other aspects of the policy formulation process that are worth noting that shed light on the role researchers play in the science-policy interface:

- Competing conceptions of global change. Due to the fact that the majority of researchers involved were from the natural sciences and associated with ACCESS in one way or another, they shared the earth-system perspective on global change (Clark *et al* 2005; Rockstrom *et al* 2009; Steffen *et al* 2004). Using a complex systems perspective, this approach emphasizes the importance of understanding extremely rapid changes in the global earth system. However, there was a minority of mainly social scientists whose conception of global change was very different. Drawing on material flow analysis (Fischer-Kowalski & Haberl 2007), the Multi-Level Perspective (for overviews see Smith *et al* 2010; van den Bergh *et al* 2011) and the economics of socio-technical transitions (Perez 2002), this approach emphasized the complex dynamics of transition and the importance of sustainability-oriented innovation systems (Swilling & Annecke 2012). In the end the earth system perspective was reflected in Themes 1 and 2, and the transition perspective was reflected in Themes 3 and 4. In the end, the bulk of the funding was allocated to Themes 1 and 2.
- Tensions between observation/understanding and transition/innovation. Related to the tension between the earth system perspective and the transition perspective was the tension between research for deepening understanding and transdisciplinary research for co-producing knowledge *with* society to resolve real-world problems. Although little was explicitly said against the latter approach, in practice it was at best under-emphasized. However, it was still early days because the CSIR and Stellenbosch University had only recently agreed to collaborate to establish a new centre for transdisciplinary research (see www.tsama.org.za).
- Limited involvement of the policy community. Besides the ongoing involvement of Imraan Patel, a senior DST official, in the process, there is little evidence that key policy-makers within the DST and other government departments affected by the GCGC Plan were involved in the policy formulation process. For example, although the Department of Environmental Affairs championed the National Framework for Sustainable Development, officials from this Department were not involved in the process of formulating the GCGC. The same applies to the water, agriculture and urban development/housing sectors.
- Weak connections to the private sector and civil society. The private sector and civil society stakeholders were effectively excluded from the process, despite considerable experience and expertise in these social sectors when it comes to implementation of programmes and projects in the real world. However, it is easier to identify this problem than resolve it because it is impossible to find 'representatives' of these sectors. However, as argued by

some transdisciplinary theorists what matters is not representation but rather the participation by people who have experience of the sector (BUNDERS).

In conclusion, the process of formulating the GCGC was driven mainly by researchers with a vested interest in reproducing a policy framework that favoured funding flows into research programmes that they managed in the case of the earth systems research community, or wanted to manage in the case of the transitions research community. Although nominally a partnership with the “policy community”, the DST created a space for the process to happen but did little to guide it. Researchers rooted within civil society and the private sector were not invited to participate.

Case 2: Cape Town Central City Regeneration Initiative²

In contrast to the researcher-driven GCGC process, the so-called Cape Town Central City Provincial Government Regeneration Initiative (CTCCPGRI – henceforth CTRI for short) was initiated, driven and led by government.³ It emerged out of a process initiated by the Provincial Minister of Transport and Public Works and it was driven and led by key officials in his Department during the period December 2009 to May 2010. It was during this period that the policy framework was formulated, and subsequently approved by the WCPG. This led to a second phase lasting 18 months during which detailed precinct-level planning took place to work out practical implementation plans for the policy framework. A third phase of project-level development and implementation commenced in 2012 leading to the preparation of a set of ambitious large-scale property development projects. One of these projects, the Two Rivers Urban Park project, envisages a brownfield redevelopment near the Cape Town CBD that if implemented would not only be the first fully-integrated ecologically designed mega-project (1.2 million square meters of residential and commercial space), it would also be up there with several similar large-scale developments taking place elsewhere in the world. All three phases were led and driven by the so-called Regeneration Team (led by an architect-cum-government official called Francois Joubert) that was established within the Department of Transport and Public Works (DTPW). This discussion is limited to the first phase of policy formulation.

After his appointment as the WCPG’s Minister of Transport and Public Works, Robin Carlisle initiated an informal networking process with a few individuals within and outside government to formulate a terms of reference for what eventually became the CTRI. He decided to build on two existing partnership agreements - one with the Cape Town Partnership (CTP) and the other with the Cape Higher Education Consortium (CHEC). The CTP is a non-profit that was established in 1999 as a partnership between the City of Cape Town (CCT) and the South African Property Owners Association (SAPOA), the latter representing the interests of property developers. Led by Andrew Boraine, a highly experienced manager with a long history in the anti-apartheid struggle, the CTP has since spearheaded the regeneration and marketing of the CBD. CHEC is also a non-profit established by the four Western Cape Universities to coordinate joint activities, in particular collaborations with

² . The case study is drawn from a Master’s thesis by Katherine Hyman (Hyman 2010). I participated in the process described, as did Katherine Hyman. I was also the supervisor of the thesis. The purpose of Hyman’s participation in the process was to document the process and this role was approved by all the stakeholders involved.

³ . This unwieldy name was necessary to avoid all sorts of negative political dynamics arising from the fact that the Western Cape Provincial Government was engaged in a planning process that was strictly speaking the responsibility of the City of Cape Town which is a metropolitan government with extensive planning powers.

the WCPG and CCT. It is led by Nasima Badsha, a progressive intellectual who used to be a senior government official.

CHEC was contracted by the DTPW to constitute a Steering Committee that would assist the Regeneration Team to formulate the overarching policy framework. Academics mainly from the Universities of Stellenbosch, Western Cape and Cape Town were drawn in, plus Andrew Boraine and Nasima Badsha, as well as well-known architects/planners from the consulting world namely Mokena Makeka and Barbara Southworth (who was previously head of planning in the CCT). CHEC appointed a project manager (John Spiropolous) to coordinate the activities.

The initial strategic intent of the CTRI was to catalyse an impactful urban regeneration initiative that would simultaneously double the floor-space of the CBD with major economic consequences, *and* resolve a key financial problem facing the DTPW. The financial problem that needed resolving was that this Department was responsible for a large stock of government buildings that were not only dysfunctional as office buildings, but also more expensive to operate than what it would cost to lease the buildings from the private sector. The Minister's vision was that strategically located state assets could be re-invented and then used as leverage (via sale, or renovation) to catalyse large-scale private sector investments in urban regeneration.

The primary task of the Steering Committee was to write up this grand vision in the form of a policy document containing the usual menu of context, vision, objectives, strategies, institutional arrangements. It was necessary, however, to do this in a way that took into account several complexities including planning regulations, market dynamics, regulations governing the deployment of state assets, social imperatives (such as including social housing in the mix), and infrastructure capacities. Although the time period was too short for this to be a genuine transdisciplinary research process involving the co-production of problem statements and possible solutions, real expertise from different sources was mobilized and integrated via a set of discovery-oriented engagements that did result in significant debate, exploration and synthesis. The process involved the following kinds of engagements:

- Regular meetings of a core coordination group involving Francois Joubert, Nasima Badsha, Mark Swilling and John Spiropolous;
- Less regular wider more formal meetings of the Steering Committee to brainstorm key ideas and strategies – these were the most crucial turning points in the process;
- Later in the process, increasingly frequent meetings between John Spiropolous and the consultants working on the drafting of the policy document;
- Research work undertaken mainly by Katherine Hyman to collect and read key planning documents, especially regarding infrastructure;
- Ongoing informal interactions with key stakeholder groups from the private sector, consulting industry and CCT;
- A crucial stakeholder workshop on 9 April convened by CHEC that brought in key players from the property development industry, consulting firms, CCT, WCPG and the Universities to discuss what was by then a draft policy framework;
- Intense interactive engagements during the drafting phase that was concentrated into the months of April and May 2010.

Although the DTPW did not initially assume that sustainability was going to be an integral part of the argument and vision of the final policy document, as the discovery process unfolded it gradually became clear that there would be one overriding obstacle to the achievement of the vision and that was the lack of an adequate urban infrastructure (specifically energy, solid waste, transport, water and sanitation). Because the Steering Committee included researchers and consultants with extensive knowledge of urban development processes, it was determined to avoid the usual mistake of setting up a grand urban planning vision disconnected from the realities of infrastructure capacity and market dynamics. While the question of market dynamics was dealt via commissioned research and engagements with the property development industry, the infrastructure question was dealt with via engagements with consultants who had previously conducted a superficial needs analysis that effectively revealed nothing. It was, therefore, necessary to build up from original reports a more accurate picture. This led to the conclusion that in contrast to what the consultants and some officials were saying, there were real infrastructure constraints and that the solutions using 'business-as-usual' technologies would be prohibitively expensive. It was this conclusion that opened up the space for the introduction of a sustainability perspective, referring specifically to new technologies for treating sewage (large quantities of which are pumped into the sea), using water more efficiently, designing and operating energy efficient buildings, generating renewable energy, recycling solid waste and introducing non-motorised mobility and public transport. However, it would be incorrect to ignore the fact that the WCPG and the CCT had evolved over the previous several years a range of policy and strategy documents that expressed commitments to more sustainable use of resources and less negative impacts on the natural environment. This created a legitimating language that key politicians, such as the Premier of the WCPG, tended to draw on to express future visions and plans. Without this discursive environment, it would not have been possible to introduce specific ideas into the CTRI policy document about sustainability-oriented urban infrastructure alternatives.

As argued elsewhere, the explanation for the rising number of sustainability-oriented policy documents in the Western Cape and Cape Town in particular lies in the fact that it is a rapidly growing city that faces very severe resource constraints when it comes to energy, water, mobility, landfill space and biodiversity (Crane & Swilling 2008; Swilling 2010). The dense network of NGOs and University-based researchers that deal with sustainability issues in Cape Town also have strong working relationships with the WCPG and the CCT. This, plus the existence of influential business-linked groups interested in sustainability (e.g. Cambridge Programme for Industry, Accelerate Cape Town), has built up an accepted body of expertise and general awareness that infuses public and policy discourse. This was the broader discursive context that made it possible to express in the final policy document of the CTRI quite a strong commitment to sustainable resource use.

The final document was handed over to the DTPW on 17 May 2010, paving the way for phases 2 and 3 as already described. This document, entitled *Cape Town Central City Provincial Government Regeneration Initiative* which appeared over the logos of the institutions involved in writing it namely CityThinkSpace (Barbara Southworth), Makeka Design Laboratory (Mokena Makeka), Urban Genesis (John Spiropolous), CHEC and DTPW, captures a vision for the central city as space that needs to be productive, connected, innovative, cohesive, sustainable and safe. By "sustainable", the document referred to the need for a "compact, transit-oriented mixed use development", "extensive networks of city gardens and pathways in natural parks and seafronts", "networked urban infrastructures ... configured to maximize the use of renewable energy, minimise water use

and cycle all solid and liquid wastes”, “gradual shift from a car-dominated to a people-centre way of life, with new developments concentrated around integrated public transport nodes and non-motorised transport facilities”, “green buildings” and “access to locally produced affordable food”.

Although the policy document is in the public domain, it did not become the subject of a public dialogue (partly because the DTPW preferred to operate below the radar screen of potential controversies over turf between the PGWC and the CCT). Nevertheless, it is fairly clear how the sustainability principles described above have been drawn through into subsequent planning phases.

In conclusion, this case is about a knowledge partnership actively solicited and led by a government department (with full political support) that involved Universities, the property development sector and consultants in a process that was not just about negotiating language to express a consensus to satisfy a political perspective. A rapid process of interactive discovery and debate informed by intensive information gathering and stakeholder engagement made it possible to generate a policy framework that has continued to inspire subsequent work and retain political support. What made it workable was the existence of a network of people that spanned institutional boundaries who knew each other well at a personal level, and who were able to work with government officials who paid attention, made time available and respected the value of research, expert opinion and ambitious visioning. Key criticisms would be the non-involvement of people from the NGO or broader civil society sector. The fact that the CCT was not involved from the start resulted in extended implementation delays later on as energy and time went into ‘catching up’ key officials and politicians at the municipal level.

Case 3: Incremental Upgrading: the iShack initiative⁴

Soon after the commencement of the democratic era in 1994, the South African Government introduced an ambitious housing programme to address the legacy of apartheid. The end result was the construction of 2.9 million houses by 2010 which in terms of sheer numbers is one of the highest rates of delivery of housing to the poor in the world. Nevertheless, the shrinkage of household sizes and population growth meant that by 2004 the housing backlog had grown from 1.5 m to 2.1 m. To make matters worse, housing policy between 1994 and 2004 focussed on the delivery of houses on cheap land to reduce costs, resulting in the fact that the large bulk of housing for the poor ended up on the urban peripheries far from places of employment and access to services. To remedy this problem, a new housing policy was introduced by the Department of Human Settlements in 2004 called *Breaking New Ground: A Comprehensive Plan for the Development of Sustainable Human Settlements* (commonly referred to now as BNG). This policy was based on a critique of the previous policy for focussing too much on housing units and therefore neglecting the need for “integrated sustainable human settlements”. A key component of this new policy was acceptance of the need for in situ upgrading of informal settlements rather than relocating them. This resulted in what is

⁴ . This section is research generated by a postgraduate group of Masters and Doctoral students known as the Enkanini Research Group funded by two grants from the National Research Foundation, one to support “community engagement” and the other to support research on “water and sanitation”. For an overview of their work see <http://www.ishackliving.co.za/>. I am the supervisor of all their work. This section draws in particular on the following thesis that I supervised: Keller, A. (2012). Conceptualising a sustainable energy solution for in situ informal settlement upgrading. Thesis submitted in partial fulfilment of the requirements of Mphil in Sustainable Development, School of Public Leadership, Stellenbosch University. [Accessed: www.sustainabilityinstitute.net]

now called the Upgrading of Informal Settlements Programme (UISP). The Minister of Human Settlements has promised to upgrade 400 000 shacks by 2014.

In early 2011, a group of postgraduate students decided to focus their research on an illegal informal settlement of 6000 people called Enkanini (which means 'take by force'). Enkanini is located within walking distance of the centre of Stellenbosch which is, in turn, a town of nearly 200 000 people located 40 minutes by road from Cape Town. The initial research question was as follows: what does in situ upgrading (as specified by the UISP) mean in practice from the perspective of the average shackdweller living in Enkanini? A transdisciplinary research methodology was adopted, but it was recognised from the start that the relevant formal stakeholders could not be identified. Instead, direct relationships needed to be established with the community which included students moving into the community to experience what it means to live in a shack, as well as spending a lot of time building relationships with individuals and mounting visible campaigns such as the painting of shacks using bright colours and designs. Contact was made with the Informal Settlement Network (ISN) which is a social movement active in the Stellenbosch area, supported in turn by Shackdwellers International (SDI). A working relationship of sorts was also established with relevant officials in the Stellenbosch Municipality who were, in turn, working formally with ISN.

It became apparent early on that in practice the UISP means delivery by the municipality (with funding from higher levels of government) of electricity (streetlights only), water, sanitation, roads, stormwater and solid waste services. However, in practice this can only happen if the settlement has been legally recognised as permanent and the land has been rezoned residential. Neither of these conditions were met in the case of Enkanini – it is one of the few *informal* settlements in South Africa that has hanging over it a court interdict ruling secured by the municipality that it is formally illegal and therefore needs to be removed. Even if they were legally entitled to be there, then in situ upgrading would mean in practice waiting for the electricity and water grids to arrive, with minimal solid waste collection services in the meantime. The WCPG has calculated that on average it takes 8 years for communities to be connected to the electricity and water grids after formal commencement of the upgrading process. Even then, all they would get is street lighting, not electrical connections to each unit.

In short, the problem statement became: if upgrading means 'wait for the grids to arrive', what happens in the meantime? The fact that development has come to mean 'trust and wait' effectively demobilizes civil society because there is nothing to organize communities around that can result in tangible immediate improvements to daily life. Instead, activists sniff out where the state intends delivering next and stay one step ahead by organizing people around what is going to get delivered anyway in a uniform top-down manner. Once the project is over, the show moves on with little left behind for the communities to do to build on what has been delivered. This is not only a recipe for a weak civil society, it also effectively also undermines democracy. An alternative is therefore necessary for reasons that go beyond urban development.

After many months of informal interactions with the community, officials and ISN, and informed by initial research on UISP and BNG, it was decided that ecological design methods and tools may open up an alternative way of thinking about a genuine *incremental* approach to upgrading that avoids all the negative consequences of the 'trust and wait' approach. Working with engineers and an

ecological architect, a design was generated for an “improved shack”, what became known as the “iShack”. This amounted to a design for a 14.2 m² shack that included the following:

- insulation in the walls and roof covered with cardboard painted with fire retardant paint;
- a thermal mass for passive heating and cooling by using a 1 meter high adobe wall along the back of the shack together with a floor made from fired clay bricks reclaimed from the landfill;
- a north-south orientation plus a roof overhang on the north side for shade in summer and solar penetration in winter;
- correctly sized and located windows for lighting and ventilation;
- a 25 watt solar panel to power 3 LED lights and a cellphone charger;
- a gutter to capture rainwater.

Working with an informal group of local leaders and with permission from the local authority, a very poorly built wooden shack inhabited by a single mother with three young children was identified for replacement. After building a new iShack for her, the old shack was demolished as required by the local authority. A neighbouring shack was retrofitted with insulation and a solar unit. Monitoring equipment was installed on both, plus a neighbouring non-retrofitted shack in order to generate comparisons⁵. The results showed conclusively the benefits of the intervention, including 4 – 6 hours of extra thermal comfort each day, reduced fire risk and improved lighting.

Running in parallel to the energy interventions described here, other students addressed solid waste and sanitation issues. Trials from this research are due to commence in late 2012. These studies were complemented by students who focussed on the social processes of community mobilisation and institution building.

Four rather dramatic consequences flowed from the erection of the iShack, the retrofitting of the two neighbouring shacks and related research on sanitation and solid waste. Firstly, a process of social mobilization within the community started to take place around demands for upgrading. The core group of community members who worked with the students accumulated skills and knowledge, including attending training modules paid for by the project. In other words, what started off largely as a rather limited technical intervention spiralled out into a wider community mobilisation process. Secondly, the Bill and Melinda Gates Foundation (who also fund the international work of SDI) requested a funding proposal to take the work forward and to scale resulting in a grant of \$250 000 in June 2012. Thirdly, in response to a protest march in Enkanini to support demands for electricity, Stellenbosch Municipality formally requested in August 2012 that the iShack project be extended to the whole community over a period of time. The details regarding funding, timing and governance must still be worked out. Fourth, the iShack project has attracted extensive media attention in the mainstream press, three television appearances and the local press.

A formal working group involving Stellenbosch Municipality, Stellenbosch University, the Sustainability Institute, ISN/SDI and community leaders has been established to take the project forward.

⁵ . The non-retrofitted shack was later retrofitted as a reward to the household for agreeing to participate in the monitoring exercise.

Using funds from the National Research Foundation and the Bill & Melinda Gates Foundation, extensive transdisciplinary research is now required to co-produce practical solutions to the following real-world challenges/problems:

- an appropriate business model, including a payment system for the service that covers the costs of repairs and maintenance plus battery replacement (every 2 to 3 years);
- a viable payment system will require a metering system, but commercially available pre-paid electricity meters are configured to measure Kilowatts, not watts;
- a way of accessing the government subsidies that are available from the Free Basic Alternative Energy Fund that has been constituted at National Government level;
- an appropriate cooperative approach that fosters cooperation between users (in, for example, groups of 5) to build social cohesion and reduce transaction costs;
- a viable selection procedure that does not depend on gatekeepers in the political system or NGO structures that tend to be patron-client relationships;
- viable financial control systems;
- training of 'barefoot technicians' who will be responsible for the repairs and maintenance as employees of a local franchise or stand-alone social enterprise;
- the need to extend the system outwards to include sanitation and solid waste services.

As the levels of complexity increase, it has been necessary to appoint full-time staff and a project manager to work with the postgraduate students over the 18 month period starting June 2012. Driven by problem-solving research, the end result will be a viable social enterprise that makes it possible to organize informal settlements around tangible material improvements. Once they realize the benefits of cooperative action, they will have in place social and institutional structures that will make it possible to continue to struggle for further improvements, including secure land rights, access to subsidies for housing, jobs, etc.

In conclusion, the iShack case demonstrates how researchers can actively engage with communities to co-produce solutions to real-world problems. By adapting the transdisciplinary research methodology to this specific context, researchers actively perturbed the social fabric of everyday life to demonstrate a viable alternative to the state's top-down approach to in situ upgrading. Instead of a 'trust and wait' approach, an authentic *incrementalist* approach emerged. It was only after the model was demonstrated and elaborated was it possible to formalise a working relationship with the other stakeholders to upscale the model. A transdisciplinary research approach will remain, however, the operating system for this partnership. Whether it can go to scale and address all the problems/challenges listed above remains to be seen.

Conclusion

It was argued at the outset that the reflexive approach is interested in contextualising the dramaturgy of deliberative policy processes in order to reveal the limits of unreflexive rote practices that result in meaningless outcomes, while the transdisciplinary approach mounts a normative argument in favour of researchers as co-producers of problem solving knowledge. While the former focusses on roles and discourse, the latter focusses on methodologies and methods for practically realising co-production. It was suggested that both are needed when it comes to understanding how policy actors come to learn about sustainability-oriented innovations. Those who advocate the

transdisciplinary approach need to be more reflexive, and those who argue for reflexivity may need to take more seriously the importance of particular methodologies and methods of actual co-production.

By reflecting on the process of building a science-policy interface at three scales, I hope to have contributed in a reflexive way to an improved understanding of the practical dynamics of deliberative policy-making. The three cases reveal the degree to which researchers become advocates and how they operationalize knowledge partnerships. Case 1 demonstrated a more traditional approach with very limited co-production of knowledge, but with researchers advocating specific policy frameworks that simultaneously served their own institutional interests and put in place a ten-year government commitment to fund what is South Africa's first coherently structured sustainability-oriented research agenda. It is significant that this combines earth system science and sustainability transitions perspectives, with the bulk of funding going towards the former.

In Case 2 a significant degree of co-production of knowledge involving public, private and University-based stakeholders took place, with researchers playing less of an advocacy role due to strong leadership by government officials. Although private sector stakeholders were engaged, civil society stakeholders were excluded. Sustainability, however, was not initially emphasized, but over time researchers played the key role in revealing the need to broaden out the script to include sustainability-oriented innovations with respect to future urban infrastructure investments.

Case 3 was explicitly motivated by a transdisciplinary co-production approach involving a particular community where researchers acted as both knowledge producers and as advocates for a particular sustainability-oriented solution. Unlike Cases 1 and 2, government was not initially a participant in the process. Nor was it possible to assume the existence of a formalised setting for engagements between organised stakeholders because none of these conditions existed prior to the process.

To conclude, further research is needed on the micro-dynamics of the actual science-policy interface. This will entail reflexive research that analyses the interactions of the actors themselves, paying particular attention to the dynamics of problem identification, knowledge production and problem solving and the roles played by particular actors as performance changes require changes in the script. These three cases reveal how important it was for researchers to actively engage in policy processes in reflexive ways. But it would be naïve to ignore that these processes are saturated by the dynamics of power, institutional interests and agenda setting by key players. Engagement will always come at a price. The key is how reflexive researchers will be in self-analysing their own practices and mistakes as they navigate the ever-changing scripts, settings, stagings and performances.

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