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Knowledge-building in adaptation management: *concertación* processes in transforming Lima water and climate change governance

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ABSTRACT Recently, three processes were used to analyze the consequences of plausible climate change scenarios for urban water governance in Lima. The first process, led by a German-financed research team, developed climate change scenarios using innovative tools. The second, Chance2Sustain, brought spatial perspectives to urban development and water governance, mapping spatial inequities in water-related vulnerabilities and including community-based knowledge. The Metropolitan Municipality of Lima (MML) initiated the third process, to prepare a city development and Climate Change Adaptation Strategy. This paper examines how these processes of knowledge construction contributed to transitions in water governance and climate change adaptation strategies. Although all processes used *concertación*[1] in their knowledge construction, the actors and the incorporated knowledge differed considerably. While the first example was dominated by professional groups and technical–professional knowledge, the Chance2Sustain and city processes included a wider range of actors and shifted thinking about adaptive management towards including contextual-embedded knowledge.

KEYWORDS climate change / *concertación* / social construction of knowledge / water governance

I. KNOWLEDGE-BUILDING, *CONCERTACIÓN* AND ADAPTATION IN LIMA

Peru is one of the 10 countries most vulnerable to climate change.[2] Its metropolitan cities of Lima (the capital) and adjoining Callao, which contain 32 per cent of the population and generate 45 per cent of the country's GDP, will experience many of the climate change consequences. Scenarios for Lima show high levels of uncertainty, with either prolonged droughts or more variable and intense rainfall or combinations of both by 2025,[3] along with associated long-term risks, including flooding, mudslides and landslides as well as increasing water scarcity. The existing unequal distribution of water between high- and low-income areas would also be exacerbated by price increases and could contribute to the spread of diseases.[4]

The lack of rainfall in the city means drinking water supply must be sourced from the upper Andean Mantaro River basin and the wetlands of Junin and Pasco, areas which themselves face decreasing supplies

1. We have argued elsewhere that "… *the concept* concertación *is difficult to translate. It goes beyond consultation and brings the different actors around the table so that solutions can be negotiated and responsibilities assigned. This includes conflicting interests, where these exist*"; see Miranda Sara, L and M A Hordijk (1998), "Let us build cities for life: the national campaign of Local Agenda 21s in Peru", *Environment and Urbanization* Vol 10, No 2, page 71.

2. Adger, W N, Nick Brooks, Graham Bentham, Maureen Agnew and Siri Eriksen (2004), "New indicators of vulnerability

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because of melting glaciers and groundwater extraction.[5] Lima has more than eight million inhabitants[6] and 74 per cent of dwellings have water connections. However, water distribution is very uneven. The water company SEDAPAL provides an average of 170 litres per person per day, ranging from more than 460 litres for high-income area inhabitants to less than 50 litres for residents of low-income areas.[7] People without connections spend 10 times more per litre than those who get piped water from SEDAPAL and consume less than 25 litres per person daily. A former president of SEDAPAL estimated that saving 10 litres per person per day would make the construction of new dams unnecessary in the short term. Other sources of vulnerability are the high-density urban fabric in the coastal zone, unstable mountain slopes in low-income areas and wastewater pollution by industrial and mining activities, 85 per cent of which is dumped into the rivers without treatment.[8]

In the debate on urban climate change adaptation, the idea of "adaptive management" is increasingly utilized.[9] Social and organizational learning is seen as essential for system survival, and both planned actions and responses to unexpected shocks are necessary. Building up the necessary knowledge involves learning from experience, adding to codified knowledge and proposing future actions. A major assumption is that participation by key actors is necessary in building consensual agreements, reducing conflicts and opening up new sources of knowledge.[10] In Peru, *concertación* processes involving a variety of actors have become mandatory in various contexts.[11] Key characteristics are learning-by-doing, combined with the construction of knowledge through various social networks. The latter implies the validation (or contestation) of the knowledge of a variety of participating actors, and a highly sensitive and complex process of dialogue–negotiation–*concertación*–conflict management and consensus-building (or not). Such processes can be seen as constantly evolving cycles.

However, there are also concerns about factors influencing the extent to which different sources of knowledge are included in urban governance decision-making. These concerns take two broad forms: one involving the power relations in new forms of hybrid network governance; and the other, ways of "mapping" and unravelling embedded knowledge from local communities as counterpoints to expert-led organizational knowledge.[12] Both attempt to integrate "lived experience" from practice with planning proposals and their spatial representations for urban adaptation and development strategies. However, the discourses, actors and experiences they acknowledge are very different. In the context of hybrid network governance, the debate is framed around knowledge management, as city governments attempt to combine economic growth measures with better service delivery, increasing adaptive capacity and the transition to sustainability in their use of natural resources, water being a strategic example.[13] These discussions usually concentrate on the inputs of codified or expert knowledge in professional organizations.[14] However, the knowledge of a much greater variety of actors needs to be included in designing and implementing urban resilience and transition strategies, including that embedded in professional practice (e.g. engineering, community work), the lived experience and strategies of local communities,[15] and the lay science built up through community-based research. Mapping such embedded knowledge means including community-based actors and their representatives.[16]

and adaptive capacity", Tyndall Project IT1.11, Technical Report 7, Tyndall Centre for Climate Change Research, UK, 128 pages.

3. Bardossy, A, S Jochen and A Chamorro (2011), "Modelamiento del clima y balance hídrico de Lima", Proyecto LiWA–IWS–Universidad de Stuttgart cited in "Adaptation strategy of Lima diagnostic", PowerPoint presentation, see http://www.lima-water.de.

4. Miranda Sara, L (forthcoming), "Climate risk scenarios and the integrated spatial and water management in the metropolitan city of Lima", CEPLAN (2013).

5. See reference 3.

6. INEI, *National Census 2007*, National Statistics Institute, INEI, Lima.

7. SEDAPAL water consumption data from INEI, *National Census 2007*; also SEDAPAL (2012), *Plan Maestro Optimizado 2009–2013*, SEDAPAL, Lima; data analyzed by Liliana Miranda Sara and Karin Pfeffer, Chance2Sustain (2013).

8. Water treatment plants are being planned to reduce the latter problem; see reference 7, SEDAPAL (2012), Public-Private Partnership projects Taboada and La Chira.

9. Pelling, Mark (2010), *Adaptation to Climate Change; From Resilience to Transformation*, Routledge, London, 224 pages.

10. Healey, Patsy (2007), *Urban Complexity and Spatial Strategies; Towards a Relational Planning for Our Times*, Routledge, London, 352 pages; also Baud, I, K Pfeffer, J Sydenstricker-Neto and D Scott (2011), "Developing participatory spatial knowledge models in metropolitan governance networks for sustainable development", Chance2Sustain Working Paper 1, 20 pages, see http://www.EADI.org; Appadurai, Arjun (2002), "Deep democracy, urban governmentality and the horizon of politics", *Public Culture* Vol 14, No 1, pages 21–47; and van Buuren, Arwin (2009), "Knowledge

Decision-making for city resilience and transition strategies also implies multi-scalar territorial perspectives (local, regional, inter-basin, macro-regional).[17] Framing water risk issues and designing and locating water provision and disaster prevention systems requires tracing and planning processes across space and time. Although various mapping techniques are becoming more common for spatializing knowledge, there is still a large divide between planners and engineers on the one hand and the wider community on the other, less familiar with such instruments as GIS.[18] Similarly, the sources of information and the dimensions included need to be made explicit to determine whether the priorities of all actors are reflected and whether relevant information and communities are excluded.[19]

Therefore, in defining knowledge-building and knowledge management configurations generally, we include the following dimensions: the framing of issues and analysis of perspectives; the variety of actors producing and using knowledge in network governance (and who is excluded); the coalitions and networks formed, including their power relations, processes of cooperation and contestation; the spatialized knowledge produced; and the changes in processes and outcomes that result from using hybrid sources of knowledge.[20]

In this paper, we examine the contributions of processses of social knowledge construction to water governance and climate change adaptation strategies, focusing specifically on the extent to which *concertación* processes allow inclusion of a wider range of actors, discourses and knowledge, and how these influence priority-setting in decision-making processes. We do this by analyzing *concertación* processes around water and climate change adaptation in the metropolitan Lima context since 2008.

The case of water and climate change governance in Lima is highly relevant. First, water is a scarce resource, which needs to be allocated in a socially just and environmentally sustainable manner. Acute water scarcity here leads to conflicts between urban water provision, energy generation, ecosystem replenishment and farmers' requirements, with climate change starting to exacerbate existing inequalities. Second, *concertación* processes offer possibilities of mutual understanding and consensus-building by including a wider range of actors and knowledge. These are represented here by a joint German–Peruvian research project called LiWA, by fieldwork and workshops carried out in Lima under the Chance2Sustain (hereafter C2S) project, and by the activities of the Environmental Commission of the Metropolitan Municipality of Lima (hereafter MML/EC) in developing the Climate Change Adaptation Strategy of Lima. A final reason is that these projects on water and climate change adaptation in Lima have included a series of scenario-building workshops with different actors, providing an excellent case for examining the potential for inclusive processes to reduce conflicts, integrate a variety of knowledge and its spatialization, and achieve a degree of consensus for sustainable water governance.

The sections below address the following questions:

- What contributions do participatory processes make to increasing spaces for different kinds of actors, to building trust, the exchange of knowledge, joint planning processes and shifts in thinking about policy discourses?
- How does the inclusion of different types of knowledge contribute to participatory processes?

for governance, governance of knowledge: inclusive knowledge management in collaborative governance processes", *International Public Management Journal* Vol 12, No 2, pages 208–235.

11. Miranda Sara, Liliana, Michaela Hordijk and Rommy Torres Molinas (2011), "Water governance key approaches: an analytical framework", Chance2Sustain Working Paper 4, 23 pages, available at http://www.chance2sustain.eu/33.0.html.

12. See *Environment and Urbanization* Vol 24, No 1 (2012) for a special section on community-led mapping; also Karpouzouglou, Tim and Anna Zimmer (2012), "Closing the gap between 'expert' and 'lay' knowledge in the governance of wastewater: lessons and reflections from New Delhi", *IDS Bulletin* Vol 43, No 2, pages 59–68 for the contrast between government's and residents' views on urban water provision.

13. See Hordijk, Michaela, Liliana Miranda Sara and Cathy Sutherland (2014), "Resilience, transition or transformation? A comparative analysis of changing water governance systems in four southern cities", *Environment and Urbanization* Vol 26, No 1, pages 130–146.

14. Medema, W, B McIntosh and P Jeffrey (2008), "From premise to practice: a critical assessment of integrated water resources management and adaptive management approaches in the water sector", *Ecology and Society* Vol 13, No 2, Article 29.

15. van Ewijk, Edith and Isa Baud (2009), "Partnerships between Dutch municipalities and municipalities in countries of migration to the Netherlands; knowledge exchange and mutuality", *Habitat International* Vol 33, No 2, pages 218–226; also Patel, Sheela, Carrie Baptist and Celine d'Cruz (2012), "Knowledge is power – informal communities assert their right to the city through SDI and community-led enumerations", *Environment and Urbanization* Vol 24, No 1, pages 13–26.

II. ACTORS, PROCESSES AND DOMINANT DISCOURSES

In this section, we look at the three participatory projects listed above, exploring the actors involved, the networks built over time, the evolution of projects, and the dominant framings and discourses espoused around water. To summarize briefly, these discourses included understandings of water as an economic good, as a human right, as a sector providing drinking water and as a right for all living beings. These discourses around water fit within different urban development approaches (Table 1). The forms of knowledge relied on included, as broad categories, codified scientific and expert knowledge and more embedded and contextual forms of knowledge based on professional practice and lived experience.

The LiWA[21] research project, initiated in 2008, was funded by the Ministry of Research in Germany with contributions from Peruvian partners. It brought together the parastatal water company SEDAPAL, German academic institutions, private sector consultants, a Peruvian inter-institutional network called Cities for Life Forum (FORO), the National University of Engineers (UNI) and a Peruvian NGO, FOVIDA. The German partners included ZIRIUS (formerly ZIRN), IFAK from Magdeburg University and the Helmholtz Centre from Leipzig (see Annex 1 for a full list of LiWA partners). These initial partners participated in all project phases. The main aim of the LiWA project was to develop a scientific method for analyzing forces driving developments in the Lima water sector and their inter-dependencies (referred to as the Cross-Impact Balance method or CIB) and to utilize this method for participatory scenario-building processes, outlining future scenarios in Lima with the Scenario Wizard software programme. As the project progressed from scientific scenario-building to dissemination and discussion, the network of actors expanded to include the Metropolitan Municipality of Lima (hereafter MML), community-based organizations and local political representatives participating on a voluntary basis but with institutional commitment.

The C2S project was approved in mid-2010 by the EU. Its main aim was to examine the challenges that fast-growing medium-size cities face in terms of economic growth, social justice and environmental governance, focusing on water-related risks and hazards in 10 cities, Lima among them, in India, Brazil, Peru and South Africa. The consortium members included universities and research centres from North and South, a postgraduate training institute in India and a policy research centre in Norway. Peru was represented by the inter-institutional network, FORO. The main methodology was interactive research with key actors, practitioners and residents. FORO introduced the methodology of scenario-building workshops to the research teams elsewhere and implemented them in Lima itself.

The Lima FORO project network, in existence since 1996, included members with wide experience in urban environmental management in Lima as well as other Peruvian cities – representatives of the MML, district municipalities, NGOs, environmental experts and leaders, academics, politicians and residents, as well as bringing in the private sector and central government agencies (mainly the environmental and housing ministries). Most members know and trust each other thanks to years of capacity-building activities and urban environmental political campaigns, and they share a common understanding of environmental

16. Scott, Dianne and Clive Barnett (2009), "Something in the air: civic science and contentious environmental politics in post-apartheid South Africa", *Geoforum* Vol 40, pages 373–382; also see reference 12, Karpouzouglou and Zimmer (2012).

17. See reference 9.

18. Baud, I, D Scott, K Pfeffer, J Sydenstricker, E Denis and L C Muguruza Minay (2013), "Spatial knowledge management in urban local government: e-governance in India, Brazil, South Africa and Peru", Chance2Sustain Working Paper 5, Fieldwork Report, 150 pages, available at http://www.chance2sustain.eu/fileadmin/Website/Dokumente/Dokumente/Publications/pub_2013/C2S_FR_No04_WP5__V3-6__100dpi_.pdf.

19. McCall, Mike and C Dunn (2012), "Geo-information tools for participatory spatial planning : fulfilling the criteria for good governance", *Geoforum* Vol 43, No 1, pages 81–94; also Martinez, Javier, Karin Pfeffer and Tara van Dijk (2011), "E-government tools, claimed potentials/unnamed limitations; the case of Kalyan-Dombivili", *Environment and Urbanization Asia* Vol 2, No 2, pages 223–234; and van Teeffelen, Jasper and Isa Baud (2011), "Exercising citizenship: invited and negotiated spaces in grievance redressal systems in Hubli-Dharwad", *Environment and Urbanization Asia* Vol 2, No 2, pages 169–186.

20. See reference 18 for a description of the dimensions of a configuration.

21. http://www.lima-water.de/en/index.html.

TABLE 1
Discourses on water and development approaches

Development approach	Pro-growth	Pro-poor	Pro-life/green	Pro-infrastructural / sectoral
Water approach	As an economic good	As a human right	As a right for all living beings	As a sector

concerns as well as common visions, goals and objectives for policy at national as well as metropolitan, river basin and local level. FORO has a clear track record in getting new policies and management tools approved at both city and national level. *Concertación*, consensus-building, conflict management and social construction of knowledge are regular practices for most FORO members. Some have also moved to other organizations and opened up spaces for dialogue, participation and *concertación*, supporting environmentalist and civic society contributions for policy change. The C2S project activities concerning water governance consisted of recognizing and assessing existing actor networks, understanding the issues, and power relations.

The third process, the Lima Climate Change Adaptation Strategy process, initiated in 2012, is led by the Climate Change Technical Group of the MML/EC. The members consisted of MML's environmental team, FORO as technical coordinating agency and the AVINA foundation as the financial agency.

The following sub-sections describe the main phases in each of the three projects outlined above and Figure 1 shows a timeline.

a. LiWA research project

The three main phases of the LiWA research project (sub-divided into eight stages) were characterized by different discourses and actors and generated different products (Figure 2).

During the first "scientific" phase in 2008–2009, the LiWA partners – the German academics, SEDAPAL, UNI, and FORO and FOVIDA representatives – were the main participants and contributors along with a few invited experts. The dominant discourse in this period was on water as an infrastructural sector (drinking water provision). Implicitly, this framing of water also assumed that better provision would lead to economic growth in the city. The main activities included:

- determining forces driving developments in the Lima water sector;
- modelling hydrological changes related to climate change; and
- developing the Cross-Impact Balance (hereafter CIB) method of evaluating interdependencies between these forces and hydrological changes based on joint contributions of the various actors.

Each group of actors produced their own list of economic, social, political and hydrological forces driving changes in the water sector, which were later discussed during joint workshops (stages 3, 4 and 5). The

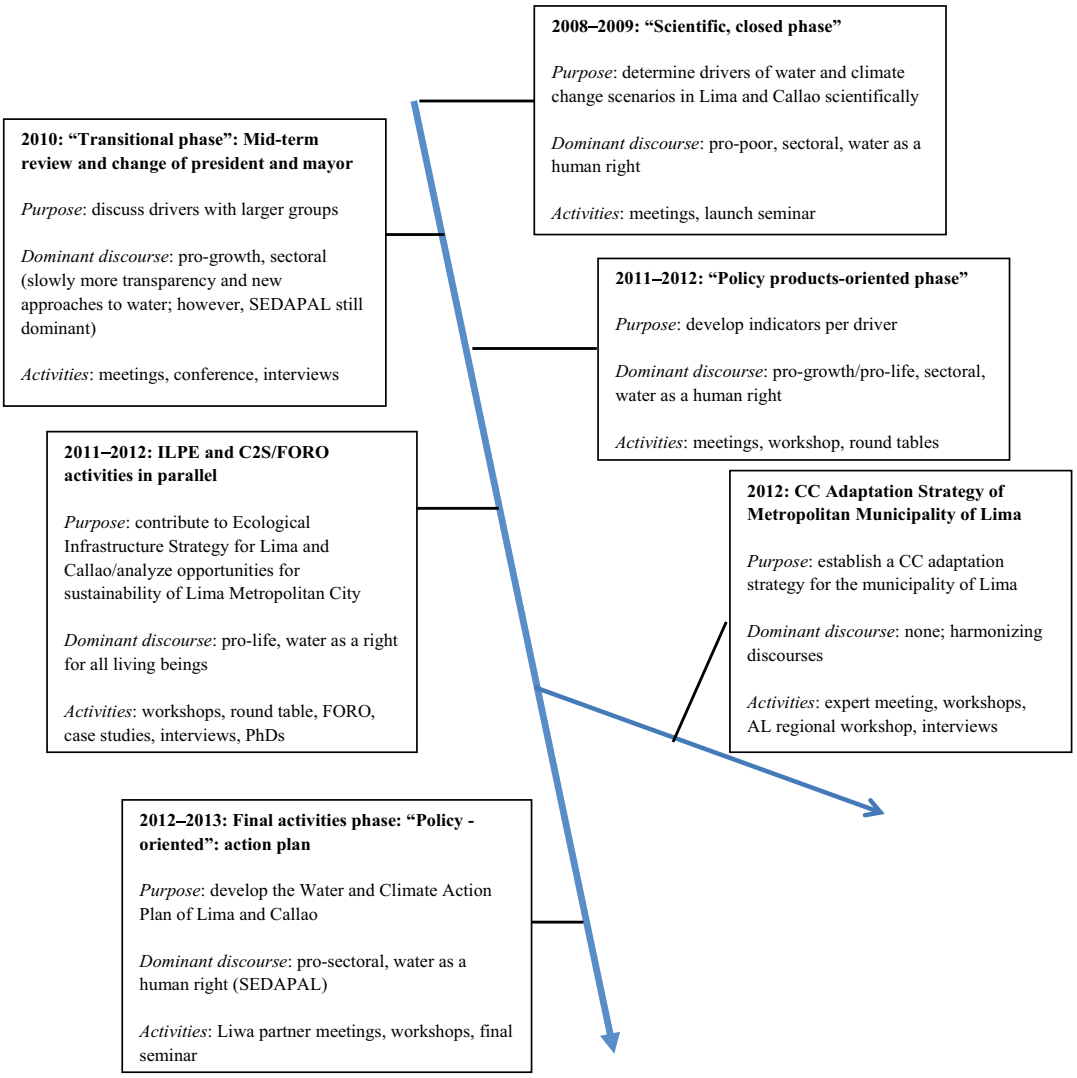

FIGURE 1
Timeline of the scenario-building processes

SOURCE: Authors' elaboration.

results were used as inputs for the CIB analysis and the Scenario Wizard developed in Germany by the ZIRIUS/ZIRN team during stage 6, and used from then on.

The project moved to a transition phase as the result of a mid-term review in 2010, which suggested a shift away from an exclusively scientific focus to include policy impacts of changing water governance on the city and the implications of water provision for other urban purposes. This meant including a city perspective for carrying out the

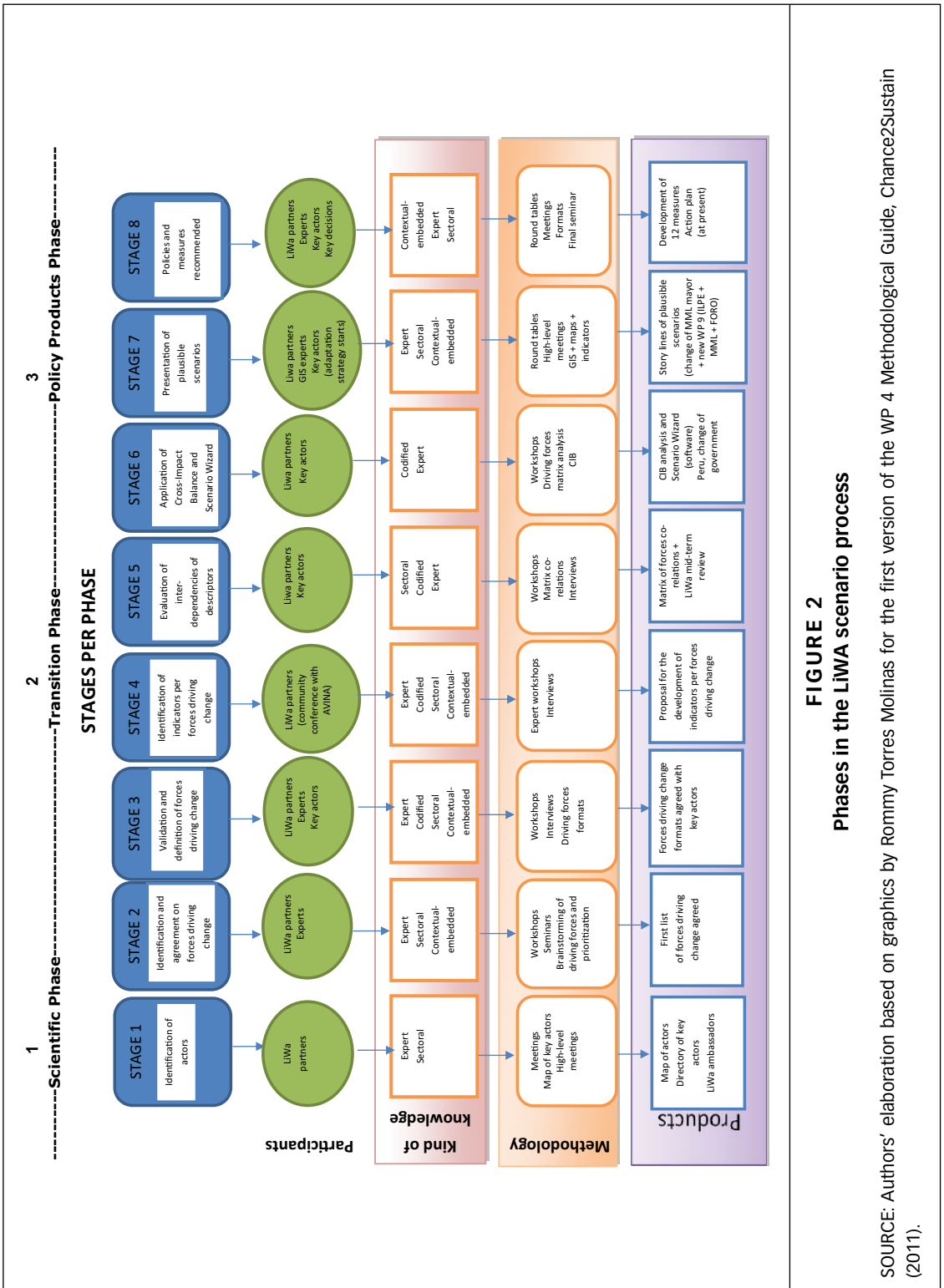

FIGURE 2
Phases in the LiWA scenario process

SOURCE: Authors' elaboration based on graphics by Rommy Torres Molinas for the first version of the WP 4 Methodological Guide, Chance2Sustain (2011).

scenario-building processes in the later stages, and a new work package of activities was developed on "ecological infrastructure in the city" (Box 1). The dominant discourse changed during this phase from "water as infrastructure" to include a "water as a human right" approach and, in the final project phase, "water as a right for all living beings" became part of the discussions. The main type of knowledge remained expert, codified knowledge, but the range of disciplines expanded to include landscape architects, urban planners and geographers. LiWA's German partners emphasized scientific objectivity, in contrast to the Peruvian NGO partners who wanted to discuss and build up knowledge of urban issues, privatization processes and poverty issues and introduce a wider ecosystem and ecological sanitation perspective. During this phase, workshops included many more participants (stage 6).

The third phase of the LiWA project (since 2011) took place within a shift in Peru's political context, with a new president as well as a new mayor of Lima, both providing more open policy spaces for sharing the knowledge produced in the LiWA research project. Thus, NGOs could participate more fully and help develop the focus on producing policy products for the LiWA project. During this phase, a countrywide meeting with community water managers in Peru was held, with several NGO networks focused on water management (organized by the Safe Water network with AVINA support). The results were brought into the LiWA project, shifting the focus to more policy-oriented products.

At the same time, the LiWA partners continued the scenario-building process for developing plausible scenarios for Lima's water sector (stage 7). The new urban work package had shifted the dominant discourse to a combined pro-life/green development focus, and led to the MML's Metropolitan Planning Institute coming in as a new partner. The Peruvian water company was not in favour of these shifts, probably because of fears related to the outcome of national elections and potential changes in the company's high-level positions, which indeed happened. This phase included the first Water and Climate Change Round Table in Lima and Callao, in which politicians, the private sector, international agencies, civic society organizations, community leaders, MML, the C2S programme and the recently created National Water Authority participated.

In 2012–2013, the final stages (7 and 8) of preparing "policy products" of the LiWA research project started, with three more round tables in which adaptation measures based on the scenarios were discussed in terms of policy implications – this resulted in the Water and Climate Action Plan of Lima and Callao, which was signed in April 2013.[22] Codified expert knowledge predominated, with some contextual-embedded knowledge from practice through the municipality and the new representatives of the water company.

22. Each LiWA partner designed measures, and their prioritization, to indicate methods of implementation (FORO developed three out of 12 measures). The partners included in these activities were the German members ZIRIUS/ILPE/IFAK and the Peruvian partners, with the gradually less prominent participation of SEDAPAL.

b. Chance2Sustain (C2S) research project

The C2S project started discussions from a more spatial perspective on city development and water governance, experimenting with mapping methods that could make it possible to visualize inequities and indicate areas of water-related vulnerabilities. The principal activities were based on the premise that socially constructed knowledge can potentially bridge the gaps between development (brown) and

Box 1
Designing for a city out of water: the Lima Ecological Infrastructure Strategy

To develop a sense of a new water culture for Lima, a new approach to infrastructure design can act as a catalyst for landscape transformation. The aim of the Lima Ecological Infrastructure Strategy (LEIS), developed as part of the LiWA integrated urban planning work package, is to provide guiding principles for open space design to proactively contribute to improving and protecting the urban water cycle. This approach shifts the focus from the current practice of "image-based" open space design to "performance-based" open space design. It no longer considers urban open space to be an expensive luxury but, rather, a space to save and purify water, treat wastewater and recycle nutrients, or even harvest water. Urban open spaces are seen in connection with remaining spaces of agricultural farmland, archaeological heritage and natural ecosystems, for example, rivers, wetlands and marshes (*lomas*). These landscape elements should create an interlinked network, serving as a framework to develop the urban structure by providing essential infrastructural services, protecting ecological and cultural heritage and enabling recreational experience.

ILPE uses a geographic information system (GIS) to store, analyze and synthesize layers of environmental, infrastructural and social data from different sources. This information should be available to all actors responsible for water management and urban planning in order to integrate and adapt their actual and future planning. To be applicable, the strategy needs to integrate multiple scales. At the metropolitan level, principles for ecological infrastructure are defined, harmonized and integrated within the regional concerted development plan. The aim is to convert those principles into policies that integrate future urban planning and water management at macro, meso and micro scale.

Locally, projects for prototypical water-sensitive solutions within different existing "hydro-urban units" are developed. Water-related problems and opportunities vary from place to place due to different natural and urban contexts within the watershed. Site-specific design strategies show how hard and soft engineering can be combined. Functional and aesthetic aspects are considered equal to social aspects, management and institutional frameworks.

Towards a water-sensitive future for Lima: the goal of all projects is not just to minimize impact but also to develop regenerative and productive hydro-urban landscapes that continually renew ecosystem functioning. A system of such water-sensitive open spaces should create an innovative urban ecological infrastructure for Lima's future. The project demonstrates opportunities for the radical rethinking of landscapes in an arid city by developing new landscape typologies that save, produce, purify and distribute water in its different forms.

SOURCE: Integrated Urban Planning Strategies and Planning Tools Work Package. Project team Stuttgart: Professor Antje Stokman, Dr Bernd Eisenberg, Rossana Poblet, Eva Nemcova (Institute of Landscape Planning and Ecology, Stuttgart University). Project team Lima: Liliana Miranda Sara, Linda Zilbert, Rommy Torres (Inter-institutional network, FORO), Juan Espinola, Luis Jara, Claudia Santisteban (Instituto Metropolitano de Planificación), Julio Moscoso (Consultant), Professor Rosa Miglio (Universidad Nacional Agraria La Molina), Jochen Beerhalter (Oficina de Medio Ambiente del Ministerio de Vivienda, Construcción y Saneamiento, MVCS, OMA).

environmental (green) concerns, short-term and long-term needs and complex multi-scalar processes of change, and can foster links between different actors in water governance systems. This requires a proper understanding of how the different actors value water, and their interest in and understanding of the water-related vulnerabilities in their city. The C2S fieldwork analyzed the major shifts in water governance taking place in Lima and how different approaches to water shaped discourses, which, in turn, influences policies. Fieldwork in low-income settlements mapped residents' perceptions of climate change, water vulnerabilities and their spatial knowledge. A series of scenario workshops to discuss the spatial relations between the different scenarios generated under the LiWA project and the MML Climate Change Adaptation Strategy were discussed with a broad set of key actors.

Insight into water governance networks was gained through strategic interviews with key actors in the climate change- and water-related governance arena in metropolitan Lima. Their knowledge of water vulnerabilities was linked to expected effects of climate change (by author Miranda Sara and Masters' programme students). Spatial knowledge of water vulnerabilities by key actors and residents was assessed by collecting existing maps and by participatory counter-mapping. This exercise showed that actors approach water vulnerabilities from very different perspectives but also showed that some focus on settlement or city-scale problems, while others take the river basin as the relevant unit.

The perceptions of water vulnerabilities in low-income settlements were combined with the perceptions and knowledge of officials from different organizations and levels of government into a quantitative spatialized analysis on population, water consumption and distribution in the metropolitan city. Multi-disciplinary, multi-scalar scientific/codified knowledge was combined with professional, contextual-embedded knowledge through meetings held with practitioners. Community-based knowledge was taken up in a case study manner and included FORO discussions. The dominant discourse shifted towards "water as a right for all living beings" within a "pro-life/green" development discourse.

c. Environmental Commission of the Metrpolitan Municipality of Lima (MML/EC) and the Climate Change Adaptation Strategy

Since early 2012, the MML's environmental team has developed a new initiative to prepare the Climate Change Adaptation Strategy. The goal was to develop a strategy linking the plausible scenarios outlined in the LiWA project to their implications for managing urban development in Lima in all sectors. The MML/EC was established, bringing together representatives from regional, municipal and district governments as well as the business sector, academics, citizen movements and NGO representatives. Figure 3 provides a social network analysis of commission members, showing that the MML, regional governments, ministries and universities are central actors, while the water company, local water authorities (ALA – Chillon, Rimac and Lurin), the private sector and civil society are less centrally involved as members of the various technical groups.

In the MML/EC network, technical working groups were set up for six priority topics and a seventh coordination group. One group focused on climate change in order to develop strategies and action plans and it was made responsible for participating in the development and future implementation of the Lima Climate Change Adaptation Strategy. It consisted of MML's internal environmental team, outside experts from international research projects, UNDP and the Ministry of the Environment, and a FORO technical and facilitator team. Using the work from both the LiWA and C2S research projects, additional information from the National Water Authority, the Peruvian IPCC member, the meteorological institute (SENAMHI) and expertise from the technical working group itself, several activities were carried out. These included an expert workshop with six Peruvian "climate experts" as well as central government representatives, to build agreement on three plausible scenarios for 2025: one with very dry conditions, one with incidental but more frequent heavy rains, and one with a combination of drier trends

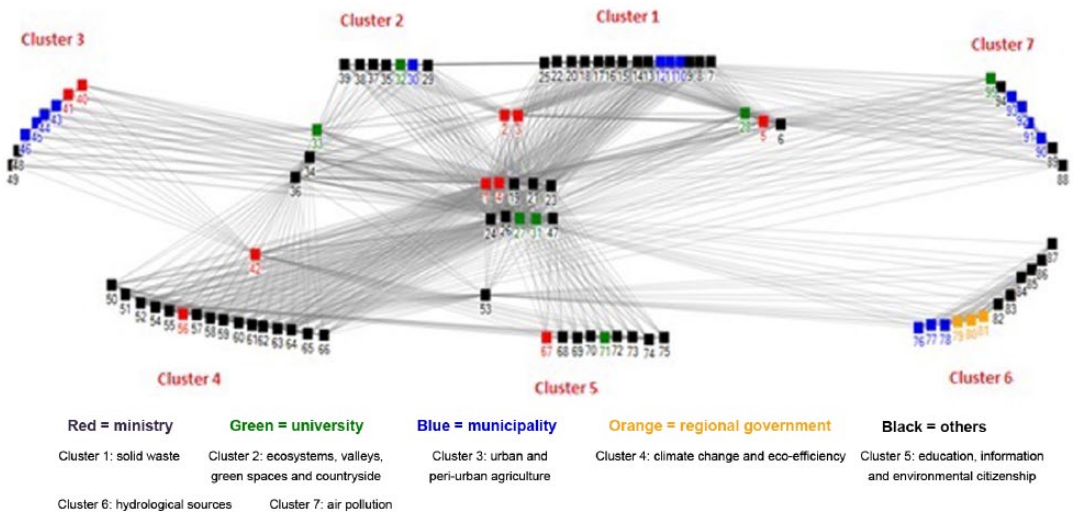

FIGURE 3
Environmental Commission of Metropolitan Municipality of Lima (MML/EC): membership networks in technical groups for Climate Change Adaptation Strategy

SOURCE: Authors' elaboration based on MML/EC members list.

with incidental heavy rainy events/seasons. Further activities included a Latin American regional workshop and workshops with local water authorities and municipal officers, as well as a series of interviews with a wider set of actors, including the popular movement of those without water in Peru. The water company was unwilling to allow the use of its internal information within the new political context but information from C2S and other institutions was not restricted. The strategy developed was based primarily on contributions made by the NGOs, the IPCC member and the LiWA and C2S international research projects. The Swiss AVINA foundation provided funds for an expert team from FORO to finalize the adaptation strategy. Currently, the strategy has been sent to the city council for approval.

The environmental team takes a "water as a right for all living beings" perspective on water, but within this larger network, different discourses vied for acceptance. The MML/EC process drew mainly on expert, codified and contextual-embedded knowledge from professionals from a variety of disciplines (engineers, architects, urban planners, biologists, geographers, sociologists, meteorologists, communicators, geologists, agricultural engineers) but also from political leaders, private sector staff and academics. Inputs of community knowledge (mediated through NGO networks and municipal representatives) were not strong. Activities from C2S included community-based studies in three locations in and outside the city, which explored perceptions of local water and climate change vulnerabilities and whose main conclusions were brought into the discussions.

III. CONSTRUCTING KNOWEDGE WITH CONCERTACIÓN PROCESSES: GENERATION, EXCHANGE, CONTESTATION AND USE

In this section, we turn to the question of how knowledge was constructed within the networks of organizations during the different *concertación* processes.

In the LiWA project, key discourses in water governance were identified in the Lima water governance network, including views on water as an economic good, a human right, a right for all living beings (human/ecosystem) and as a (drinking water) sector. These views on water approaches were located within wider development discourses, including "pro-growth", "pro-poor", "pro-life/green" and "infrastructural sector" (mainly pro-large water infrastructure investments) (Table 1).

The *concertación* process developed within the LiWA project overall followed a course whereby each participating actor analyzed issues from their own point of view, identifying opportunities for harmonization or reconciliation with other actors' views. During this process, knowledge of existing discourses and practices was built up, exchanged and negotiated and areas of conflict identified and managed, with consensus-building as the final outcome.

During the first scientific phase of the project, the main forces driving change in the water sector were identified through a series of workshops with different LiWA partners. Thirteen forces were identified and grouped into five clusters that related to:

- ecology (source areas and aquifers);
- governance (institutions and their authority);
- economic factors (internalization of costs);
- planning (urban form, including land use plans and the issue of increasing informal growth); and
- education (promoting efficiency in water use and sensitization on water issues).[23]

23. The list is from a PowerPoint presentation by Christian León, ZIRIUS, Workshop, 6 October 2011, see http://www.lima-water.de.

The various partners each collected background information on one set of factors to provide input to subsequent workshops. The FORO network worked on planning and governance forces, sourcing and validating knowledge from planning documents, interviews and meetings with experts. The water company worked on water management, water flows, sourcing internal knowledge and, together with a German university researcher, modelling river water flows in the Andes. Another German research centre worked on economic forces in relation to water with the Peruvian national regulatory water institution, SUNASS, using information provided by the water company. Yet another German research centre worked on educational programmes, sensitizing people about water changes, with the Peruvian NGO, FOVIDA. Descriptors and sub-descriptors for each of these forces were discussed extensively in small groups in terms of their prioritization, directions of change and inter-connections, and the complexity of the connections became clear. Through the discussions, contextual-embedded knowledge from sectoral practice was included in operationalizing these forces.

Participants differed in the importance they assigned to each issue. Ecological issues concerning protection of water sources and Integrated

Water Resource Management (IWRM) were considered very important by all participants. Economic issues around sustainable water rates and spillover effects of water provision were considered less important by civil society actors than by public and private sector participants. Governance issues – strengthening leadership, regulation, resolution of conflicts, dialogues and alliances – were considered very important by public sector and civil society participants and less so by private sector participants. Issues around land use planning and control of unplanned growth were considered important by public and private sector participants, whereas civil society participants gave this little priority. Efficiency issues in the water sector – reducing water losses, sustainable sanitation, re-using wastewater – were considered important by civil society participants and somewhat important by others. Finally, increasing knowledge through sensitization on water issues was considered important only by the public sector.

During successive workshops, there was continuous discussion about the descriptors, their indicators, their relative priorities, and interdependencies within the CIB method, with some strong disagreements. For instance, FORO's suggestions for defining poverty as inequality, or reducing poverty by widening participation were points of disagreement; and when IFAK, a German LiWA partner, needed numbers on poverty and socioeconomic classifications for calculating drinking water consumption by socioeconomic class, this became a contentious issue. When disagreements became too heated, the topic was shelved for a while and taken up again after individual mediation, although consensus was not always reached.

Through workshop discussions, additional factors contributing to water sector changes were identified, namely, privatization of the parastatal water company, the existing urban form, and current lack of wastewater treatment and water re-use. Although including the effects of possible privatization remained contested, other factors identified through the CIB analysis were finally accepted by all participants. Twelve main water-linked forces driving change in the water sector were agreed upon:

- form of government;
- water company management;
- water tariffs;
- population growth;
- urban poverty;
- water consumption;
- catchment management;
- urban form;
- water deficit;
- wastewater treatment and re-use;
- water infrastructure; and
- climate change.[24]

24. The list is from a PowerPoint presentation by Christian León, ZIRIUS, Workshop, 24–26 May 2011, see http://www.lima-water.de.

Each force was described by combining factors and indicators set at various levels. Relationships between the factors were used by IFAK to prepare the CIB analysis using the Scenario Wizard software to define the most robust scenarios for the Lima water sector. The ZIRIUS coordinator carried out the analysis and chose the four most "consistent" scenarios from the results. This analytical process took place in Germany outside

the purview of the Peruvian partners. These climate change scenarios for 2040 were discussed in Lima in several workshops and have now (as of 2013) been concluded. However, the water company has not formally recognized these scenarios and is using various factors developed within the project for its own future planning. In addition, IFAK has combined the different scenarios developed with water flow availability results per scenario to help design measures within the LiWA action plan, which was proposed and signed in March 2013.

Information exchange among partners was uneven until the mid-term review in 2010. Internal information from the water company was only provided to the German academic partners for scientific analysis under the strict provision that it would not be passed onto other partners in the *concertación* process; all LiWA partners (German and Peruvian) had to sign a confidentiality clause before the project started. The German partners took the contextual-embedded information on forces driving change developed during successive workshops and also internal technical information from the water company and analyzed this within their CIB method. The mid-term reviewers, with their technical, academic backgrounds and their long experience in practice, brought the city and urban perspective to the discussion, focusing attention on city developments and the influence of existing and plausible urban futures. The resulting redesign of the LiWA project provided, as noted, a spatial perspective for the first time and much more contextual-embedded knowledge from urban practice.

In the third LiWA project phase of "policy-related products", from 2011 onwards, the German landscape architecture institute (ILPOE), MML's Metropolitan Planning Institute, FORO and the environmental team of MML/EC developed the extra work package within the LiWA project, focusing on what contributions an ecological infrastructure strategy could make to Lima's Water and Climate Change Adaptation Strategy. Making use of FORO's participation in the C2S research project, the two groups used expert, codified knowledge and their own contextual-embedded experience from working with a variety of practictioners to prepare background reports. The explicitly spatial perspective on water and climate change management that emerged through discussions within the C2S research project led to the use of various mapping techniques to visualize neighbourhood vulnerability and city-level maps of water accessibility within Lima. However, this remains a separate strand of thinking, with possibilities of being included in the MML Climate Change Adaptation Strategy initiative.

The C2S research project focused on several domains and instruments for city development, linked by the question of how spatial knowledge management contributed to building adaptive capacity for sustainability. Only the work package focusing on water-related environmental governance is discussed here, with its action research process. FORO initiated C2S by inviting Lima FORO members to participate in the research process. A team of experts was established from the most interested institutions,[25] with an advisory committee to comment on research methods. The National Board of Directors of FORO was also involved.

The research on water governance networks, *concertación* processes and outcomes was conducted for a University of Amsterdam (UvA) PhD by Liliana Miranda Sara, together with FORO members, Masters Programme students from UvA and the Catholic University of Santiago de Chile,

25. These included CENCA, LABOR, GEA, VIDA, ECOCIUDAD, FOVIDA, MML and UNI.

and a GIS expert from UvA (Pfeffer). Methods included an analysis of census data and water-related information to spatially represent water vulnerabilities in Lima, as well as strategic interviews with key water governance and climate change actors (opinion leaders, politicians, academics and experts). Students interviewed residents from five informal settlements along the Rimac River, from the upper river basin level to the city, eliciting perceptions of water-related vulnerabilities. The GIS research produced a series of maps showing water-related vulnerabilities across Lima, which were included in wider discussions. Research findings are being widely disseminated in journals, reports, policy briefs, lectures and the media.

In C2S's research process, discussion has been between those using the "pro-poor" and "water as a human right" discourse (especially residents, municipal bureaucrats and politicians), and those using a "water as a right for all living beings" approach (FORO network, MML/EC). In addition, representatives of ministries, academics, some politicians and the private sector also had "water as an economic good" approach within a pro-growth development perspective.

The C2S process included a series of multi-actor working groups, seminars, one international forum and one yearly project workshop with the whole project team in Lima.[26] The FORO National Assembly provided a nationwide platform to disseminate the different activities during the C2S period and was used to enhance knowledge-building and to develop capacities within member institutions. The knowledge produced with C2S was also brought into discussions with LiWA as well as MML/EC projects, opening up more spaces for debate for these efforts as well.

26. Similar workshops were held in the other research locations of the Chance2Sustain project.

When the environmental team (MML/EC) started the MML Climate Change Adaptation Strategy initiative, conversations with other MML departments showed that water governance was influenced by a variety of "city visions" as well as spatial discourses. The MML's Metropolitan Planning Institute usually combines a perspective on water as an economic good with a sectoral approach; this means that the natural environment surrounding the city (agricultural areas, water aquifers) is of secondary importance to them. The MML housing team had a "pro-poor" focus, developing a poverty map for all of Lima and identifying areas of extreme poverty and vulnerability, particularly in the hilly areas surrounding the city. The environmental team built up an ecological structure map, showing the landscape units and ecologically sensitive areas in the city (coastal *lomas* (marshes), the coast, rivers, deserts and mountains). The first two "city visions" have been formally endorsed by the councillors but the ecological structure map is still pending.

The MML Climate Change Adaptation Strategy initiative also used much of the LiWA and C2S material in its discussions and in the development of the strategy document. The technical group on climate change decided to consider only three of the driving forces – population growth, water flow availability and climate change issues – in developing its own set of climate scenarios.

At the beginning of this period, community-based information was brought into technical group discussions through their member NGOs, which held a number of community water management workshops. Under discussion were local forms of water management in areas without official water provision, and community provision of irrigation and drinking water in low-income neighbourhoods. Many communities

have small-scale water-channelling initiatives supported by international NGOs, with simple technology sourced from practical local experience. In both the upper river basin and along riverbanks in Lima, communities create a network of small water channels and lagoons to "harvest" water, as well as stabilizing soil to avoid mudslides. The knowledge from community-based practices was combined with that developed in various research projects to allow the technical group to achieve consensus and write up a Climate Change Adaptation Strategy for Lima in record time (less than one year). Current consultations with councillors and the municipality are adding political knowledge to the mix to provide a final document.

The MML, with contributions from C2S, has developed such instruments as the Ecological Structure Strategy and maps and the Climate Change Adaptation Strategy, while the LiWA project has contributed the scenarios, the round tables and seminars as well as the Lima Water Action Plan to the MML/EC project. Altogether, these projects have provided spaces, platforms and audiences for sharing and exchanging knowledge, debating the arguments, particularly with non-dominant actors, contributing both to the interactive construction of knowledge and to changing policy discourses. These new forms of consensus and agreement have contributed to the approval of MML's environmental policy (2012), an increase in MML's budget to implement it (2013), the signature of the Lima Water Action Plan by key water governance actors (SEDAPAL, MML, FORO, SUNASS, FOVIDA, UNI) and the anticipated approval of new urban environmental policies and management instruments that are expected to outlast political changes, central and municipal, after the forthcoming elections (2015).

IV. CONCLUSIONS

Our first question concerned the contribution that participatory processes can make to building trust and to the exchange of knowledge, by increasing spaces for different kinds of actors. Various "spaces" have been created here, both through international research projects that bring in new actors and build networks with Peruvian partners, as well as through new Peruvian laws that provide mandates for new water governance and environmental policy processes, including *concertación*.

The LiWA research project combined private and public sector actors, with mainly technical academic networks. Opening up to water governance framings and taking wider ecosystem issues into account proved difficult and the "products" remain academic with little that can be practically applied as yet. The C2S project included a different range of actors, namely the inter-institutional network FORO, international academic institutions, Peruvian NGOs, informal settlement communities and key actors in Lima's water governance networks. It discussed the range of framings and discourses around water governance, acknowledging community-based perspectives on water-related vulnerabilities and taking a spatial view with a multi-scalar model of water governance networks.

The MML initiative has shifted the existing sector-based approach to water governance of a highly centralized government, which had prevented the integration of different perspectives on water governance

or metropolitan city development. The relatively new legal framework has mandated the opening up of discussion to a larger network of actors, including NGOs, citizen organizations, community-based groups, experts with various backgrounds and political representatives. In contrast to the centralized processes in place just 15 years ago, this inter-institutional coordination provides a basis for building adaptive capacity and moving towards sustainability transitions.

To what extent do these *concertación* processes build trust, exchange of knowledge and joint planning? Is it possible to build a hybrid, multi-level network across different stakeholders, or is a hub-and-spoke pattern necessary, with a central, nodal agency and other stakeholders around it? The literature suggests that knowledge travels more easily in hybrid networks, where mandates and political will provide necessary support. The LiWA *concertación* processes were fairly independent of local government and therefore could resist efforts to include a wider range of actors and new discourses. The water company, a dominant stakeholder in the network, prevented exchanges of knowledge with wider groups of participants, a situation that started to change after the new central government came into power. The MML initiative combined a legal mandate with a wider variety of participants, allowing the inclusion and acknowledgement of community contextual-embedded knowledge. The C2S project had no legal mandate but provided access to and support from international knowledge networks, linked to an interactive approach to knowledge-building across institutional boundaries. These results suggest that knowledge does travel more easily in hybrid networks, where mandates and political will provide support.

Our second question concerned the types of knowledge included in *concertación* processes and how they contributed to participatory processes. In the LiWA project, engineers, academics and the water company were the dominant voices, with FORO maintaining a facilitation role. Although FORO gradually played a stronger role, it remained weaker than SEDAPAL or other government entities. Because community-based organizations and representatives from MML were consulted only once the basic model, its main dimensions and the scenarios had been established, they could not add additional dimensions and issues.

The water company held a decisive position in the process, deciding what information should be shared with the other Peruvian partners. The privileged access by the German academics to internal information from the water company for their technical analysis, results of which were not shared until late in the process, revealed structures of (dis)trust that are slowly being reduced by the current administration. Dominant discourses leaned heavily towards a scientific, analytical approach based on water as human right and as an urban (drinking water) sector, which shifted, thanks to outside reviewers and Peruvian partners, to a city perspective wherein water is part of an urban ecological infrastructure. Although large areas of consensus were built up, the remaining focus on scientific–academic work among the German partners makes linkages to policy and implementation complex, so that now, MML is working with Peruvian partners to develop in that direction.

Different combinations of partners generated knowledge, some in fairly closed groups and others working in wider networks with various methods (workshops, focus groups and expert and community interviews), developing more integrated discourses on water governance.

Discussions, conflicts and consensus-building were integral to the knowledge-building processes. Different participants tended to retain their original perspectives, accepting new dimensions only after long discussions or outside persuasion. "Water as a sector" remained the primary perspective, with urban and ecological issues and poverty and population growth issues being secondary. A transectoral and multi-scalar approach integrating the needs of the surrounding territory and the city would be desirable, but the refusal of SEDAPAL to include the municipalities of Lima and Callao in their management decisions remains a strong political barrier.

The MML strategy initiative with the MML/EC also displayed a range of perspectives that started to be integrated through discussions and meetings within the network. This initiative builds on the LiWA processes that had already crossed sectoral divides, so the process did not start from scratch and is supported by strong legal mandates for integration. Because several LiWA participants were involved in the MML initiative, knowledge travelled more widely than before. Finally, it was possible to include contextual-embedded knowledge from local communities. MML information was shared more easily with the partners engaged in preparing the Climate Change Adaptation Strategy. Although this strategy has not yet been approved by the councillors, the final document has been shared, contributions have been received and internal MML discussions have provided direct contributions to the text, so a basic consensus has already been built. Publication of the document is expected soon.

The C2S programme opened up discussion on more spatial perspectives in city development and water governance, experimenting with mapping methods, visualizing inequities and indicating areas of vulnerability across scale levels and with explicit inclusion of communuity-based perceptions of water-related risks. Its interactive methods of knowledge validation and exchange through workshops, policy briefs and opinion papers contributes to expanding opportunities for mutual understanding among different actors, both in Peru and across international knowledge networks.

The main conclusion about these *concertación* processes is that actors can build agreements on collaborative action over time with diverse water and development discourses as well as different territorial and metropolitan city visions, bringing in knowledge through multi-scalar spatial perspectives and providing inputs for scenario-building towards future forms of water governance and climate change adaptation. Such processes by necessity include conflicts as well as recognition of the others' perspectives and require contextual-embedded knowledge as well as expert, codified knowledge to build up city scenarios capable of "seeing" what might happen when conditions change in the future. Although discourse mobility is limited by strong interests, the research processes showed that scope for social change remains, even with new political and institutional changes in the future. They do require democratic and decentralized institutional frameworks, providing strong mandates and political will supporting such processes, so that the views of the poor, vulnerable and excluded can be heard.

ANNEX 1
LiWa partners

- IFAK – Institut für Automation und Kommunikation e.V. Magdeburg (General Coordinator)
- ZIRIUS (formerly ZIRN) – Stuttgart Research Centre for Interdisciplinary Risk and Innovation Studies, University of Stuttgart (Coordinator, Peru)
- Institute for Modelling Hydraulic and Environmental Systems, Department of Hydrology and Geohydrology, University of Stuttgart
- Institute of Landscape Planning and Ecology, Faculty of Architecture and Urban Planning, University of Stuttgart
- SEDAPAL, Servicio de Agua Potable y Alcantarillado de Lima
- Helmholtz Centre for Environmental Research (UFZ), Department of Economics, Leipzig
- Foro Ciudades para la Vida (FORO), Lima
- Ostfalia Hochschule für Angewandte Wissenschaften, Campus Suderburg
- Universidad Nacional de Ingeniería, Lima
- FOVIDA – Fomento de la Vida, Lima
- Dr Scholz and Dalchow GmbH (private consultants)

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