A multifunctional Sydney laneway: what’s transdisciplinarity got to do with it?

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ABSTRACT
Academia and industry increasingly recognise the need for multifunctional urban spaces. But how do we meet this need? Emerging responses point to the promise of transdisciplinarity. We critically reflect on this claim by analysing the role of transdisciplinary practice in the successful conversion of a Sydney laneway into a multifunctional urban space. We trace the co-existence of different disciplinary practices throughout the project stages, to better understand how much transdisciplinarity contributed to its success. A tentative explanatory framework emerges from our analysis and is offered to map the enabling conditions, disciplinary dynamics and strategies that allowed this laneway’s transformation into a multifunctional space. Enabling conditions were the municipality had institutionalised a concern for the environment; an organisational change programme ensured the project’s independence from the capital budget; and an environmentally aware community group played a core role. The disciplinary dynamics observed were diverse. Planning and design were transdisciplinary, but implementation and maintenance were not. Finally, practitioners used various strategies to bring actors together: they understood the political nature of the organisation; they recognised the different types of actors involved in the project, and then used appropriate language to communicate ideas and to manage risks and expectations.

1. Introduction
Contemporary urban environments face many challenges: their populations are growing despite limited space; their biodiversity is declining, and climate change adds multiple threats. How can cities adapt to remain resilient? One important answer lies in multifunctionality: the idea that a piece of technology or infrastructure should deliver multiple resources, functions and associated benefits, towards creation of interconnected urban spaces that adapt to changes and disturbances and facilitate efficient use of space (Kato & Ahern 2009; Lundy & Wade 2011).

But there are barriers to achieving this: our organisations are set up to deliver mono-functional solutions such as stormwater infrastructures, which provide drainage facilities
only and miss opportunities for optimal site integration, increased landscape amenity and community acceptance (Henderson et al. 2012). How to get out of this trap? Transdisciplinarity has been heralded as a promising pathway out of traditional, siloed organisational practices. Transdisciplinarity attempts to integrate formal and informal knowledge in a change from ‘science for society’ to ‘science with society’ in order to solve complex and real problems (Scholz 1995, 2015; Häberli & Grossenbacher-Mansuy 1998; Scholz & Steiner 2015). A growing literature is entrusting this concept with the ability to facilitate multifunctional landscapes in practice, by fostering engagement between researchers from the humanities, the natural and social sciences, and policy and practice professionals involved in land use decision-making processes. The resulting dialogue, it is proposed, leads to a holistic understanding of the urban landscape’s needs in question, and will establish tangible nature–culture interacting systems (Fry 2001; Naveh 2001; O’Farrell & Anderson 2010). By coordinating actors with different types of knowledge, and by operating at multiple institutional levels, transdisciplinary practice is said to integrate the functions of those urban spaces based on legal, economic, social and technical attributes (Matos Castaño et al. 2015).

These are promising claims. And yet, transdisciplinarity – both as concept and practice – is still in its infancy. As result, there is a lack of consensus about the concept and few studies on transdisciplinary practice. The term ‘transdisciplinarity’ is recognised in Europe and applied in investigations linked with landscape ecology and sustainability research (R W Scholz & Steiner 2015). In other parts of the world, transdisciplinarity is associated with approaches such as community-based participatory research, action research, experimental action research, ‘participatory research’, ‘public participation’, participatory rural appraisal, social learning, mode 2, co-design, co-production, and co-creation or co-construction of knowledge, among other approaches (Roux et al. 2010; Lang et al. 2012; Brandt et al. 2013; Scholz & Steiner 2015). Some trandisciplinary research focuses on developing transdisciplinary definitions that distinguish it from other disciplinary approaches, especially interdisciplinarity, which have been subject to an intensive scholarly discourse over the last 40 years (Nicolescu 2006; Darbellay 2015; Klein 2015). Other research groups are focusing on the development of tools, models or frameworks to facilitate transdisciplinary processes while other groups are assessing transdisciplinary processes developed mainly in research centres and networks funded by public agencies and private organisations (Tötzer et al. 2011; Guzmán Ruiz et al. 2015; Lawrence 2015; Polk 2015).

Transdisciplinary practice is influenced by and takes place in different lifeworld contexts. Insights and empirical evidence into these life-world experiences and local contexts are scarce and highly desirable to understand the role and applicability of transdisciplinary practice (Bammer 2005; Max-Neef 2005; Kueffer et al. 2007; Klein 2008; Wiek & Walter 2009; Lang et al. 2012). Transdisciplinary practice is defined as roles, interactions, processes and experiences of state or local governments, regional agencies, industry, local community groups, indigenous people, NGOs, or private consultant firms to implement projects on the ground in order to solve societal problems. In some cases, the projects might be supported by researchers; however, the practitioners are the main actors responsible for implementing the projects (Guzmán Ruiz et al. 2015). Most of the studies of transdisciplinary practice have been in the health sector, especially in early childhood special education and early intervention (Chapman & Ware 1999; Rapport et al. 2004; King et al. 2009; Bell et al. 2010; Bock Hong & Reynolds-keefer 2013).
In relation to urban studies, few researchers in alliance with practitioners working in public entities are investigating transdisciplinary processes developed by practitioners in cities that may contribute to the creation of multifunctional landscapes in cities (for examples, see Edwards et al. 2007; Fam et al. 2013; Matos Castaño et al. 2015) – an arguably pressing priority in our quest to future-proof urban life on this planet. This paper analyses what transdisciplinary practice had to do with a municipality’s successful transformation of a Sydney laneway into a multifunctional urban space. We deemed the project successful because it decreased flooding risk while increasing green space, amenity values and security. But to what extent did that success depend on transdisciplinary practices? And will the answer apply to other scenarios where multifunctional outcomes were achieved?

We propose that (1) a closer look at individual cases is needed to supplement general theorising with a more nuanced understanding of actual transdisciplinary practices that contribute to the creation of multifunctional urban spaces. Drawing on the present case study, our paper therefore offers a (2) tentative explanatory framework that identifies the enabling conditions, disciplinary dynamics and strategies applied by the practitioners who facilitated the project of the case study. In this way, this paper contributes to the literature by developing (3) an explanatory framework that can be used to analyse similar cases. Thus, this paper addresses research gaps identified in the transdisciplinary literature such as process management, organisational change and learning, team dynamics and knowledge integration by practitioners (Ryan-Vincek et al. 1995; Huang & Newell 2003; King et al. 2009; Daniell et al. 2010; Tötzer et al. 2011; Fam et al. 2013). For instance, the identification and effectiveness of enabling conditions and strategies applied in transdisciplinary processes are not clear (Daniel Stokols et al. 2005). These variables can help practitioners to plan transdisciplinary projects better, and increase opportunities for investments in transdisciplinary processes by organisations (Stokols et al. 2008; Jacobs & Nienaber 2011; Lang et al. 2012). Disciplinary dynamics can give insights into the experiences and processes of transdisciplinary teams, which are not largely explored, and can favour the new trend in understanding knowledge integration by teams, instead of by individuals (Hildebrand-Zanki et al. 1998; Stokols 2006; Bock Hong & Reynolds-keever 2013). We hope that this framework – modelled on a practitioner perspective – will help close gaps in transdisciplinary practice research by addressing the current dearth of empirical evidence and frameworks for local contexts, and the lack of knowledge about process management, team dynamics and organisational change (Apgar et al. 2009; Daniell et al. 2010; Fam et al. 2013). We envision our tentative explanatory framework to serve as a learning platform for practitioners and academics interested in understanding how transdisciplinary practices can help create multifunctional landscapes in cities.

2. Theory

In the transdisciplinary research literature, different authors have developed models and frameworks to evaluate research processes. For instance, Stokols et al. (2003) created a model to assess collaborative processes and scientific and public policy results from transdisciplinary research teams and centres. Moreover, Hall et al. (2012), developed a framework to conceptualise transdisciplinary team-based research. The objective of the framework is to offer evidence-based models to increase effectiveness and efficiency of
transdisciplinary research. However, it was not possible to find models or frameworks to facilitate the understanding of transdisciplinary practice in projects delivering multifunctional landscapes.

Looking for possible ways to understand our case study, we consider useful Olsson’s study (2006). The objective of the Sydney-based project is the provision of multiple simultaneous benefits for citizens and nature, to lead social and ecological transformation. According to Olsson and colleagues (2006), a socio ecological transformation follows two phases – a preparation and a transition phase – linked by a window of opportunity.

1. In the preparation phase, the system gets ready for change: exploring new system configurations and strategies, and establishing networks that integrate and build knowledge. In this process, new forms of leadership emerge that help open up the window of opportunity (Olsson et al. 2006).

2. Three criteria are critical for a window of opportunity: that a problem is recognised; second, that a solution is available; and third, that the political climate is conducive to the change and actions required to achieve that solution (Kingdon 1995; Olsson et al. 2006).

3. In the transition phase, flexibility and improvisation are essential to deal with uncertainties in the new processes. Key elements of the transition phase are dynamics of cross-scale interactions, the management of problems in different domains, and the development of solutions to these problems (Olsson et al. 2006).

We suggest that these phases can help us understand the conditions that enabled practitioners to succeed in the case-study project (what we call enabling conditions), the disciplinary dynamics at play, and the strategies used by the practitioners involved. In the framework (Figure 1) we propose, enabling conditions are linked to Olsson and colleagues’ (2006) preparation phase and its associated window of opportunity.

Next, our framework proposes that the disciplinary dynamics and the strategies practitioners use to deal with social-institutional barriers to facilitate the project can be linked to Olsson and colleagues’ transition phase. To analyse the disciplinary dynamics operating at each phase, we used the following terminological definition: transdisciplinary practice coordinates and integrates actors at different hierarchical levels and sectors – for example, industry, academia, government and the local public – to develop a common goal through mutual learning directed at understanding and solving complex social problems (Max-Neef 2005). Features of transdisciplinary practices are: team members have diverse disciplinary perspectives and abilities, and integrate participants from different backgrounds; teams receive incentives from their organisation; team members communicate effectively to develop a joint understanding of the problem; and are willing to devote time to manage the inherent tension of such collaborations (Stokols et al. 2008).

This is a comprehensive definition and – perhaps not surprisingly – authors such as Ramadier (2004) consider it difficult to implement all of its features in practice: cognitive, conceptual and personal challenges may all decrease the participation and diversity of actors involved in transdisciplinary processes. Both underrepresentation or overrepresentation of certain actors can threaten the transdisciplinary nature of a given project – as can contexts where participation of diverse actors becomes unmanageable (Lang et al. 2012). Similarly, a project may only be deemed transdisciplinary in the initial or final phase (with different social actors participating), while other phases may be developed by a homogenous group
of same-sector actors (Jahn et al. 2012). In short: the disciplinary dynamics and the degree of cooperation among actors during each project phase are context-dependent, and reflect the complexity of the social problem that needs to be solved (Mobjörk 2010). More often than not, social and ecological transformation will not proceed in a purely transdisciplinary fashion, but will involve inter-, multi- and monodisciplinary practices.

As interdisciplinary, we define practices that involve unrelated academic disciplines working together to achieve a common goal. Such collaboration creates a common terminology as a result of fusion of concepts and methodologies from different disciplines (Tress et al. 2003). Multidisciplinary practice involves teams dealing with the same subject matter, but each member pursuing separate goals and analyses, without a common dialogue that could advance problem-solving, or lead to integration and synthesis of knowledge and outcomes (Elliott 2011). Finally, monodisciplinary practice is specialised practice: it requires isolation or simplification, since it seeks to understand a complex problem through the lens of a single discipline or subject area (Max-Neef 2005).

In addition to the analysis of the disciplinary dynamics applied in the project’s transition phase, it is critical to understand what strategies practitioners use to bring actors together despite socio-institutional barriers (Farrelly & Brown 2008). Strategies can be defined as the modus operandi of practitioners who pursue change (Brouwer 2015). The strategies might include negotiation, persuasion, conflict management and diplomacy, depending on practitioners’ different levels of trust, legitimacy and power to bring actors together, and reflecting their knowledge of the political nature of the organisation (Williams 2012). Practitioners might also manipulate and transfer local and scientific knowledge and information through
diverse narratives and communication styles, to facilitate cognitive and decision-making processes, thereby revealing the interests and motivations of the actors involved (Battilana et al. 2009). When a project is pioneering and innovative in nature, practitioners may use strategies to manage multiple expectations and risks by clarifying possibilities and limitations, and by maintaining continuous communication and a common perspective of the project among all actors (Renner et al. 2013).

3. Research approach

Due to the need for empirical evidence of transdisciplinary practice, we used a case study approach to investigate how a local Australian Government organisation – here called a municipality – transformed a Sydney laneway into a multifunctional urban space, and to what extent transdisciplinary practices were applied in this project. This approach is particularly suitable when: firstly, little is known about characteristics involved in decision-making processes at the organisational level; and secondly, the information generated by the analysis may inform practice in similar contexts (Leedy & Ormrod 2013). Transdisciplinary experts consider that multiple case studies capture the uncertainty, multiple connections and complexity of transdisciplinary processes (R W Scholz & Steiner 2015). Additionally, outcomes of case studies can identify organisational processes and strategies that promote transdisciplinarity (Daniel Stokols et al. 2005). Sydney’s case study is part of a broader project of multiple cases studies that explain transdisciplinary processes in multifunctional projects developed by municipalities, communities groups and consultancy firms in Australia.

3.1. Selection of case study

For the selection of the case study, we contacted practitioners and academics that could give information about successful projects delivering multifunctional landscapes in Australia. Additionally, municipalities’ web pages and other institutions’ pages were reviewed to find projects delivering multifunctional landscapes. In parallel, we created a criteria framework for projects delivering multifunctional landscapes. The criteria framework comprised different factors such as stage (in design, under construction or already implemented) and scale (lot; streetscape and lanes; precinct and catchment). Based on Rodenburg and Nijkamp (2004), we included a gradient of multifunctionality (deliver one function but incidentally providing other functions; or focusing on delivering diverse functions simultaneously). Another factor was the objectives of the projects, for example, water quality and supply; climate; biodiversity conservation or human health or well-being (Naumann et al. 2011); Finally, the framework included the delivery of urban ecosystem services by project such as food supply, water flow and runoff mitigation, urban temperature and climate regulation, noise regulation, air purification, waste treatment, animal sighting, recreation, tourism, aesthetic appreciation, and spiritual experience (TEEB 2011; Hernández-Morcillo et al. 2013). This criteria framework as a type of assessment facilitated the identification of a suitable multifunctional project that accomplished different objectives and offered various benefits and services for society and nature (Asmussen & Creswell 1995).

Two academics and six practitioners engaged as independent evaluators assessed 17 representative projects in Australia against this framework by rating the multifunctional landscapes of these projects. The ratings were binary, either 1 if the element was presented
in the project or 0 if it was absent. The Sydney laneway case study was chosen as it received one of the highest scores in relation to our criteria framework, involving an increase in the area of green space, amenity values and security, and a decrease in flooding risk.

3.2. Case study analysis

Multiple methods were applied to obtain detailed information about the project. To understand the project’s history and enabiling conditions, we analysed a total of 92 documents comprising management plans and programmes, policies, meeting minutes, official internal communications and newspaper articles. Five oral history interviews and semi-structured interviews were conducted with senior managers and a local politician of the municipality, as well as coordinators and members of a local community group, to elicit information about the main events and decision-making processes during the project. In this way, interviewees from different sectors helped to reveal different insights into the project and the organisation (Nader 1980; Herndon & Kreps 1993). To identify the disciplinary dynamics and the strategies used by practitioners to bring actors together, we conducted 10 semi-structured interviews with managers, coordinators, a local community leader and community group members. Interviewees answered questions exploring personal experience, communication and interactions among team members working in the project, and the main strategies used to deal with challenges or difficulties in the project.

Thematic analysis of our data involved an on-going, critical and analytical review process (Creswell 2003). Key actors from the municipality and the community verified the history and the description of the organisational processes. Since knowledge of transdisciplinary practice is limited, we distilled the results of our case analysis into a tentative explanatory framework that maps the project’s enabling conditions, disciplinary dynamics and actors’ strategies onto Olsson and colleagues’ (2006) phases for transformation of social-ecological systems

Enabling conditions were analysed in terms of the processes that prepared the organisation to develop the project (preparation phase), and the characteristics of the window of opportunity. For the transition phase, we analysed the disciplinary dynamics based on our terminological definition of mono-, multi-, inter- and transdisciplinary practices outlined above (see 2.). Finally, we described the main socio-institutional barriers to transdisciplinary practices in this project, and analysed the strategies practitioners used to overcome these barriers and to bring actors together. Given the dearth of research on transdisciplinary practice in the context of projects delivering multifunctional landscapes, our data analysis and discussion of results draw on a broad body of literature from domains such as co-management, co-governance, co-engineering, management processes, team diversity, project management, social learning and participatory processes in public administration, policy or development studies.

3.3. Redesigning a Sydney laneway: case study context

Imagine a shady little laneway in metropolitan Sydney, Australia: always littered, regularly flooded, and habitually frequented for illegal activities. The need for change was inevitable: an urban transformation project was born. The flooding, littering, and illegal activities had to stop, or at least abate. To achieve this, a multifunctional green space was created (instead
of parking lots, as originally intended) by installing buffer strips, permeable pavement, solar energy panels, a rain tank, and by planting trees and creating a social space for citizen interaction. The project was set in the institutional context of a municipality in Australia’s state of New South Wales. These organisations are responsible for preparing municipal strategic statements and administering local planning schemes. Their organisational structure commonly comprises local politicians, a general manager and a number of sections and departments responsible for services relating to infrastructure, planning and environment, and community (Allan et al. 2006).

Environmental projects arising in such an institutional setting usually follow a standard procedure: the planning and environmental services departments strategically analyse the project against priority lists and budget availability. If senior managers approve of the project, its technical specifications are then developed by the infrastructure services department, which also implements the work and maintains the finished landscape. However, our case study project did not follow this standard procedure. It was the first urban transformation project lead by this municipality in which a community group actively participated. The project was not part of a pre-planned priority list of works; it was set up involving different hierarchical levels of the organisation, academic experts, senior managers, the community group and one local politician. The design involved multiple workshops between staff from the environmental service and infrastructure service departments and members of the community group. The infrastructure department was responsible for implementing the project. The project spanned eight years for planning processes and two years for design and implementation. The maintenance phase is ongoing: to this day, the municipality maintains the laneway’s infrastructure, and the community group its trees.

4. Results

We present our case study findings as a tentative explanatory framework that maps the project’s enabling conditions, disciplinary dynamics, and actors’ strategies onto Olsson and colleagues’ phases for transformation of social-ecological systems (Kingdon 1995; Olsson et al. 2006). Our notion of enabling conditions is linked to the preparation phase and its associated window of opportunity, while our concepts of disciplinary dynamics and strategies are tied to the transition phase.

4.1. Enabling conditions that facilitated the project

In the eight-year preparation phase (2002–2010), the municipality went through a period of change that would eventually facilitate development of our case study project. Through legislative reforms in the state of New South Wales (NSW), such as the Local Government Act 1993 and the Local Government Amendment Act 2009, municipalities changed their organisational structure to include environmental management. An environmental services department was established and staff started building knowledge and developing different visions for sustainability programmes and actions related to climate change, water management, environmental planning, waste management and energy, among others. Of relevance for our case study project, a water agenda was established in 2002, with the formation of an alliance between the environmental services department and academics aimed at developing the first integrated and holistic sub-catchment planning process for the municipality.
Outcomes of these planning processes included four sub-catchment management plans, a strategy for a water sensitive community, and water sensitive urban design programmes including education programmes, implementation of rain gardens and green lane programmes.

The window of opportunity to develop this project initially emerged in 2010, when a building was established in our case study’s lane. By law, the NSW State Government demanded that the relevant building company responsible for such development also resurface the lane and provide parking. But a community leader and resident of the lane, who attended water sensitive design workshops and had technical knowledge in design, sent a complaint to the municipality, suggesting that a green space be developed in the lane instead of parking. The proposal included water sensitive urban design and a space for social interaction by residents and the community, addressing social and environmental problems in the lane. The municipality’s environmental services department viewed the complaint and proposal as an opportunity to implement water sensitive urban design through a participatory process with the community. Similarly, senior managers considered that the project could fit into a new organisational change programme that attempted to avoid monofunctional projects and, instead, promote a holistic, integrative and multifunctional approach. In addition, the project could align different policies and strategies of the urban water management agenda of the municipality such as sub-catchment management plans, a strategy for a water sensitive community and water sensitive urban design programmes. The actors had recognised a problem and identified possible solutions and the political climate was favourable, all criteria of a window of opportunity. Under these conditions, the actors started to find financial resources for the project, which benefitted from the storm-water management service charge and rainwater tank incentive scheme established by the New South Wales Government in 2006. In parallel, negotiations with the building developer and the influence of a local politician were crucial to the financial independence of the project. The council departments for development assessment and infrastructure services negotiated with the developer to use the money originally allocated to lane resurfacing for the implementation of the project instead. The developer agreed. The community group’s leader contacted one of the local politicians of the municipality, who included the project in his plans, thereby increasing the project budget. Importantly, the project’s finances were thus independent of the municipality’s 4- or 10-year work program.

4.2. Disciplinary dynamics applied in the project

In the transition phase (2010–2012), practitioners establish different disciplinary dynamics in order to deal with new processes and uncertainties inherent in the project, while also managing problems in different domains (Olsson et al. 2006). Below we explain the disciplinary dynamics that operated during the planning, design, implementation and maintenance of the project.

4.2.1. Project planning

Our case study revealed that transdisciplinary practices operated during project planning in the transition phase, identifying a common societal problem and developing a shared vision for the project, and establishing diverse interactions and negotiations between staff of the municipality, the development company, community members and academic
researchers to gather information, organise responsibilities and find financial resources for the innovative project.

Staff from the environmental services department worked with academics to establish integrative planning processes. The development assessment and infrastructure services departments negotiated with the development company to get financial resources. Environmental services and legal services departments created a management risk plan to work with the community. The community leader interacted with the local politician to get support, and subsequently the politician worked with senior managers to approve financial incentives for the project.

4.2.2. Project design
We also identified transdisciplinary practices operating during the design of the project, through the integration of interests and ideas, and mutual learning from two departments of the municipality and the community group. For example, several workshops involving 15 residents and staff from the municipality were held to discuss alternative and innovative designs for the relevant section of the lane. The actors involved in the design mentioned how they crossed boundaries of knowledge of engineering, environmental sciences, architecture, landscape design and art, establishing a final design that satisfied all contributors.

Multidisciplinary features also played a role during project design, since a practitioner from the environmental services department served as direct liaison with the community, discussing interests and ideas for the project, while an engineer from the infrastructure services department was in charge of incorporating the community's ideas into design alternatives. Both professionals were guided by a main coordinator from the environmental services department. Managers from other departments gave specific technical advice for the development of the project as well.

4.2.3. Implementation and maintenance of the project
Staff from the infrastructure services department were in charge of the implementation of the project. This department comprised mainly engineers who work and communicate well as practitioners, sharing similar professional skills, perspectives and communication styles. Thus, they applied monodisciplinary practices. In comparison, the infrastructure services department and the community group were responsible for maintaining all of the water infrastructure and the trees, respectively. Multidisciplinary practices were applied here, as two teams with different backgrounds, skills and communication styles worked in parallel on specific tasks. Each group worked from its own perspective and undertook its responsibilities without communicating or collaborating with the other group.

4.3. Practitioners' strategies for dealing with socio-institutional barriers and bringing actors together
In the transition phase of the project, practitioners need to apply different strategies for dealing with socio-institutional barriers and bringing actors together to enable the project. Below we describe the main socio-institutional barriers identified in our case study, and the strategies applied by practitioners to overcome them.
4.3.1. Socio-institutional barriers identified in the project
Practitioners mentioned barriers that applied during the whole project, as well as specific limitations affecting the planning, design, and implementation and maintenance of the project. Main barriers identified for the whole project were a lack of clear processes, no principal manager leading all processes, and the absence of continuous commitment from senior managers, elected officials or decision-makers to promote true cooperation among departments.

Constraints specific to the planning phase related to the fear of failure and risks associated with the municipality working with the community, as no other project before had been designed and maintained with active community involvement. Limitations identified by the community group were the lack of financial resources to establish the project in the whole lane, and the need to convince people of the value of the project during its planning.

Examples of barriers in the design phase were the lack of training of some staff in how to collaborate with the community; high expectations from the community group wishing to redesign the entire lane as a multifunctional space; and biased views and rigid opinions of some community members and government staff, who were not open to alternative solutions and only pushed their own design ideas. In the final phase of the design, the decision-making power of the state of New South Wales’ road and traffic authority was considered a barrier, as this was the only entity that could approve or reject the design based on standards for roads, but not necessarily for lanes involving water technologies. The community believed that this step in the design phase reflected excessive bureaucracy or adherence to official rules and regulations. In the implementation phase, limitations were a lack of coordination between design and construction departments, suggesting a lack of trust between, and confidence in, staff of these departments.

In the maintenance phase, community group members considered other residents’ limited interest in maintenance activities a barrier. To overcome these various barriers, practitioners used the following strategies to support the project.

**Strategy 1: Understanding the political nature of the municipality**
To overcome socio-institutional barriers, practitioners established different coalitions as a way to facilitate the project. The community leader established alliances with one politician from the municipality. In this way, the project was included in the politician’s plans, and he was able to secure financial resources. At the same time, practitioners from the local government organisation strategically tapped into different networks to ensure the organisation would be receptive to, and approve of, the project. To garner support, they showed evidence of policies, programmes, academic research and partnerships to the general manager, senior managers and local politicians; they also created a risk management plan for working with the community, to reduce the likelihood of the project being rejected by municipal management staff and local politicians. In this context, the community group needed to be legally formalised, with clearly defined roles and responsibilities, to facilitate the administrative and legal processes related to the group’s role in maintaining the finished landscape. Moreover, practitioners were aware of how some local council departments work more hierarchically than others and used this knowledge to communicate with staff and increase receptivity, trust and confidence in the project. To accommodate this, a strategy used by practitioners was to talk directly to the staff, reminding them that the project had full support from local politicians or the general manager. Practitioners mentioned how staff from very
hierarchical departments would easily follow instructions from top managers, a fact that was used to facilitate project development while avoiding formalities.

**Strategy 2: Recognizing the nature of actors involved in the project and using proper language to interact with actors**

Practitioners involved in our case study project used demographic studies, workshops, surveys and direct interactions to communicate with the local community group, and to understand its vision for the urban space. One practitioner was the main channel of communication between the municipality and the community, listening to and translating local and technical ideas from both sides into suitable narratives. This practitioner was guided by others trained in community liaison, who believed strongly in the contribution communities can make to environmental projects.

**Strategy 3: Managing expectations and risks**

In our case study project, all actors involved held high expectations with regard to project outcomes. For instance, one of the community group’s main expectations was to establish a green space in the whole lane instead of just one section. For engineers expectations were related to the proper functionality of the water infrastructure. In parallel, environmental officers needed to manage, for instance, health and legal risks associated with transferring maintenance responsibilities to the community. They applied different strategies and mechanisms to manage expectations and risks, including the use of discussions, priority lists and surveys. For example, environmental officers showed community group members green lanes and management plans created in other cities of the world, to clarify expectations and risks. Analysis of design alternatives in relation to time, space, budget and legal factors helped all actors to understand the feasibility of design ideas and manage expectations. Environmental officers also reiterated the message that the project was a trial of an organisational change programme. By emphasising the collaborative nature of the project, environmental officers kept staff involved in the project focus on its main goal. Outcomes of surveys and discussions, as well as joint leadership, were useful in dealing with dominant individuals or actors who promoted only a single interest.

5. Discussion

The municipality behind our chosen case study project promotes programmes and actions in areas such as climate change, environmental planning, waste management and energy. In relation to water management, the organisation had established a water agenda comprising integrative and holistic strategies. The political institutionalisation of environmental concern, and the council’s local leadership in sustainable management (Brown 2008; Dollery et al. 2011), stand out as important enabling conditions during the preparation phase of the project. The municipality involved in this case study may be said to exhibit moderate levels of transdisciplinary practices, as it had created a network with research institutions to develop a water agenda, including water sensitive community and education programmes, which confirm the interest of the organisation in transdisciplinary collaboration and commitment to community expectations (Brown 2008; Morison 2009).

In this context, a window of opportunity emerged with enabling conditions such as awareness of a problem and identification of possible solutions that were supported by the political context (Kingdon 1995; Olsson et al. 2006). The window of opportunity originally emerged...
from a complaint and proposal related to an environmental problem, confirming awareness and interest from the community. A possible solution for the environmental problem was to apply water sensitive design through participatory processes. The political climate supported this solution, since senior managers were interested in implementing an organisational change programme for holistic, integrative and multifunctional approaches. This organisation’s interest might be linked to the desire of municipalities in Australia to increase their economic efficiency, generate cost savings, and expand and improve their service to the community (Dollery et al. 2006). Decision-making processes involving community might favour new knowledge, which can contribute to organisational change as well (Boxelaar 2004).

The project’s window of opportunity opened up the possibility to use financial sources such as property taxes, fees and charges for services, grants from higher tiers of government and developer charges (Allan et al. 2006). In this case, the financial sources were a rainwater tank incentive scheme, a stormwater management service charge, and money raised through negotiation with the developer and from a local politician’s agenda. For these reasons, the budget was independent of the capital project budget. Importantly, these financial sources provided the freedom, flexibility and openness to innovation that were needed to apply transdisciplinary practices in the different phases – which differs markedly from other projects that have scarce resources or are dependent on fixed timetables and formal procedural steps within an organisation (Mollinga 2010).

And yet, despite the numerous advantages of this project, it is questionable to what extent its success was defined by transdisciplinary practices. After all, the planning of the project involved only a small percentage of the community, and few actors from the private and public sectors. Should we speak of ‘weak transdisciplinarity’ in our case study’s planning phase? It seems so: for when actors are underrepresented, when disciplinary boundaries are rarely crossed, and when only one view of reality is recognised (not multiple perceptions thereof), then these are signals of weak transdisciplinarity (Max-Neef 2005; Lang et al. 2012). In our case study, the project team did not necessarily cross-disciplinary boundaries during activities related to creating, synthesising, translating or mobilising knowledge (Daniell et al. 2010; Elliott 2011).

A clear – and perhaps our case study’s strongest – example of transdisciplinary practice can be found during the project’s design. While the number of different actors involved might be deemed low, we note that all participants continuously interacted to discuss alternatives and find a common vision for the design of the lane. This on-going interaction may be said to have diminished disciplinary boundaries, enabling all participants to learn about urban water design, and to understand others’ perspectives. Similar transdisciplinary practices have been developed in participatory processes in Queensland, Australia. The creative design process among diverse professionals and actors can offer collective learning and encourage the emergence of natural leaders, stakeholder appropriation (where participants take ownership of the process), and skills transferral (Lawrence et al. 2000; Daniell et al. 2010).

How can we explain that – after such strong transdisciplinary practice during the project’s design – ‘only’ multidisciplinary and monodisciplinary practices were applied during the implementation and maintenance of the project? We suggest that this is due to the fact that multidisciplinary approaches are typical in municipalities in Australia, where project teams disperse after reaching an agreement on actions to be taken. Further, project implementation and maintenance also demand expertise and specific skills that are only available
Through multidisciplinary and monodisciplinary practices (Edwards et al. 2007; Daniell et al. 2010)

During the transition phase, these disciplinary dynamics may have helped practitioners to manage different socio-institutional barriers and changing conditions without losing momentum (Olsson et al. 2006). Specific socio-institutional barriers to transdisciplinary practice identified in our case study project were: lack of clear processes and coordination, no principal manager leading all processes, fear of failure, and risks of the municipality working with the community. Further, we identified a lack of training of some staff in transdisciplinary processes, high levels of expectations and strong personalities in the community group, excessive bureaucracy or adherence to official rules, and a lack of trust and confidence between staff. These results are consistent with previous studies (Dewulf et al. 2007; Farrelly & Brown 2008), which point to socio-institutional barriers such as insufficient legitimacy of actors, discontinuous participation, fear of failure, vagueness and ambiguity of results, communication and coordination problems, misunderstandings, and mismatched expectations. Others similarly noted that practitioners from municipalities of New South Wales faced constraints such as the lack of staff capacity and high staff turnover, competing priorities, and difficulty dealing with government agencies (Pillora et al. 2009).

We suggest that practitioners need to apply particular strategies to deal with these socio-institutional barriers in a way that differs from their normal, day-to-day practice. Among these strategies is their capacity to understand the political nature of the organisation involved, and to use that knowledge to their advantage. For instance, the community leader knew how the local government organisation worked, which enabled him to approach the local politician. The politician decided to support the community leader. This finding is in line with the study of Morison (2009) that confirmed how local politicians acknowledged the community’s environmentalism and assisted its environmental initiatives. The use of policies, programmes, academic research and partnerships by practitioners to increase support of senior managers, elected officials and decision-makers is consistent with the data obtained by Brouwer (2015). Similarly, in our case study the creation of the risk management plan to work with the community reduced the likelihood of the project being rejected or funds being redirected to other goals. This risk management plan can be compared to operating manuals for recreation or community facilities managed by community volunteers or delegated authorities in municipalities of New South Wales (Dollery et al. 2014). The requirement for the community to be legally formalised in a group is also an accepted protocol for improving decision-making transparency and avoiding actors’ disappointment or disempowerment (Barreteau et al. 2010; Daniell et al. 2010).

Commonly, researchers apply methods called actor analyses to understand the nature of actors and their communication styles (Titz & Döll 2009). The practitioners involved in our case study project did not apply actor analyses. But they used demographic studies, workshops, surveys, and direct interaction to understand the actors’ motivations, and transfer knowledge and ideas in different communication styles, facilitating dialogue and agreement on the vision for the urban space. It is possible that these strategies facilitate communication and develop shared concepts while minimising conflicts and disciplinary boundaries (Attwater et al. 2005).

Practitioners managed risks and expectations through discussions, priority lists, surveys, examples of previous projects implemented in other cities, joint leadership, and the consistent message that the project was a trial of an organisational change programme in this
way, staff and community could work more flexibly, and better manage the risks associated with this innovative project. According to Ryan (2014), municipalities need to be transparent and clear about what community expectations they can and cannot meet. In this context, it is important that practitioners proactively maintain a clear purpose for the project to avoid the dominance of strong personalities, single interests and divergent objectives (Dewulf et al. 2007; Daniell et al. 2010; Lang et al. 2012).

The outcomes of this study are an evidence-based response to the call for transdisciplinary processes in the delivery of multifunctional landscapes, showing that the success of projects delivering multifunctional landscapes does not only depend on transdisciplinary practices. Other disciplinary approaches play a role as well. As a dynamic process, none of the disciplinary dynamics is better than another; all disciplinary approaches fulfil specific needs and complement each other. It seems that a consensus in the planning and design of projects delivering multifunctional landscapes may be sufficient to create outcomes otherwise generated by transdisciplinary practice. If the level of complexity in decision-making processes is low, implementation and maintenance activities can be developed through monodisciplinary and multidisciplinary approaches, which are common in municipalities. However, when transdisciplinary practices are absent during project implementation and maintenance, there may be the risk of poor communication and coordination so typical of monodisciplinary and multidisciplinary practices. This lack of communication and coordination can lead to dissatisfaction among the local community and practitioners, who spent time and resources during project planning and design, and contribute to mistakes in delivering efficient multifunctional landscapes in cities. One solution could be the assessment and oversight of the work of multidisciplinary and monodisciplinary teams by members of transdisciplinary teams involved in the planning and design of the project, to ensure it delivers the intended multifunctional landscapes.

The tentative explanatory framework contributes to the transdisciplinary research group interested in tools and frameworks explaining transdisciplinary processes. It demonstrates the application of transdisciplinarity at municipal level, addressing research gaps in such areas as process management, organisational change and team dynamics in local contexts. The tentative framework highlights key factors, conditions and processes that municipalities and local community groups need to be aware of to overcome social and institutional barriers and develop these projects together. Additionally, it describes roles and characteristics of transdisciplinary teams and features of monodisciplinary, interdisciplinary and multidisciplinary practices in regard to team dynamics.

6. Conclusion

The main goal of our case study was to understand how a municipality in Sydney, Australia, successfully realised a project delivering multifunctional landscapes, and what role transdisciplinary practice played in that success. For this purpose, we created a tentative explanatory framework comprising enabling conditions, disciplinary dynamics, and strategies applied by practitioners to bring actors together. We observed a range of enabling conditions during the preparation phase: namely, the political institutionalisation of environmental concern, local leadership in sustainable management, environmental awareness by a community group, an organisational change programme focused on integrative, holistic and multifunctional approaches to a project developed by the municipality, and financial
independence from the capital budget, allowing sufficient time and flexibility to work with the community group in the different phases of the project.

Transdisciplinary practice had a role in the planning and design of the project, but not necessarily thereafter as multidisciplinary and monodisciplinary practices were applied in the implementation and maintenance. Different strategies were used by practitioners to overcome socio-institutional barriers and facilitate transdisciplinary practices, such as applying knowledge of how the municipality uses different communication styles to transfer ideas and manage actors’ expectations and risks.

The empirical evidence displayed in our tentative explanatory framework is relevant for academics and practitioners. For academics, the framework demonstrates that transdisciplinary practice is not essential at every stage of a project for the successful delivery of multifunctional landscapes. In addition, the study increases knowledge on process management, team dynamics and organisational change. It offers insight into the strategies and diversity of team dynamics that can be established in projects delivering multifunctional landscapes. Practitioners can use the tentative explanatory framework as a guideline to design and implement projects delivering multifunctional landscapes with the active participation of local communities. It highlights the key factors, skills and processes that organisations and practitioners need to be aware of in order to develop these projects. In addition, the framework and the analysis of this study help practitioners to assess their own work and define what did or did not work in a project to support better outcomes in future projects.

Ultimately, we need more case study analyses of transdisciplinary practice in projects delivering multiple outcomes to draw out lessons for other practitioners and to verify just what role transdisciplinarity plays in the creation of multifunctional landscapes in our current and future cities. This study is limited to one case study in a single sector and geographical context it was not possible to compare data due to lack of studies analysing multifunctional projects in other entities, sectors or geographical contexts, which could give insight into important factors linked with transdisciplinary practice. Therefore, further research could evaluate and test the tentative framework in projects delivering multifunctional landscapes executed by other public entities, private organisations or a combination of both in the same or different geographical contexts. Furthermore, future research could analyse projects in multiple sectors, such as water, health or energy, to understand the different roles and the applicability of transdisciplinarity in practice.

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