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Reflections on citizen-technical dialogue as part of cycling-inclusive planning in Santiago, Chile

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ABSTRACT

Cycling-inclusive urban planning is attracting worldwide attention as cycling has demonstrated its potential for contributing to resolving not only mobility but also diverse issues of social concern (health and physical activity, urban congestion and pollution), amidst the challenges of global warming and the need to define more equitable ways of organizing urban systems, to mitigate the impacts of segregation, discrimination and other factors contributing to exclusion and vulnerability.

In recent years these converging interests, which involve academics, politicians and planners, private sector actors and citizens as individuals and as organized groups (civil society), have stimulated a growing body of experience and substantial evidence on what measures may contribute the most to progress. Today, we know a great deal about the elements that make a city more sustainable. We know less, however, about the *processes* whereby cities, regions and countries move forward effectively. Applying specific measures often involves contextual factors that are less understood, particularly those arising from local cultures that reflect professional skills and user behaviour, and the institutional arrangements that define their interactions.

In this paper, we examine the experience and results from a project conducted by a university team that partnered with an advanced citizen group in Santiago, Chile, as part of a key phase in a multi-year process of change. Interest arose in response to local advocacy and was significantly mobilized through a three-year collaborative planning process led by the regional government and citizens' groups, with technical assistance from Dutch experts. The experience discussed here reveals that it was the ongoing iterations between different kinds of technical and non-technical actors and the resulting blend of urban expertise that drove the process forward, leading to systemic changes in both planning and city spheres.

1. Introduction: critical steps toward achieving sustainable cities

> *The very old saying 'you can take a horse to water but you can't make it drink' must have been coined by people at the sharp end of sustainable transport. Globally we are drowning in excellent material. [We know plenty about] how to produce huge gains for quality of life, health, community, air quality, poverty and accessibility, reduce death and injury on the roads and create lively, viable communities. All these topics have been covered in detail in our last 20 years. The reality is we are just not doing it.*

John Whitelegg, editorial, World Transport Policy & Practice (2014).

Our rapidly urbanizing world faces substantial challenges from diverse sources, many related to environmental, social and economic limits first argued in the 1970s (Meadows, Meadows, & Randers, 1992). In most cities, transportation is a major polluter of air and water, as well as generating 20–25% of greenhouse gases, social and health inequities, and other costs, which worsen with economic growth. Meanwhile, potential energy failures, fires and the wildly fluctuating costs of fossil fuels, along with risks inherent in pandemics expected to accompany global warming and other major changes in the biosphere, threaten mass transport systems.

In recent decades, citizens and experts in regional and transport planning have identified crucial ingredients for more sustainable transport systems but, as Whitelegg's heartfelt comment quoted above indicates, achieving the necessary shifts has brought more frustration than celebration to date. Undermining progress are institutional silos in the governance sphere and research/practice

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silos in the technical and academic fields (Low & Gleeson, 2003). The "what" is often confused with the "how" in the sense that many believe that identifying ways of reducing emissions (public transport, electric cars) and/or encouraging modal shifts favouring more active transport (cycling and walking) should convince politicians and the public of their virtues, and thereby induce change.

Far from being linear, however, change is a complex process that requires navigating and reworking behavioural and institutional environments that are both shaped by and tend to reproduce existing conditions and lessons from a past that may be very different from the future. This has been explored in some depth by Kingdon (2003) in the policy sphere, Friedmann (2011), Innes and Booher (2010) and de Roo and Silva, 2010 in the planning sphere and, in the case of transportation, by Banister (2005), Low and Gleeson (2003) and Ortúzar and Willumsen (2011) with their call for a continuous planning framework, among others.

In practice, the lack of a clear approach to the "how" has brought on-going conflicts over major projects involving the car-centred focus embedded in highways and concessions, the bus-centred requirements for more space of Bus Rapid Transit (BRT) systems, or the demands of cyclists and other interested parties for more cycle-friendly cities. Sometimes, these conflicts open the way to change. Often, however, they increase costs, slow or stymy progress toward greater sustainability, and even undermine citizens' confidence in their governments, institutions, and democracy itself. This reality reflects a failure to address underlying causes, foster crucial debates, and thereby build the "foundational consensuses" necessary to support diverse measures that together constitute significant improvements to the way people and communities live together.

Current planning theory, meanwhile, underlines the importance of collaborative processes that bring in key actors representative of diverse players, particularly different scales of government and citizens, to find "better ways of living together" (Healey, 2006). Collaboration among diverse, interdependent actors, through fruitful dialogue or deliberation has proven crucial to successful innovation in complex rural and urban settings (Innes & Booher, 2010). In the case of transport, the goal of participation is to have up-to-the-minute insight into how people think and feel about transport, cities and sustainability, as well as generating co-responsible attitudes, "buy-in", and foundational consensuses sufficient to support the debates and costs of change (Bickerstaff, Tolley, & Walker, 2002; Giering, 2011; Innes & Booher, 2000). A major challenge along the way, particularly in recently democratizing countries such as those of Latin America, has been finding ways to breech the gap between citizens' practical knowledge and the specialists who spend years training away emotions and perceptions to achieve knowledge that is considered pristine and "objective". In previous articles we have explored the role of conflict in producing citizen learning (Sagaris, 2010) and diverse ecologies of citizen and government actors (Sagaris, 2014) to progress toward more sustainable transport and planning practice in real cities. Cycling, which is enjoying a comeback after 30 years of relegation to the back burner as a transport mode, offers particularly rich lessons (Sagaris, 2015).

This paper focuses on a specific moment (2010–2011) within a collaborative planning process, which brought together citizens' experiential and engineers' technical knowledge to drive forward a cycling-inclusive planning process, in Santiago, Chile. The process achieved significant results in a relatively short period of time, summarized below, inviting a reflection on what elements made this possible. Moreover, it is worth examining whether there are any lessons that could be useful to planners, citizens and engineers grappling with similar challenges in different places.

The next section summarizes methods, followed by a narrative characterizing the Santiago process. Section 4 presents and reflects on the results of a project that can be considered part of this process, in which citizens worked with a university-based technical team on a government-tendered contract. Section 5 examines some final conclusions and possibilities for future experimentation through community-based research.

2. Qualitative methods and a narrative-based presentation of data

This is primarily a reflection on the apparent serendipity of a complex rather than linear planning process that has brought significant change to the metropolitan region of Santiago de Chile. Both authors pioneered consideration of cycling as crucial to sustainability in Chile, one from his perspective as a transport academic and the other from her perspective, first as leader of grassroots citizen organizations (1993–2010) and, more recently, as a post-doctoral researcher in planning (2013-present).

For this paper we examine the sequence of events that allowed cycling to shift from an identity as an obsolete ride for poor, marginalized men to a trendy, healthy and inclusive way of getting about town for men and a growing percentage of women. This shift was achieved in a remarkably short period of time, the six years between 2007 and 2012.

We use a narrative structure to capture the complexity of this process (Uprichard & Byrne, 2006) and follow Byrne's perspective on coming at causality backwards (Byrne, 2011), that is, seeking to identify the key elements that drove the system, through reflection and examination of events with the benefit of hindsight. The intention here is not to find a universal law applicable in every context, but rather to identify *possible interactions that made significant change possible* and measurable in the relatively short period of six years.

In particular, we are interested in how diverse actors managed to build a clumsy but reasonably effective interface between citizens' experiential knowledge and the technical knowledge of university trained experts, particularly civil engineers. This was far from a clean, happy process, and it involved many implicit and some explicit clashes. Partly, these dynamics reflected what Dutch cycle planning expert Godefrooij (2008) identified as the difference between project-based and process-based planning (Table 1), with engineers tending to treat planning as the cumulative effect of specific projects.

This gap between project-centred and process-centred approaches reflects a fundamental difference in world views, discussed by Phelan (1999) in an insightful article. There he examines the contrasts and similarities between systems theory and thinking about chaos and complexity. Although there is "a high degree of commensurability between the two theories" closer examination reveals shared terms, but the two "differ markedly in their research agenda and methodologies" (Phelan, 1999, p. 237).

The prime differences between these two world views, sometimes called "hard" versus "soft" system methodologies (Checkland, 2000), include their purpose, "positionality[1]" and resulting methods. Systems theory, as applied in engineering, follows Phelan's observations, in that it tends to focus on *prediction*

[1] *Positionality* is defined in sociology as important aspects of our identity such as gender, race, class and age that are markers of relational positions rather than essential qualities. Anthropology, meanwhile, has developed specific methods for encompassing diverse positionalities of researchers with regard to their subject matter, including "participant-observers" and, more recently, "observing participants".

Table 1
Projects and processes compared.

Project-focus	*Process-focus*
Focus on projects and implementation	Seeks the optimum, the "best" solution
Seeks a known result, within a given timeframe	*Results uncertain*
Tries to control people	Tries to involve people
Inflexible, linear process	*Original concepts may change*
Based on technical expertise	Circular ("iterative" process) enriches knowledge base and ensures ongoing feedback and adjustment
Doesn't produce greater learning, or identify learning for the future	Participants learn/teach and build new goals together
RISK: Obsolete by the time it's completed build support	RISK: Endless conversation.

Source: Godefrooij (2008).

and control for the purpose of problem-solving. Complexity theory seeks to resolve problems too, but using a more *open-ended*, *exploratory approach*.

Systems theory attempts to define and explain systems with a large number of parts (or agents) and interactions, whereas complexity theory examines "something that *emerges* when several agents follow simple rules" (Phelan, 1999, p. 239). He uses the example of "Boids", an animated film capturing the complex soaring, diving and curving progress of a flock of birds across the sky, using just three simple rules (Reynolds, 1987). Byrne (2001) uses the epidemic of "Black Death", which reshaped Europe in the middle ages, as a similar catalyst that profoundly changed the whole complex system of land use, tenancy, work and social relations. For this study, we see these two perspectives as complementary, even where they may produce conflicting results. While they cannot simply be combined into a single language or worldview, we find the typologies developed by Walker and Salt (2006), to distinguish between complicated and complex systems (Table 2), help to work between and get the best from both. In other words, they do not eliminate the gap between "hard" and "soft", but they do identify the two entities between which we must bridge.

Being able to navigate both approaches, as we attempt to understand and plan the complex realities of city and regional planning, can help overcome the limitations of each. For example, the "machine" metaphor that prevails in the *complicated* system approach leads the media and politicians to understand congestion as a phenomenon that threatens the whole city-system with *collapse*. This has led to the building of more infrastructure for cars, which quickly becomes saturated and then requires more building, a feedback loop that ultimately creates more car use, congestion, pollution, in other words, worsening the original problem.

Approaching the issue from a *complex* perspective, which views the city as an open adaptive system (Gunderson & Holling, 2002), suggests that an increasingly rigid condition (like congestion) can trigger conflict and crisis (chaos) to the point where a substantial *reorganization* takes place, the result of radically different interactions among system components. This can help to understand why replacing the Cheong Gye Cheon elevated freeway in Korea with a park (Kang & Cervero, 2009) became an effective long-term solution not only to congestion, but also in response to other needs within the system, particularly for natural areas vital to health and sociability.

In the Santiago case, this bridging process was largely unconscious, fraught with misunderstandings and "errors". It was highly unusual for consultants to include citizens from non-governmental organizations in their team. This innovation reflected long-standing relationships born during an anti-highway conflict and maintained as the citizens' group, Living City, and the transport academics, continued to evolve along separate but complementary paths. Personal relations were as important as institutional collaboration, and in this case the two combined to generate a significant bridging between technical and experiential knowledge, that favoured the general process of change toward greater sustainability.

In retrospect, and particularly when examining specific indicators for progress on cycle inclusion, we can see that this collaboration, as part of a larger participatory process, was remarkably effective, generating moments of validation amongst citizen organizations, technical staff, university researchers and politicians, that ultimately made innovation reasonably low risk. This article, therefore, reflects on what elements made this possible and considers what lessons could be useful to planners, citizens and engineers grappling with similar challenges in different places.

One final ingredient in understanding this process required going beyond the traditional research stance of engineering, which works within the paradigm of an objective, measurable world observed by an independent third-party, using a strategy that attempts to eliminate the messiness of emotion and happenstance through statistical procedures. These are the mathematical equivalent of generating a sterile laboratory that will allow us to isolate and identify linear causal relationships, an approach that works for many complicated problems.

But where human and other living beings are involved, we found that methods to identify and understand multiple positionalities from the social sciences were also crucial (Cilliers, 2005; Stacey & Griffin, 2005). In this sense, we found it useful to consider the city a "living laboratory" (Evans & Karvonen, 2011), full of surprises, where new entities (or consensuses) can emerge that are not predictable if we only look at individual components. Evans and Karvonen (2011, pp. 127–128) cite several paradigmatic cases of early field biologists (among them Charles Darwin, who called the Galapagos a living laboratory) and pioneers in population biology whose work in the field made it possible to establish the "bedrock of modern ecology: ecosystems".

Table 2
Complicated and complex compared.

	Complicated	Complex
Nature of system	Closed system: relatively predictable	Open system: as subsystems merge, unpredictable new entities and conditions emerge
Central metaphor	A machine that collapses if not properly maintained	An ecology composed of living and non-living actors, which reorganizes under stress
Causality	Mainly linear, single cause-single effect	Complex causality, multiple factors, multiple effects
Moving the system	Involves input–output models	Two or three key interactions can move the whole system
Scales	Separate scales, like staircases	"Nested" scales or panarchies, with immediate direct communication between each
Research positionality	Third person, objective observer	Diverse positionalities (citizens, government planners, engineers, architects).
Research strategy	Objectification through laboratory approaches (modelling, etc.)	Real-life exploration in the "living laboratory" of the city-region

Source: Own elaboration, based on Holling (2001) and Gunderson and Holling (2002), Walker and Salt (2006) and Evans and Karvonen (2011).

From this perspective, it is helpful to move beyond "machine" to ecological metaphors that afford new understanding (Tippett, 2010). Living laboratories are messy, in both the academic and practical sense, blurring boundaries and "contaminating" the pristine setting with germs from the teeming swamps of real life. They are also, necessary for innovation, based on "sensing, testing and refining complex solutions in real-life contexts" (Evans & Karvonen, 2011, p. 128).

3. Santiago: citizen-driven changes to planning and city systems

Metropolitan Santiago is a city-region with a population of 6.5 million people, living in Chile's fertile central valley, between the coastal mountain range toward the west and The Andes to the east. As occurred elsewhere in Latin America, massive rural to urban migration began in the 1950s and today 40% of the population resides in this mostly urban region, which also produces 40% of Chile's GDP. The military regime's deliberate removal of poor Chileans from middle- and high-income neighbourhoods in the 1980s left the city extremely segregated (Sabatini, Wormald, Sierralta, & Peters, 2009), making travel to work or for other purposes complex and expensive for the majority.

Governance is extremely fragmented, among 52 municipal areas or *comunas*, each with its own elected mayor and city councillors, while the regional government (the equivalent of a state or provincial government elsewhere) is headed by a presidential appointee and has no real planning powers within the constitution inherited from the military regime (1973–1990). Civil society, badly damaged by massive human rights violations practiced by the regime, has emerged with considerable difficulty, under-skilled and under-funded, and typically excluded from planning decisions. Since the 2012 municipal elections, when citizen participation became a major slogan, engagement has become more common, but typically in the framework of paternalistic relations that severely limit the agenda and the activities subject to participation, along with its results.

In the late 1980s, a major advertising campaign ushered in what was to become Chile's version of "automobility" (Urry, 2004), car-centred urban planning. It ridiculed a young man travelling with considerable difficulty across the city by bike, to visit his sweetheart. It was so effective that it can still be seen on the Internet. Until 2007, the typical response to attempts to treat cycling as a serious transport mode was the laughing citation of the campaign's punch line … "Get yourself a car, buddy!"

Notwithstanding, the *Movimiento de Furiosos Ciclistas* (MFC, furious cyclists movement), modelled on Critical Mass cycle rides, which developed in San Francisco and New York, emerged in Santiago in 1997, organizing a monthly ride through the city centre to demand better conditions for cyclists. Inspired by Forester (2012), they advocated treating cyclists as ordinary road vehicles, promoting primarily "road warrior" behaviour, emulating New York cycle messenger culture, which has had a major influence on advocacy in many cities. Their relationships with political authorities tended to swing between highly oppositional or clientelistic stances that allowed some leaders to pursue careers in government.

By the early 2000s, two pioneering municipalities had, nevertheless, begun to experiment with specialized cycle-ways, on-road (Santiago) and on-sidewalks and in parks (Providencia). Global Environmental Facility funding brought some increased interest, but this was side-lined amidst the challenges of a major renovation of the city's bus system, in 2007, which was so fraught with problems that it almost brought down the national government (Muñoz, Ortúzar, & Gschwender, 2009).

Interest in cycling continued to germinate, however, and new citizens' groups emerged with more diverse memberships and more sophisticated ideas about how to improve cycling culture. These included *Macleta*, a women's cycling group, which brought in mostly young, middle class professional women; the *Bicicultura* centre, which produced major arts and cultural events focused on cycling; *CicloRecreovia*, a husband-and-wife partnership working to create open streets initiatives modelled on Bogotá's successful walking and cycling Sundays; and the Living City neighbourhood coalition. This last was a metropolitan-level citizens' organization with strong roots in neighbourhood and market organizations in the city's historic centre on the "other" side of the Mapocho River. Living City was forged through an anti-highway conflict and went on to develop "citizen-led urban planning" initiatives, based on an empowered vision of participation as collaboration among equals from the citizen and public sectors.

Amidst fierce opposition and slander campaigns from a small coterie of MFC leaders, these new groups formed United Cyclists of Chile (CUCH, *Ciclistas Unidos de Chile*), determined to generate a friendly space for collaboration to move ahead on a pro-cycling agenda. In 2007, this came to fruition when Living City was able to broker a technical assistance agreement between the regional government and a Dutch NGO, Interface for Cycling Expertise, I-CE. After a successful first round of projects in development countries, I-CE was just beginning a new three-year initiative to take Dutch expertise to cities in Latin America, India and Africa.

Together, CUCH leaders, the national transport authorities and the regional government designed a collaborative process to improve conditions for cycling. This took the form of several commissions, one of which focused on updating and improving Santiago's cycling master plan (Ortúzar, Iacobelli, & Valeze, 2000). Developed in the 1990s by a consultancy project, the plan was unknown outside a restricted government circle and had never seen implementation. This commission coordinated several small working groups (15–25 people) who focused on (i) defining technical standards for Chile, (ii) improving coordination within the different government bodies involved in cycle-related planning, (iii) fostering behavioural change and other elements. A plenary roundtable became the way proposals from the different groups were validated by citizens, political leaders and technical staff alike.

In addition, each year, ten days of training brought Dutch know-how to a diverse set of interested professionals and citizen groups. Training activities ranged from formal lectures to on-street audits and other participatory activities, along with intense workshops to improve specific plans and designs under development by selected municipalities. Altogether these activities built trust and improved cooperation between citizens and planners, struggling with many institutional limitations.

The Citizen-Government Roundtable for Cycle-Inclusion, as the process became known, was complemented by significant progress in major events (*Bicicultura* Festivals), a women's cycling school developed by Living City and the Macletas, and the first open streets initiatives in the San Bernardo and Las Condes municipalities. Although most of the work was done by small groups of 8–15 people, and through plenaries involving 80–100, altogether, the three-year process drew in over 1500 people, each embedded in their own municipal, political, territorial, citizen, professional networks, thereby influencing a substantial swathe of public and elite opinion (Sagaris, 2015).

Its main achievements, in the short run, included brokering an agreement between the ministries of public works, transport and housing to create a US$ 49 million fund for specialized cycle facilities; the first efforts to rewrite national road design standards to incorporate bicycles and tricycles; new funding for cycle promotion campaigns; and other related activities. Above all, a participatory

action research approach, validated by the roundtable plenary, was able to update and build substantial support for a cycling master plan, which was elevated to the status of an official project as part of Chile's bicentennial celebrations (Sagaris & Olivo, 2010).

In the ensuing years, these achievements in the planning sphere began to produce substantial changes in the city's streetscape. In six years (2007–2012), the city: quadrupled the provision of cycle facilities (quality remained poor) from under 50 to almost 200 km, turned cycling from a poor man's antiquated ride into the trendy way to get around, brought in recyclers and tricycle users, established a safe cycling handbook, and standards for design, based on Dutch and other international standards. In 2015, the housing ministry officially approved new guidelines for designing diverse on-road cycling facilities, intersection treatments and other key elements, to achieve better cycle routes and cycle-inclusion (the Dutch concept). Cycling's modal share went from less than 2% (2006) to over 4% (2012), the number of cyclists on the main routes is rising 20–25% yearly according to counts (UyT and Ciudad Viva, 2012), two national presidents have maintained cycling as a national priority, and high standard facilities and networks are now being planned for cities all over the country.

Women have gone from 10% to 20% or more of cyclists (depending on the route). The city's open streets initiative, *CicloRecreovía* has taken off, with almost 60 km of car-free space for cycling, walking and other activities, every Sunday. A newly inaugurated public bikes system in 14 municipalities has been very well received, and bus operators are developing a pilot experience to put bike racks on buses, as they now do routinely in North American agencies.

Santiago is hardly a cycling Mecca as yet, but few cities have achieved this level of progress in such a short period of time. Santiago's success occurred during a period when the public transport system almost collapsed, car use soared (although it now seems to have peaked) and most transport investment went to highways and the Metro (underground train system).

Among the elements that contributed to this success was a contract tendered by the national government in 2009–2010, which involved an innovative model of citizen-technical cooperation. While far from straightforward, the results of that contract, discussed in the next section, made a substantial contribution to the overall progress of cycling in Santiago.

4. Living City-DICTUC: building an interface between experiential and technical knowledge

As occurs elsewhere, in neoliberal Chile outsourcing major studies and engineering work is a common practice. This has made the participation of organized citizen groups in major initiatives by government extremely difficult, in a context in which consultants' salaries are fairly high, participation is not well understood, and no resources are supplied to support and build participation. In practice, this has led to a situation in which citizens find themselves sacrificing what little spare time they have to work *ad honorem* for well-paid consultants, a situation that quickly led to frustration, conflict and participation "fatigue". It has also hampered the development of more robust, technically competent citizens' organizations, a serious barrier to progress. A broad social movement demanding action to stop the high toll in deaths and disability caused by the growing use of cars in the 1970s, for example, catalysed the Dutch success with cycle-inclusion. In the ensuing decades, local, provincial and national organizations of cyclists carried on the efforts for change. Their leaders acquired training, became technical staff or politicians and, in general, pushed society into the level of cycle use considered typically Dutch today (Buis, 2012).

Meanwhile, once it had built consensus regarding the cycling master plan, Santiago's cycling roundtable needed to move ahead. In Chile's highly technical planning environment, this required additional validation, from a "technical" community of professionals, particularly from engineering, and new kinds of data that went beyond the scope of the participatory process. To achieve this new input into the process, the national transport ministry tendered a study, hiring a consortium composed of Living City and DICTUC, the consultancy hand of the engineering faculty at Pontificia Universidad Catolica de Chile, a highly respected university throughout Latin America.

For those involved it was a rather bizarre experience, marked by the contrasts between project-centred and process-centred approaches and soft and hard systems, discussed above. The engineers on the team, for example, were accustomed to short meetings, where tasks were assigned, decisions made and everyone went off to do their part. The citizen representatives were accustomed to deliberative processes, involving trust- and consensus-building, and on-going communication to develop common positions, despite starting differences. Throughout the two-year consultancy, the partners alternated between these different approaches. Deliberation was strongest during the early phases, to define the kinds and characteristics of cycling facilities. As engineering results became the focus, the citizen professionals no longer participated, and the final report was entirely written by the DICTUC part of the team.

The four main tasks commissioned by the government were an international study of best practices in cycle-planning and design worldwide (Living City); a Santiago study (DICTUC), to identify current practices by as many as possible of the 52 local governments in metropolitan Santiago; an inventory of the number and quality of existing cycle facilities (DICTUC-Geography); and a set of proposals to government (DICTUC). The government expected the consultancy to produce the complete engineering studies for 10 km of cycle-way, to new standards, yet to be defined. This last task proved impossible for the resources available, and was replaced by the proposal of a method for evaluating and establishing priorities for planning these facilities, summarized below.

A dispute between the consultancy and the government arose during the latter half of the contract, with the resulting final contract focusing on a proposal for a method to identify priorities for cycling infrastructure development. The international and Santiago components of the study were never published, and the detailed GIS inventory of cycle facilities, which was supposed to have become available on-line, was shelved. Thus, although the contract was completed, results were not shared with participants in the Roundtable process. Nor were they clear to the consultants. Moreover, in 2010, a new government representing conservative parties replaced the centre-left coalition government that had supported the original Roundtable. Although Living City managed to ensure that study results were presented to a "plenary", in fact, the new government limited attendance and hence diffusion of the studies. Notwithstanding, as the following sections reveal, the tasks carried out in these far from ideal circumstances did in fact significantly influence progress toward improved conditions for cycling.

4.1. The international study

The international study, carried out by Living City during the early months of the consultancy, provided an overview of best practices worldwide, focusing on the Netherlands, Denmark, the US, Canada and the UK, as documented in the literature. This information was complemented by experience from field visits, carried out as part of other activities, beyond the scope of the contract.

While the engineers in the project wanted information on infrastructure specifications, Living City insisted on including information about governance arrangements, relevant institutions, planning procedures, and some behavioural change methods. Thus, along with identifying and classifying a long list of diverse measures for urban improvements, education and behavioural change, it also presented information on planning processes, implementation and evaluation, particularly the key components in master plans, and crucial institutional arrangements that have allowed cities to advance.

Table 3 summarizes the recommendations in the international report and the results in succeeding years. While movement was far from steady and linear, significant progress and even some breakthroughs did occur. In particular, after years of debate and delays, new national standards for cycling infrastructure were finally approved, a process that began with guidelines developed by the transport planning body, SECTRA (www.sectra.cl), in 2010, and culminated in a new document, prepared by the housing ministry with participation from citizen groups, finally approved in 2015.

These new guidelines are expected to significantly improve on the previous system, which saw an office within the housing ministry in charge of approving (and often designing) cycling infrastructure, although its professionals had no experience with or formal qualifications in this area. This had led to cycleways that look more like Olympian slaloms as they curved around posts and trees, crossed busy thoroughfares with no warning, ducked under trees, and squeezed pedestrians on narrow sidewalks rather than allowing cyclists to circulate safely on straight roads.

Staff responsible for cycling in the Chilean transport ministry have become increasingly expert in specific cycling-related and transport issues. At the municipal level, where much planning and design is carried out, highly sophisticated staff have now developed exemplary cycle facilities in both Santiago and Providencia. Other municipalities, with fewer resources, have also achieved significant progress. Intersections remain a major challenge, with few suitable solutions apparent, although the new standards reflect a growing understanding that these are vital for safety and other reasons.

One of the curiosities of the governance system inherited from the military regime is that the national transport, housing and public works ministries essentially make all major decisions regarding Santiago's transport system. This makes planning top-heavy and highly centralized. In this case it also meant that achievements in the country's capital became part of the presidential agenda. As a result, by 2014, the transport ministry had commissioned Cycling Master Plans, a crucial ingredient in achieving significant progress, for small and medium-sized cities throughout Chile.

How well these will reflect the needs and aspirations of each city remains questionable, though. Reports, in 2014, indicate that the participatory aspects of the Santiago Roundtable were ignored, as Santiago-based professionals developed plans without even consulting local planning departments or users. However, the third largest city in the country, Concepcion, has created its own cycling office, a significant step for a regional city.

The biggest limitation to progress today remains the amount of funding available for cycling infrastructure and the way it is assigned. Municipalities typically lead the design process but most have to apply for funding, which is allocated road section by road section, rather than as a coherent part of an integrated network. This is the equivalent of building a highway one km at a time, and going for years with no access-egress facilities or coherent connections to the rest of the transport system.

In the case of Chilean traffic legislation, another focus within the international study, the highly cyclical nature of urban planning decisions in Chile at the national level is apparent. The need for changes was first raised by advocates in the early 2000s, was taken up by national ministries and congress members in 2007, then chewed up and reduced to virtually no changes by the end of the first Bachelet government in 2010. The international study emphasized the importance of addressing key issues through traffic laws, and the final proposals (see below) provided an initial analysis of key legislation in Chile.

In 2013, cycling staff at the transport ministry commissioned a new study. Once again, they made the unusual decision of working with a team composed of a civil society (*Bicicultura*) organization and an engineering firm. This instance produced an in-depth analysis of international practices, national laws and other relevant legislation. The result was that in 2015, changes to the law have again been proposed and, after some hesitation by national authorities, include reducing maximum speeds in urban areas from 60 to 50 km/h.

Table 3
Main proposals and outcomes, international study.

	Recommendation	Result	Year
1	Application of urban design, behavioural and economic measures combined.	Innovation in urban design continues to date. Some behavioural measures (financing for civil society campaigns), no economic measures.	2007 onward
2	Design standards for cycle facilities.	New chapter for national roads design manual drafted by transport ministry, but rejected by housing ministry.	2010
		New guidelines drafted and approved by housing ministry.	2012–2015
3	Local and national staff specializing in cycle-related planning, with training and participation in relevant international meetings and events.	Transport ministry maintained single staff person until 2009, replaced with specialized staff person and assistants, with support for some professional conferences (VeloCity Vancouver).	2012 onward
		Local staff at key municipalities developed some to considerable expertise, but housing ministry agency, with no training in this field, continued to approve cycle-designs.	Until 2014
4	Support for pro-cycling campaigns, especially those led by civil society groups.	New funding was created (until government changed in 2010), then reduced, has not been improved since.	Until 2010
5	Master Cycle Plans should be developed with on-going community input that include funding and planning of investment year by year.	Master Cycle Plans being developed by consultants, with little or no local participation, for towns and cities throughout Chile.	2014-present
		Funding is limited, not earmarked for strategic projects or scheduled to meet on-going targets.	To date
6	Cycle Plans should include a judicious combination of economic, behavioural and urban measures, with speed limits and legal responsibility for collisions being a key element.	New transport law study commissioned, late 2013, and amendments in this direction currently under discussion in government and congress.	Underway 2015

4.2. The Santiago study

The Santiago component of the consultancy (DICTUC and Ciudad Viva, 2012) identified six separate planning initiatives, starting in 1997, which attempted to define a plan, cycling safety measures, treatment of danger points, air quality, and improvements to operationalize the 2010 Master Plan.

Obtaining basic data to identify cycling-related measures already implemented or planned by the metropolitan region's 52 *comunas* proved a major challenge. Probably the most significant long-term result of this effort, which involved letters, e-mails and seemingly endless phone calls to municipal staff, was that today the transport ministry personnel responsible for cycling maintain an on-going inventory, with support from the regional government's environmental office.

The Santiago study obtained replies from 38 of the 52 municipalities, only two of which had any kind of plan for cycling infrastructure. Many, however, had some facilities, often only a few blocks long. Sometimes they reported cycling facilities by number and others by length. Since a single road might have several facilities, this became extremely confusing. Some municipalities provided detailed lists of plans for implementing individual road sections, but all were contingent on funding, mostly from the regional government's "national fund for regional development". The limitations inherent in the data and the enormous effort required to accumulate small amounts of data also made it difficult to compare demand for cycling, as expressed in municipal modal share figures, with the actual facilities available.

In retrospect, one of the most striking contradictions revealed by this process was the fact that the municipalities with the highest cycling modal share had no cycling infrastructure and, often, no plans to develop any. Similarly, the two municipalities with the most developed plans (Santiago and Providencia), had the lowest cycling modal shares. From a planning perspective, this seems backwards, but in fact, this paradox proved quite effective. Although their cycling modal share was fairly low, Santiago and Providencia are major urban centres and destinations for daily trips. Every day, Providencia, for example, with a population of some 125,000 people receives over one million visitors, who come for work, education and shopping.

Santiago is a low – to middle-income area, while Providencia is middle – to high-income. Providencia's cycleways showed many flaws to experienced cycle plan designers: for example, they were built on linear parks along busy city streets, and each block-length section ended in a brick wall, requiring cyclists to make two 90-degree manoeuvres within a 2-m radius to cross intersections. Nonetheless, their attractive landscaping and inclusion within or alongside parks brought out women cyclists in large numbers, most of them well-dressed professionals and housewives. This contributed to a new image to cycling as fashionable and upscale, making it attractive to upwardly mobile families striving to better their circumstances. Had these facilities been built in low-income areas, standards would have been lower and they would have been perceived as second-class solutions for the poor, leading to their rejection. Notwithstanding, the rather spotty information collected from this part of the study served as an important input for the GIS inventory, described in the next section.

4.3. The GIS inventory

In most English-speaking countries, geography is considered an integral part of planning and most universities locate their planning programs in their geography departments. In much of Latin America, however, geography is ignored when it comes to considering the disciplines relevant to urban and regional planning. This study did not radically change that perspective, but it did open the way to more collaboration between these relevant disciplines. Defining the criteria for assessing types of cycle infrastructure and their quality proved to be the most significant deliberative component to this consultancy, bringing the Living City citizen planners, fresh from field visits and three years of training with the Dutch specialists, together with the engineers and geographers working in this team.

The result was a significant consensus concerning the definitions of the different kinds of cycling infrastructure and the characteristics relevant to defining their quality. This was a major achievement given the very different perspectives of the citizen and engineering professionals participating in the project. These criteria, moreover, then became the basis for a complete inventory documenting the nature and quality of cycling infrastructure throughout the city. This data was collected and validated through field visits on bicycles and organized using GIS programs that associated location and status, using photographs, locational and other data (Fig. 1).

This approach revealed that several cycleways contemplated in some official documents did not actually exist and provided an exact number of cycling facilities, 191 km. Initially the government had committed to making this database available on-line, but this did not occur. Notwithstanding, the transport ministry maintains the inventory and makes it available on request.

4.4. Strategic proposal for new infrastructure

As mentioned in the introduction to this section, the project became embroiled in a dispute over the degree of detail expected for the proposal for new infrastructure. Moreover, in a city with fragments of cycle facilities scattered over hundreds of hectares of roads and neighbourhoods, trying to select just 10 "strategic" kilometres for intervention proved an impossible task. Should the area selected reflect high cycle use (the virtually invisible periphery of the city) or attempt an intervention in a high-profile sector where it would have considerable social (and probably political) impact? Should it attempt to rectify some of the worst barriers in the current network or correct specific points that were particularly dangerous? At this point, deliberations within the team began to go around in circles, reflecting the difficulties of the task and the fact that an adequate solution required broader debate and consultation and, indeed, more resources than those available for this relatively modest consultancy.

To resolve the issue, the engineers on the team took on the challenge of evaluating the network according to the inventory and the other available data and recommending a procedure for selecting priorities for future investment in infrastructure. Despite the conclusions from the international component of the consultancy, recommendations for complementary behavioural or economic measures were not considered or included in the final proposals to government. This failure to associate infrastructural and legal improvements with measures for behavioural change and economic incentives remains the Achilles' heel of planning for cycle-inclusion in Chile today.

Nonetheless, this component of the consultancy made some very important recommendations. These included identifying criteria for establishing a network of cycle facilities (a grid of facilities 1–4 km apart) and procedures for establishing and implementing the Santiago Master Plan. It also provided an analysis of the existing cycleways, identifying new infrastructure required for priority routes, complementary routes, new routes and connections among them. Using this network as their basis, they then proposed weighting demand, viability and strategic connectivity as key criteria for defining new cycle infrastructure projects (DICTUC-CV,

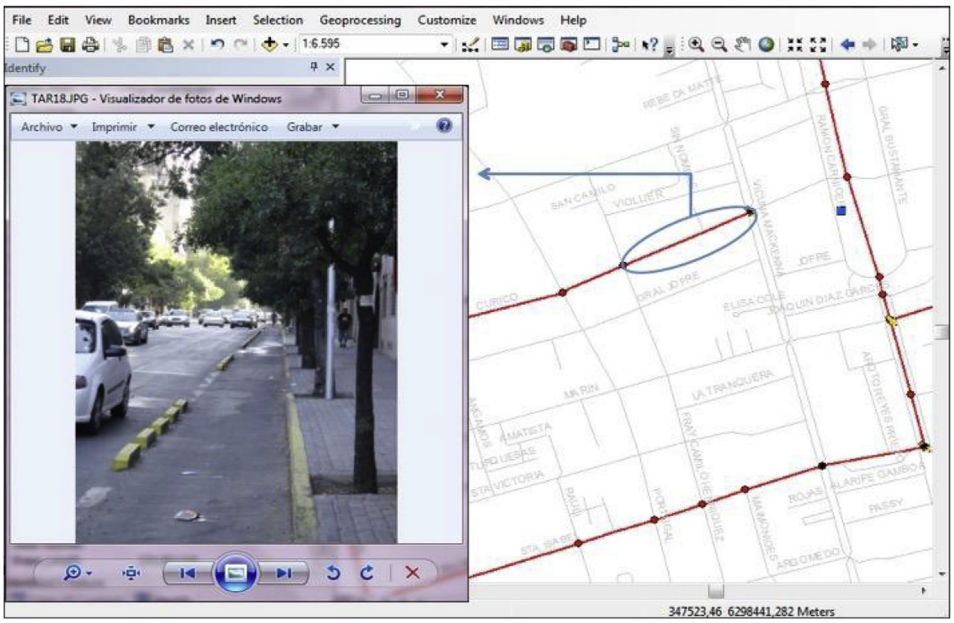

Fig. 1. An example of the data collected and presented by the geography team, which inventoried Santiago's cycle ways with geographical, photographic and other data providing a complete picture of the state of the system.

2012). The method developed based estimations of demand mainly on the frequency and severity of accidents affecting cyclists, ranking the municipal areas with the most severe problems, rather than examining modal shares and travel patterns for existing and potential cycling trips. Further criteria, for design, evaluated the contribution of potential new infrastructure for improving connectivity, hierarchy and network density (Fig. 2).

This component of the project underlines the usefulness of considering information generated by the participatory activities led by the cycling roundtable. In 2007–2008, Living City had developed a Green Map that included not only existing infrastructure but also real routes used by cyclists as they travelled through the city. Similarly, in 2009, a participatory mapping process brought in data from key informants in 22 municipalities with a particular interest in cycling. While not "hard", statistically valid data, these initiatives did provide important insights into how real users currently used the city, how they would like it to improve to better accommodate cycling, and how they perceived variables such as connectivity, coverage, the network and other factors related to strategic design (DICTUC-CV, 2012, p. 29). This information was compared to infrastructure projects provided by municipal governments, making it possible to identify considerable mismatch between actual usage/needs and current/planned infrastructure.

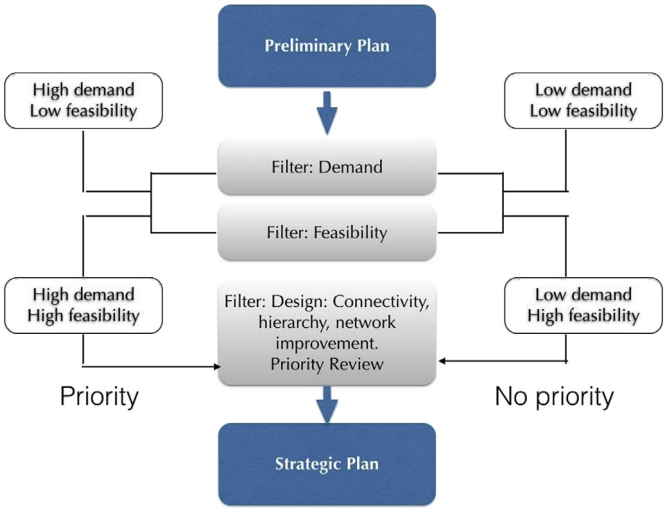

Fig. 2. The process developed to define priorities for cycle infrastructure development in a more orderly, logical fashion. A preliminary network plan goes through three "filters": demand, feasibility and design (connectivity). Each phase discards low demand, low feasibility options and makes high demand high feasibility options, high priority, while low demand – high feasibility options are not priorities. Altogether this process defines the strategic plan for cycling infrastructure development.

The final report of the consultancy concludes by noting that while this method provides insight into current demand as it relates to current plans for infrastructure, it does not consider potential demand, which will materialize as the network matures and consolidates. It therefore recommends further processes of consultation and participation to bring in estimations and perceptions of municipal planners, current and potential users.

Perhaps the most significant contribution from this report was that it adopted and adapted, from a Chilean perspective, the concept of "cycle-inclusion" that was central to the Dutch strategy (and trainings by Interface for Cycling Expertise), bringing them into the formal planning sphere in Chile. It defined "cycle inclusion" as the integration of planning for cycling within regular urban and transport planning, and considered how to make this a reality by achieving an optimum distribution of road space for all users. Many of the principles presented here in a formal report in Spanish for the first time (summarized in Table 4), became the basis for the design guidelines developed first by the ministry of transport (2010) and later by the ministry of housing.

In addition, this component of the project also endorsed a table originally developed by Living City, with input from Dutch and Chilean engineers (Table 5), which formally defined the type of cycling facility appropriate for the different types of road considered by Chile's national ordinance (*Ordenanza General de Urbanismo y Construcción*).

This section of the report went on to define specific types of cycle facilities, and adopted the Dutch' five principles at the section,

Table 4
Principles to achieve cycle-inclusion with general urban and transport planning.

1	The bicycle is a vehicle and should therefore circulate on the road, and not on the sidewalk.
2	Cyclists should circulate in the same direction as cars, unless specific infrastructure allows them two-way or counter-flow movements.
3	Cyclists should circulate on the right side of the road along with other slower vehicles.
4	Drivers of motorized vehicles must give priority to cyclists when sharing lanes and infrastructure.
5	The concept of shared space must be applied where no specific facility is available for cyclists to circulate.

Source: DICTUC and Ciudad Viva (2012, p. 33).

intersection and network levels, based on the objectives of making cycle routes: direct, safe, comfortable, attractive, and coherent. As discussed, it also provided an overview of the laws and regulations governing different aspects of cycling and road infrastructure development.

The final section of the report proposed a strategic plan based primarily on design criteria and an initial study of costs. This plan has remained largely invisible in terms of actual planning processes to date. The main reason is that funding decisions are seldom technical. This is because decisions about cycling infrastructure are mainly made by Regional Councils, composed of representatives of political parties; their respective parties appointed these until open elections became the method in 2012. Allocation of funds, however, remains the result of negotiations that assign funds using partisan, rather than planning criteria. Therefore, transferring cycle investment decisions to a framework that favours planning priorities and improved design standards remains a major challenge, for Metropolitan Santiago and all of Chile.

5. Final reflections

Although many cities today are setting ambitious targets for behavioural shifts toward more use of bicycles for transportation, few have achieved Santiago's substantial improvements in such a short time. Most studies focus on identifying the lists of measures that can be applied for achieving these shifts, without looking closely at the processes by which these measures were refined, adapted to local contexts, and applied in ways that maximized their interactions, and therefore their effectiveness in specific cities.

This study has looked more closely at details in the planning process by which Santiago was able to combine citizens' aspirations and experiential knowledge with transport engineering expertise, in the context of a collaborative and participatory planning process endorsed by political and technical planners in national and local levels of government.

While it would be foolish to assume that other cities could follow the exact steps taken in the Santiago process, it is likely that similar planning *approaches* could yield more significant *impacts* elsewhere. The experience of Seville in Spain, for example, reveals similarities: the decision to give priority to building a network of cycle facilities started with a participatory process led by neighbourhood associations; local authorities brought in technical expertise from traditional sources (engineering, architecture) and expert cyclists to develop their strategy; they integrated cycling with public transport and bike share systems to expand their reach; and they included measures to stimulate the development of bike repair, rental and tour services. This boosted cycling's modal share from just above 0–6% in two years (field visit and interviews with key planners, 2010–2011).

This case suggests the importance of technical studies incorporating the results of participatory planning processes, and also becoming inputs for further participatory efforts to answer the questions that arise from these technical studies. It highlights the need for current and potential users, technical planners and politicians alike to develop criteria for quality, targets, design and investment priorities, and suggests ways of doing this that can avoid or channel conflicts and get the most out of these essentially deliberative processes.

Above all, it suggests that planning for change in transport should not attempt to follow a linear pattern, moving step by step through a series of instances. Rather it should seek the iterative pattern of an on-going conversation among many diverse kinds of expertise, translating among them, validating and re-validating, constantly, as the process evolves.

The DICTUC-Living City consultancy project, explored here, took many experiential forms of data and results, from the Green Map noting cyclists' real routes, through the principles and tables taught as part of the trainings by Dutch experts, developed over decades of experimentation. It not only translated them to Spanish but also endorsed them as relevant and useful, validating them for a significant segment of transport and urban planners in Chile. First developed and validated by citizens, local planners and Dutch experts, these were then validated by engineering academics and professionals. Because the latter are considered the arbiters of "technical validity" in Chile, this was essential to ensure their institutionalization. Subsequent events, particularly the approval of national guidelines for "cycle-inclusive design" (2015) and efforts to reform national traffic legislation (2013-present) underline the importance of this additional validation.

Table 5
Chilean roads and Dutch recommendations for cycle facilities.

Chilean ordinance	Purpose	Design speeds (km/hr)	Flow volumes (vehicles/hr)	Recommended infrastructure
Express road, highway	Distances over 8 km	80–100	4000	Physical segregation, two-way, on both sides of the road.
Trunk road	Distances over 6 km	50–80	Over 2000	Physical segregation, two-way, on both sides of the road; may be one-way depending on density (residential or commercial), distance between intersections, etc.
Street or collector road	Functional continuity over 3 km	40–50	1500	Visual segregation (painted cycleway) may be sufficient but depends on volume and speeds of motorized vehicles.
Service road	Functional continuity over 1 km	30–40	600	Signage should give priority to cyclists and pedestrians,
Local road	Short distances, no functional continuity for vehicles	20–30	Medium or low capacity	design should limit speeds, 30 km zones or 7 km/h zones recommended, depending on context.
Counter-flow	Make one-way systems permeable to cycles	Context dependent		One-way streets are major barrier to cycle-inclusion. Making streets two-way is recommended; permitting counter flow cycling in visually or physically segregated lanes is another option.

Source: DICTUC and Ciudad Viva (2012, p. 34).

This experience also indicates that planning processes require deliberation to establish fundamental consensuses (the Roundtable, the deliberation within the study team), but must also allow different kinds of professionals to get on with some tasks using their own methods, particularly in terms of achieving efficient project implementation, once these consensuses are clear. The new guidelines or legal reforms, for example, reflect both technical studies by experts and deliberation by all interested parties to build new consensuses on what is best for a Chilean environment.

This reflective study also suggests that planning processes need to include very diverse mechanisms for

- collecting data
- analysing data, possibilities, alternatives and goals
- evaluating and re-adjusting all of the above.

We believe that participatory measures can be particularly useful for exploring potential data sources and new approaches to new challenges, and also to analyse, select and implement appropriate measures. This experience points to the importance of *embedding technical studies in participatory processes*, to get the most out of different kinds of experiential, technical, theoretical and other expertise.

Moreover, participation needs to generate *different instances and different kinds of participation*, to *mobilize knowledge*, *planning and political systems together* to achieve agreed-upon objectives. In this case, participation sometimes took the form of cyclists' mapping workshops to identify real routes. Later, it took the form of formal citizen-government-academic working groups and a plenary to which these groups presented their results, for validation. Technicians and professionals "participated" as consultants through formally tendered studies, although many also participated in the I-CE trainings, workshops and street audits too. The inclusion of Living City in the DICTUC team was highly unusual but ensured the necessary continuity between the participatory and training process underway, and the new expertise brought to bear by the transport engineers. In this instance, it was the result of the individual vision of those organizing the team. In future, it would be wise to build this into terms of reference and the resources available for these kinds of studies.

All these instances provided important inputs into the specific array of conversations, documents, rules, guidelines and procedures that ultimately helped to create a new pro-cycling culture within Chilean planning institutions.

This is not to say that Chile is now a cycling paradise, far from it. The nascent culture of cycle-inclusion remains hotly contested by a car-centred planning paradigm that has grown in parallel, and is considerably more powerful, when measured by resources and planning faculties. Nonetheless, this experience suggests that new consensuses can be encouraged and cultivated, which make significant change possible, even in a hostile environment.

Furthermore, this experience suggests that planning processes must consciously generate spaces that:

- bring out the best knowledge from diverse actors;
- bring it together in diverse spaces and appropriate assemblies;
- allow specific actors to get on with their own tasks;
- keep communications open so consensuses continue to evolve as conditions change.

Further research arising from this study could examine equivalent processes in other cities and contexts, to identify common and contrasting points. Cumulatively, this new body of knowledge could provide some ground rules and guidelines for designing more effective collaborative planning processes to achieve sustainability.

Testing these theories, process ideas and designs in the "living laboratory" of real cities and their often fragmented and contradictory planning environments seems increasingly necessary. Many participatory processes are, in fact, trial-and-error "tests" of someone's ideas about what could generate more public interest in, and commitment to, innovation. Recognizing this formally and evaluating results from this perspective could help to identify and apply the most useful components.

Further research would do well to study processes from a complexity, as well as a "complicated" or systems-based perspective. It is likely that much useful knowledge could be extracted by going back over successful and unsuccessful planning processes, using some of the principles identified here. This makes history a highly relevant discipline for finding ways to achieve more sustainable urban planning.

In his work on policy transplants in the sphere of transportation, De Jong (1999), De Jong et al. (2002) identify a *progression*, from informal to formal practices, through regulations, laws, and potentially constitutional-level changes. This study is consistent with their idea that process-based changes in informal and formal arenas are helpful, and perhaps essential, to achieve the legal and institutional changes necessary for sustainable transportation.

In this sense, planning as both theory and professional practice is an essential complement to traditional methods from engineering, architecture and other disciplines. With the "communicative turn" developed by Friedmann (2011), Forester (2012), Healey (2006), Innes and Booher (2010) and other thinkers, planning has the flexibility and many of the tools necessary to build an interface between different cultures of knowledge and the languages that sustain them. Given their roots in "hard" and "soft" systems thinking, a single narrative is probably impossible, but a shared narrative, weaving together diverse conceptual and linguistic approaches appears not only possible, but also necessary.

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