Te Ara Mua - Future Streets suburban street retrofit: A researcher-community-government co-design process and intervention outcomes

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ABSTRACT

Te Ara Mua - Future Streets is a controlled before-after study of neighbourhood infrastructure changes that aim to make walking and cycling safer and easier and reflect cultural identity in Māngere, Auckland, New Zealand. The project intervention was delivered through an innovative and challenging partnership between the research team and funding/delivery agencies. The purpose of this paper is to explain the underlying concepts behind Future Streets and the process of delivering an area-wide community street retrofit. Project documentation were reviewed so that the key concepts, steps and activities in project delivery could be described. Variations from planned delivery, the reasons for these variations, and broader delivery successes and challenges are also briefly discussed. A substantial community engagement process informed design objectives, which in-turn informed retrofit designs. The street modifications have been implemented and a different streetscape now exists for key routes in Māngere, giving greater affordance to walking and cycling and a more attractive urban realm. The initial response to the modifications from the community are generally positive although the loss of parking in favour of protected cycle lanes is causing concern for some. A range of difficulties in delivering the intervention included unclear governance, different researcher/practitioner cultures, unrealistic timeframes, project funding uncertainties, and regulatory barriers. Nevertheless, Future Streets is positively influencing new delivery projects and transport policy, and for next steps process improvements should be employed to make demonstration projects like Future Streets easier. Closer cooperation between the science and transport sectors are needed to test and progress transport approaches which have the potential to positively influence urban form, and the health and wellbeing of residents of towns and cities.
1. Introduction

The design of streets in cities and towns affects liveability and has implications for injury, health and wellbeing, the environment, and the desirability of neighbourhoods (Frank and Kavage, 2009; Giles-Corti et al., 2016). In many ‘new world’ cities this realisation is leading to a trend towards more liveable urban spaces (Kenworthy, 2006; Hamilton-Baillie 2008; Gehl 2013), particularly around urban centres, waterfronts, and other places where people concentrate.

However, in low density Auckland (Sallis et al., 2016), New Zealand (population 1.4 million), there has been a lack of focus on the street design of existing suburban neighbourhoods, despite most people living in them. Approximately 70% of occupied dwellings in Auckland are separate houses (Auckland Council, 2014), which is the dwelling type most represented in New Zealand suburbs. More road capacity to meet the demands of increasing motor vehicle traffic has historically driven change, and public transport and active travel infrastructure has been of lower priority than private motor vehicle infrastructure in suburban settings (Mees and Dodson, 2001; 2006; Imran and Matthews, 2011).

Meanwhile concepts such as Bike Boulevards (Walker et al., 2009) and Complete Streets (Smart Growth America, 2018) in North America, 20 MPH zones (Webster and Layfield, 2003), Mini Hollands (Transport for London, 2018) and DIY Streets (Sustrans, 2010) in London, and 30 km/h residential areas in the Netherlands (Vis et al., 1992) all show how suburban streets can be re-imagined to deliver better transport outcomes. Although some (such as 20 MPH zones) are gaining some traction, these concepts have not translated yet into universally accepted practice for improving suburban streets in many cities. There is a continued need to demonstrate and provide evidence for how suburban streets should be designed and function in the future, acknowledging some key mechanisms, such as the discouraging effect that motor vehicle traffic has on walking and cycling (Jacobson et al., 2009).

Te Ara Mua (translation “the path ahead shaped by the past”) Future Streets (hereafter Future Streets) is a controlled before-after intervention study to implement and evaluate neighbourhood infrastructure changes that aim to make walking and cycling safer and easier in Māngere, Auckland, New Zealand. The broader goal is to understand the wider benefits and costs of neighbourhood streets and other public space environments designed to facilitate active travel modes, minimise road traffic-related injury and disease, and thus support healthier communities. At the core of the project is a hypothesis that, in suburban communities, the wider societal benefits of healthier mobility (i.e., active transportation, such as walking or cycling for transport), through retrofitting environments to safely promote active travel modes, exceed the outcomes that currently result from business as usual streets and other spaces that heavily prioritise private motor vehicle travel.

There is an important distinction here between new suburban developments and retrofitting of existing suburban streets. This study focusses on the latter, as in most towns and cities, new developments always represent a very small proportion of total streets and it is hoped that on these streets active travel might be better built into designs from the beginning.

Future Streets is ambitious in many ways, including the geographic scale of the intervention, complex research design and multiple outcomes of interest across a range of disciplines. Arguably, the most challenging component was the research team’s intent to develop, implement, and evaluate the intervention in partnership with the local transport authority (Auckland Transport) and other stakeholders, within the timeframe of a four-year research programme.

Local resident neighbourhood perspectives, objectively-assessed physical activity, reported travel and activity behaviours, as well as observed road user behaviour outcomes, are the primary measures for the research (Macmillan et al., 2018) and the outcomes for these will be addressed in future papers. However, the process of developing and implementing the Future Streets intervention differed from conventional street improvement projects in the way information was gathered to inform the design, the design process and even the infrastructure that is typically implemented. The process of implementation was not straightforward and there are valuable lessons from describing the development process and highlighting some of the key issues encountered. The challenge of implementing research knowledge and new policy within the context of sustainable transport goals have been experienced in other countries (Godschalk, 2004; Hull 2008; Tenney et al. 2016; Eriksson, 2017; Isaksson et al. 2017). To some extent the challenges faced in this project are part of a wider effort by transport sectors to respond to a changing world (Cohen 2012; Marletto 2014).

The purpose of this paper is to explain the underlying concepts behind Future Streets, outline the process of intervention design and implementation, and describe the street improvements that resulted from the process. A secondary purpose is to explain how the process differed from what was planned, and briefly discuss the issues surrounding the variations.

Beyond the scope of this descriptive paper, a related paper (Witten et al., 2018) more deeply explores the challenges and enablers to the project, from both researcher and Auckland Transport perspectives, in an attempt to explain the underlying system factors leading to the project variations. Along with the present paper, this knowledge should help with planning future innovative street intervention projects.

2. Background to Te Ara Mua - Future Streets

Some countries have been much more proactive than New Zealand in planning road networks and streets that accommodate a wide range of road users, none more so than the Netherlands where a deliberate and considered approach to road design has existed for many years. The widespread implementation of cycle lanes following considerable public unrest in the 1970s (Wardlaw, 2014) and the introduction of Sustainable Safety policies (Wegman et al., 2005) in the 1990s (including nationwide implementation of 30 km/h neighbourhood streets), are two clear examples of national scale road network planning that clearly reflected the desires of communities. Underpinning these initiatives, and Dutch road planning in general, is the concept of ‘self-explaining roads’ (Theeuwes and Godthelp, 1995; Van der Horst and Kaptein 1996; Theeuwes, 1998), which underpins the Future Streets intervention described here.
Cognitive psychology has a key role in the theory underpinning the self-explaining roads concept. Affordance theory (Gibson 1979) and the concepts of mental ‘schema’ (and scripts), originally developed by Piaget but much later applied to road design (Theeuwes and Godthelp, 1995; Charlton et al., 2010), are particularly important in this context. For self-explaining roads, the design of streets affords the behaviours that are desired on them and through repeated exposure, road users establish mental scripts for behaviours that are expected in various contexts. For example, by clearly identifying an arterial road, drivers should expect relatively easy passage, but on local streets (which should look and feel very different to arterial roads), a sense of ‘place’ should be obvious through design and slower vehicle speeds should be expected. Consistent application of the functional characteristics of different street types reinforces mental scripts for correct, normal and safe behaviour over time.

The self-explaining roads theory outlined above suggests that both positive and negative road user behaviour can be reinforced depending on the planning and design of mobility networks in cities and towns. It could be argued that in many cities worldwide, private motor vehicle mobility has been afforded and reinforced to a point where a number of negative externalities such as traffic congestion, greenhouse gases, poor air quality, traffic injuries, physical inactivity and related disease, and community severance have resulted. Therefore, particular effort is needed to convert mobility networks to self-explaining roads that afford an overall more positive set of outcomes.

In New Zealand, an experiment to apply self-explaining roads principles to suburban streets in Point England, Auckland (Charlton et al., 2010) led to unique street designs with much more differentiation between road types than is usual. The intervention achieved appropriate traffic operating speeds for each road type (e.g. 30 km/h operating speeds on local streets), and much clearer understanding of behavioural expectations by road users (Mackie et al., 2013). Most importantly, traffic crashes reduced by 44% and the social costs of crashes by 49%, compared with largely unchanged crashes in surrounding areas (unpublished, data available on request). These outcomes were achieved mainly through modifications to local streets to make them less formal, with line marking removed (later reinforced as effective by (Shackel and Parkin, 2014), and strategically placed planting and artwork to slow motorists and reinforce a sense of place. Conversely, distributor (collector) roads received enhanced delineation and more formal spaces for road uses (e.g. via marked cycle lanes and built crossings) to reinforce relatively easy mobility (Fig. 1).

Street design has traditionally been the purview of traffic engineers. The realisation that other professional disciplines also have an interest in the design and outcomes of suburban streets led to the Future Streets project. In particular, the broader public health implications of street design were a key addition to the capability of the research team, building on a growing body of literature that relates urban design to active mode uptake and healthier communities (Macmillan et al., 2014; Giles-Corti et al., 2016; Sallis et al., 2016; Stevenson et al., 2016; Smith et al., 2017; Mueller et al., 2018). Specifically, a research team comprising transport engineering, human factors, public health, and social geography specialists came together to create the Future Streets concept and research project. Partnerships with road controlling authorities, community representatives, and other stakeholders created a wider Future Streets project team, focussing on designing and implementing a street change intervention, in the context of a robust epidemiological study.

![Fig. 1. Earlier Self-explaining roads changes.](image-url)
3. The development and implementation of Te Ara Mua - Future Streets

The aims of the research and intervention components of Future Streets are to:

1. Demonstrate a process for community participatory design and implementation of Future Streets in Māngere, Auckland, with the goal of safe and easy walking and cycling and reinforcement of local identity
2. Measure and describe the integrated road safety, health, environmental and social outcomes resulting from Future Streets implementation
3. Model the costs and benefits of a more generalised implementation of the intervention at city and/or national scale
4. Influence institutional change in transport policy and practice.

There were key stages in the development of the street improvements. These stages are discussed chronologically as follows. Full details of the research project methodology are outlined in (Macmillan et al., 2018).

3.1. Establishing partnerships, motivations and values

During the development of a research proposal and funding application, we developed an initial partnership with the regional transport planning authority (Auckland Transport). This was crucial as Auckland Transport have control over transport infrastructure investments in the Auckland region. At this point, they provided a letter of support, which included a nominal funding commitment of NZD$1 million as a starting point for intervention design and construction. Following the successful funding of the research project, we developed this relationship with Auckland Transport further. The New Zealand Transport Agency, which assists with local road funding and helps with the strategic planning for transport in New Zealand, was also an early partner in the project and a steering group among the research team, Auckland Transport and the NZ Transport Agency was established early to manage the research, intervention development and implementation.

As a crucial first step in establishing this new collaboration, the motivations and values of the various team members were shared to help understand perspectives and identify possible risks to the project across the broader team. For the researchers there were inevitable motivations of knowledge for betterment, influenced through robust evidence, innovation, exploration, and possibilities for the future. For transport officials, a focus on achieving better outcomes for transport networks (including transport choice and better understanding of the economic implications of the proposed transport improvements), were key priorities. Across both groups was a shared desire to make the transport system better for future generations, reflecting a system that was not working well for active transport modes; and also a desire to influence economic planning tools that are powerful in shaping transport project outcomes, but which at the time reflected a limited number of outcomes, with most weight given to reducing congestion and vehicle journey times.

The research team also brought more specific ‘value positions’ to the Future Streets project, specifically:

- The self-explaining roads concept should be extended into the areas of walking and cycling routes to create an intuitive and user-friendly walking and cycling network within suburban communities.
- Transport infrastructure must consider wider implications than only traffic injuries and the efficient movement of vehicles. Street design also has implications for broader human and environmental health and wellbeing and equity.
- The local community and mana whenua (local Māori, indigenous New Zealanders, who have authority over their locality) must have an active role in identifying issues and developing ideas and concepts, early and throughout the project. Mana whenua have special significance in planning legislation and the policy environment more widely through the government's acknowledgement of ongoing responsibilities under the 1840 Treaty of Waitangi and the Resource Management Act 1991.
- Social and health inequities are preventable and structurally mediated. In New Zealand, communities with higher levels of socioeconomic deprivation, and a high proportion of Māori and Pacific residents, have greater potential to benefit from initiatives focussing on improving safety and health.

3.2. Area selection

An initial short-list of areas was developed and agreed on by the steering group. From this short-list intervention and control areas were selected as best meeting a set of a priori inclusion criteria:

- Potential for accessibility to local destinations such as schools, churches, community facilities, shops, work sites
- Higher than average traffic injuries
- Higher deprivation
- Ability to find at least two areas with similar destinations and road types
- Based on natural community boundaries and each area not divided by major barriers such as motorways
- Alignment with Auckland Transport cycle network planning.

A pair of neighbourhoods in the wider Māngere area best met this set of criteria and following a randomised allocation, Māngere Central was allocated as the intervention area and Māngere East was allocated as the control area (Fig. 2). It was notable that, at the
time of selection, Māngere East was rated third worst and Māngere Central was rated fourth worst in terms of fatal and serious crash risk out of 280 neighbourhoods in Auckland (Auckland Transport 2012 unpublished data). The size of each of these areas needed to be sufficiently large to demonstrate area-wide route improvements on a variety of road types and accommodate a sufficient number of residents for the household survey as part of the outcome evaluation.

The perceived ability to work closely with the Local Board was also a balancing factor for confirming the pair of areas to work with. Auckland has 21 local boards (for which members are elected) that play a key part of Auckland Council’s governance, representing local communities and having some decision-making authority. For Future Streets the Māngere Otahuhu Local Board was key to the project’s feasibility, planning and acceptance by the community. Following area selection, early buy-in from the Local Board was achieved, partly due to ambitions for Māngere by local board members that were compatible with the Future Streets goals and ideas. For the Local board, a project to help improve the aesthetic appeal of Māngere and address personal safety concerns at some walkways was desired, as well as an opportunity to re-consider an existing idea for a planned new road through the area.

3.3. Community engagement

A community participatory design process was adopted to establish the project, understand local concerns and aspirations, and to inform design solutions. The Local Board and a community reference group had a leadership role in the community engagement process and many meetings, conversations and events with various groups were held. A stall set up in the local shopping mall, with maps and opportunities for people to plot their normal trips and the issues experienced on them, was particularly successful. All together 43 formal community engagement sessions were carried out, in addition to numerous informal meetings of various kinds. A rich explanation of how travelling around Māngere was experienced by local people was achieved. The specific locations of problem areas were identified, as were key issues that had high levels of agreement. These were:

- Personal Safety – especially on off-road pathways, poor lighting, youth drinking and crime
- Speeding traffic
- Lack of crossings - especially on busier arterial roads
- Roads are dangerous for cycling
- Confusion about road user priorities, especially around the shopping mall
- Dogs in the area posing a threat to pedestrians and cyclists

A process of engagement with mana whenua was also carried out to understand perspectives, areas of importance, identify issues, and ultimately to design cultural references within the intervention using Te Aranga principles (Auckland Design Manual, 2017). The key objective of the Te Aranga principles is to enhance the protection, reinstatement, development and articulation of mana whenua cultural landscapes enabling everyone in New Zealand to connect to and deepen a ‘sense of place’. The outcomes from this process were incorporated into the design response. More details about this component will be published later.
All of the issues and opportunities were then combined with other city-wide aspirations (such as safer streets and a better cycle network) and background theory (self-explaining roads), to create design objectives for the street interventions.

3.4. Concept design

The responsibilities for the design process were split with the research team leading the community engagement and concept design process, and Auckland Transport leading the detailed design and construction process. Design concept development was informed by the findings from design literature, community and mana whenua engagement process, road user behaviour (from video cameras and traffic counting tubes), crash data, and the expertise of the design team. The following design objectives were triangled from all of this information and were invaluable in guiding the design process:

1. Street/route hierarchy giving greater priority to pedestrians and cyclists
2. People feel safe on routes
3. Reduce traffic speed and make it more consistent
4. Improve people’s ability to cross the road safely
5. Schools and the shopping mall are priority destinations for the walking and cycling network
6. An arterial separated bike network is important
7. Improvements reflect the identity of Māngere people

Building on the ‘human centred design’ approach that was adopted, for the design process a hypothetical scenario of a 12-year old travelling to school independently was used to help with decisions about the level of safety and amenity required from infrastructure changes. This scenario was particularly useful for choosing cycle infrastructure and pedestrian crossing facilities. There was also a deliberate placemaking component to the project and it was strongly agreed that the designs should not only provide functional transport infrastructure, but also add to a sense of place and identity.

An external accessibility audit was carried out on the preliminary designs to ensure that the designs were user-friendly for pedestrians and those with mobility impairments. A road safety audit of the detailed designs and a post-construction audit following a site visit were also carried out by Auckland Transport.

A design committee, including representatives from the research team, Auckland Transport and other consultants, debated and developed the design concepts, in conjunction with the community reference group over a total of seven participatory planning sessions (three with the community reference group and four with the design committee). In between these meetings design work was carried out by sub-groups taking direction from the design committee.

The introduction of high quality cycling infrastructure was one aspect of the design approach that was not overtly raised through the community engagement process (although concerns about cycling safety on the road were raised), but rather was introduced by the design team, in response to emerging leading practices, a national desire to see better quality cycling routes, the development in transport infrastructure, but also add to a sense of place and identity. An external accessibility audit was carried out on the preliminary designs to ensure that the designs were user-friendly for pedestrians and those with mobility impairments. A road safety audit of the detailed designs and a post-construction audit following a site visit were also carried out by Auckland Transport.

3.5. Committing project funding

Full funding for the intervention delivery was largely committed as the project progressed and the initial funding ($1m) was never envisaged to be sufficient to deliver the full project. Auckland Transport, the Local Board and the NZ Transport Agency were the key intervention funders. Because Future Streets did not exist within the programme of works previously set for Auckland as part of the National Land Transport Fund (the system for allocating transport funding in New Zealand), a case for the funding needed to be developed by the research team for consideration by transport authorities. As part of this case, we expanded the usual set of outcomes (safety and travel time benefits), to match the objectives of the project, arguing that these extra outcomes (disease prevention and environmental well-being in particular) should be considered in Transport Projects.

3.6. Confirming designs

Settling on the final designs was a relatively complicated process involving the inputs from a range of stakeholders. Auckland Transport, road safety, public transport, parks and reserves, Intelligent Transport Services staff, and other regulatory subgroups of Auckland Transport (e.g. approvals for non-business as usual trials, regulatory approvals for land use) were examples of stakeholders who were involved in sign-off throughout the design and delivery stages.

3.7. Delivery

Originally, the research team estimated that NZ$4–5 m might be needed to deliver the project across Māngere Central, however, the final total budget for the intervention (which does not include the full scope of work that was originally intended, nor the researcher contribution to the design process) cost NZ$9 m, including operational expenditure. Operational expenditure includes the professional fees of those who have planned and designed the scheme. Approximately 50% of the infrastructure investment was
The planned and final timing of the intervention and surrounding research activities is shown below in Fig. 3. The final extent of the scope of works is shown in Fig. 4 and example before/after photos are shown in Fig. 5.

The responses to the design principles are shown below in Table 1 and reinforce how the designs have reflected the community and other information that were collected at the beginning of the design process. A fundamental difference to the earlier Self-Explaining Roads project was a focus on the busier minor arterial (collector) roads, as opposed to local streets. This approach stemmed from the theory that most of the problems (injuries, perceived safety and barriers to active travel) relate mainly to these busier roads and so improvements on these streets would yield the greatest benefit. These streets now look and feel very different with much more balance in the space allocated to various travel modes, compared with the baseline designs, where a disproportionate allocation of space was previously given to vehicle travel (Fig. 5c). A key challenge on these streets was to decide on the best approach for affording safe and easy cycling. Shared paths and bi-directional cycle lanes (on one side of the road only) were considerations, but it was felt that on the balance of evidence, on-road unidirectional physically separated cycle lanes would provide the safest solution. Other streets in the area received relatively minor changes and some streets received no changes, all with the idea of...
reinforcing each street’s level in the street hierarchy. However, reflecting the community engagement and traffic data, one street (Fresian Drive) was modified in its function. Despite operating as a collector road with relatively high traffic volume and speed, it was originally planned as a local street and residents and the project team felt it should revert to more of a local street, while retaining some link function. Therefore, traffic calming, planting and painted cycle lanes were included to reflect this new function.

An innovative feature of the scheme was to deliver infrastructure that would serve both transport and recreation/fitness purposes. A recreation circuit was created (Fig. 5a and inset), building on existing links between public reserves and the street network. This was also an opportunity to address concerns about public safety in a public reserve, by making the route through it more attractive.

![Fig. 5. Māngere Central before and after the Future Streets intervention. A) a clearer transport route through a park, B) more inviting pedestrian access to the mall, and C) rebalancing road space to better serve active and public transport.](image)

Table 1
Design responses to design objectives.

<table>
<thead>
<tr>
<th>Design objectives</th>
<th>Design response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Street/route hierarchy giving greater priority to</td>
<td>Intensive infrastructure on collector/arterial routes using raised table zebra crossings, wider-footpaths with improved lighting and protected cycle lanes (shown by label C)</td>
</tr>
<tr>
<td>pedestrians and cyclists</td>
<td></td>
</tr>
<tr>
<td>2. People feel safe on routes</td>
<td>As above, and new, wider, pathways and lighting in parks that were intimidating (shown by label A)</td>
</tr>
<tr>
<td>3. Reduce traffic speed and make it more consistent</td>
<td>Speed calming including raised pedestrian tables, narrower vehicle carriageway (via protected cycle lanes), coloured and tactile intersection treatments and planted islands on lower category streets.</td>
</tr>
<tr>
<td>4. Improve people’s ability to cross the road safely</td>
<td>Raised table zebra crossings on collector roads and new crossings on arterial road, where desired crossing behaviour was indicated.</td>
</tr>
<tr>
<td>5. Schools and the mall are priority destinations for the</td>
<td>Schools served by better crossings and traffic calming. More attractive and usable pathways to the town centre (shown by label B), including better lighting.</td>
</tr>
<tr>
<td>walking and cycling network</td>
<td></td>
</tr>
<tr>
<td>6. An arterial separated bike network is important</td>
<td>Protected cycleways on collector roads and plans for protected cycleways on arterial road (but arterial component will be constructed at a later date)</td>
</tr>
<tr>
<td>7. Improvements reflect the identity of Māngere people</td>
<td>Coloured pathway (Kōkowhai – yellow) reference to shark oil traditionally used by Māori (shown in Insert in Fig. 5), Traditional Pou (carved poles), endemic plant species, wayfinding to culturally relevant landmarks, and improving the linkages from the marae to other destinations such as the town centre</td>
</tr>
</tbody>
</table>
Other innovative aspects of the project that were delivered included:

- A community engagement process that went far beyond normal practise, seeking to integrate local and professional knowledge to optimise design
- Taking a team approach to design, with urban designers, human factors specialists, engineers, public health specialists and social geographers all contributing to the design process
- taking an area-wide design approach, to capture a range of local end to end journeys
- using green spaces as part of the transport system,
- prioritising pedestrians on side roads (although the final solution was somewhat over-engineered)
- testing uni-directional protected cycle lanes
- Bus-stop designs that integrate protected cycle lanes
- integrating placemaking and cultural components within a transport project

Some aspirations for the project did not come to fruition. New designs for crossings on the major arterial road and on side roads were not permitted to proceed through the planning process for complex reasons (Opit and Witten, 2018) and novel designs to afford pedestrian priority on side-roads were rejected due to incompatibility with rules. Despite these failures, good provision for pedestrians was still provided using treatment options more routinely available.

4. Hitting ‘road blocks’ and ‘paving the way’

4.1. Issues in the process of planning and delivery

There were a number of challenges that made delivery of Future Streets difficult, and then enablers that eventually allowed the project to proceed. These barriers and enablers are briefly summarised here, and a more in-depth case study of the research/practice interaction via in-depth interviews with key actors in the project is described elsewhere (Witten et al., 2018). It is important to note that these issues have been generally agreed between the research and Auckland Transport delivery teams.

Some of the key issues involved:

- Unclear project governance, management and decision-making procedures, made more difficult than usual by the unique partnership arrangement between the research team and Auckland Transport
- Different cultures and expectations between the research and Auckland Transport personnel, due to different backgrounds and perspectives
- Funding uncertainties, due to only partial funding for the project being confirmed at the outset
- Unrealistic timelines partly due to funding needing to be confirmed and partly due to the relatively complex nature of the project
- Regulatory barriers and difficulty in delivering trials within standard planning procedures.

4.2. Different approaches to design

The vision for Future Streets was generally shared across the wider project team, but there were differences in how that vision should be achieved. Table 2 below compares the characteristics of the design approach adopted by the research and Auckland Transport teams.

The advantage of the Auckland Transport design approach was more efficient movement through the planning process towards delivery, but it was less flexible to accommodate innovation, improvements and new ideas. The research team's approach was focussed on new ideas and improvement, but this caused some delays within the current planning structures.

An overall issue for timely delivery was the backlog of projects and relatively untested systems resulting from a large local authority amalgamation process which was completed approximately five years prior to the inception of this project. It seemed that a number of processes required to be negotiated by the project were not clear to those involved in the delivery of it.

Regardless of the different approaches to design, the broader team (the research and Auckland Transport design team together) experienced several frustrations as other stakeholders, who played a role in approving or delivering the steps needed to implement Future Streets but who were not central to the goals and ambitions of Future Streets, caused delays. Certainly, as the project progressed and differences between the researchers and Auckland Transport designers diminished through a shared understanding and
achievement of the initial project stages, barriers presented by those outside of the wider team became more relevant. Overall, it was clear that while individuals from both sides had influences on project delivery. The problems mostly related to how individuals were required to behave within a larger system context (Witten et al., 2018).

4.3. Overcoming the barriers

A shared understanding of the perspectives of both the researchers and the Auckland Transport team mid-way through the project, as outlined in interviews (Witten et al., 2018), was a key turning point in the collaboration. A great deal of commitment to delivering Future Streets was then exhibited by all involved, but it still required persistence, patience and compromise by the key members of the collaboration. Eventually, disagreements about design gave way to a more urgent need to deliver the project in a complete way and within a timeframe that would not undermine community credibility and the research surrounding the project.

5. Initial community response to Future Streets

A detailed explanation of the community responses to Future Streets will be reported later, in accordance with the evaluation framework presented (Macmillan et al., 2018). However, following community meetings (Future Streets Team, 2018) and other conversations, preliminary indications are that the completed Future Streets changes have overall been appreciated, with many from the Māngere community commenting that the project has benefitted the area. This is understandable as there is little reason to object to better pathways, safer crossings and cultural references, which dominate much of the scheme, all of which were the result of a significant engagement process. There is preliminary evidence that the safer crossings and other improvements for those with disabilities have been particularly appreciated, and this will be formally assessed in the near future.

The new separated cycle lanes have caused more mixed reactions, with some objecting to the parking loss that they have caused—a phenomenon that is not uncommon (Lubitow et al., 2016; Wild et al., 2017), and questioning the community's desire for them. Others, who understand the goals of the project and stand to benefit from them, feel that the new cycle lanes afford safe cycling and new opportunities for physical activity and healthy living.

The mixed initial response to the cycle lane component of Future Streets reinforces the difficulty in establishing whole community buy-in, despite the comprehensive community engagement process that was carried out. However, when the rationale for the project is explained to people, they typically understand the changes that are now in place. This suggests that a wider local and central government mandate or ‘social licence’ (CicloGivica Ltd., 2016) for projects such as Future Streets is needed. Continued improvement in community engagement, perhaps including more user-testing of some design elements, would also assist in refining designs and achieving overall acceptability. The new cycleway design is also a radical departure from standard road design for the community and some residents simply requested information about how they are to be used.

The delays to construction, as outlined earlier, almost certainly impacted on the broader community's understanding of the project, as the impacts of the relatively intense community engagement earlier in the project are likely to have diminished over time. Community conversations to date, also suggest that relatively more promotion and ‘activation’ of the infrastructure may have been needed, given the significant changes to the streets.

6. Discussion

This paper has explained the underlying concepts behind Future Streets, the process of intervention design and implementation, and the resulting infrastructure changes. Future Streets demonstrates street environments that might be adopted if community and environmental well-being were adopted as key transport outcomes. The project builds on the safety focussed Self-Explaining Roads approach by integrating wider health and wellbeing principles into street hierarchy, route planning, road design and placemaking processes. The behaviours that are expected on the various routes are now reflected in the design, and a fuller range of road uses are afforded by the infrastructure changes.

The main contribution of the Future Streets intervention to both the practise and scientific domains is an inclusive design process and a best practice demonstration of context-sensitive suburban street retrofit to make walking and cycling safer and easier. The intervention also provides a setting for innovation, learning and progress.

Referring specifically to the design components of Future Streets, a number of innovations, as outlined earlier, have been delivered with an overall goal of delivering street environments that make walking and cycling easy and safe, as opposed to designs that simply comply with current standards. Other innovative aspects did not progress, and the final result reflects a negotiated product of the ideas, planning regulations and community preferences. The initial intention to treat each street in the area as per a defined road hierarchy, was only partially achieved. Many of the lower-cost local road treatments, to help differentiate the local streets from the busier routes were not implemented, although it was felt that the benefits to be gained from treating these local roads were much lower than the more problematic collector streets. The placemaking components of the project were partially completed, but the available budget meant hard decisions needed to be made about what was really needed. While the cultural elements were prioritised and completed, other opportunities such as children's artwork were not implemented.

The area-wide approach to street improvements, where walking, cycling, connections to public transport and placemaking components could be delivered together had many advantages, compared with the mode-based approach to planning which is currently the norm for Auckland Transport and other agencies. Integration was achieved and hence the relative completeness of the area is more compatible with the everyday experiences of residents’ movements around the area. It also meant that community
engagement did not have to be repeated for discrete projects (e.g. for cycleways and then separately for a street closure). However, the area-wide approach also created boundaries where improvements stopped and unmodified streets that are unattractive for walking and cycling resumed. The scale of the area, while relatively large from a project perspective, means that new and safer active trips may be limited to shorter local trips in the short to medium term, including to public transport. While this is likely to meet the needs of a range of trips carried out by our independent 12-year old (school, shops, nearby friends), it does mean that benefits for adult commuters and others who might venture further, may be limited for now.

But the reality is that cities keep changing and that with time, there are likely to be further improvements to Māngere streets, with further benefits. There are further planned improvements which are a natural extension of Future Streets and a desire to connect it with the wider network including the nearby airport precinct and other neighbourhoods.

There are further ways in which Future Streets is influencing other infrastructure programmes. Auckland Transport’s Safer Communities programme (community focussed walking and road safety infrastructure) and the policy direction being taken by a newly elected New Zealand government are two examples of the project’s influence. This further demonstrates that the Future Streets intervention is not a discrete feature, but rather an evolving concept that is being influenced by community, stakeholder and research findings on one hand, but conversely it is influencing surrounding practise.

There were issues in delivering the intervention and the research together, which caused delays and some design compromises. Yet to cement transport authority commitment, design and construct a non-business as usual community area-wide infrastructure project, with before/after measures (two years following implementation), within six years, is a significant achievement that has taken enormous effort. Further improvements to partnerships like this are needed, however, if future projects to push beyond business as usual are valued. Research agreements and city planning procedures both need to accommodate each other’s ‘ways of working’ if learning and innovation is expected. This would seem essential given the required changes in transport over coming years to respond to escalating road traffic injuries, obesity related disease, climate change and an emerging demand for more liveable places.

Going beyond the domain of natural experiments, research projects where practitioners and researchers work together to develop and evaluate improved transport possibilities are challenging but beneficial if executed well. The experiences of Future Streets provide some lessons for those attempting similar intervention research:

- Mechanisms to ensure a close working relationship between researchers and practitioners are crucial, including regular communication to ensure respective values and perspectives are appreciated, and expectations are jointly understood. This will ensure that both delivery and research objectives can be achieved.
- Robust community engagement and background data collection is essential and sufficient resources are needed for this.
- A clear pathway from community engagement/data collection to design objectives and design outcomes is important both for credibility and maximising the likelihood of success. Delays between these steps can undermine community buy in and credibility.
- The science/community trade-offs need to be well understood, with ethically grounded ways of dealing with conflicts. In delivering the intervention, community needs should supersede scientific rigour.
- An evaluation framework that includes reflection of the design process, while the design process is still in progress can be valuable.
- Science, innovation or independent enquiry should be actively designed into transport and other city planning structures, so that trials, intervention based research, and evaluation of temporary and permanent interventions can be efficiently carried out.

7. Conclusions

The hypothesis for Te Ara Mua Future Streets is that, in suburban communities, the wider societal benefits of healthier mobility through retrofitting environments to promote active travel modes exceed business as usual outcomes that heavily favour private car travel. The intervention component of this ambitious research project is now complete, but it hasn’t been without its challenges, and effort is currently underway to understand and remedy these challenges. In time, the research component of Future Streets will reveal the outcomes and overall merit of the project. We have learned that innovation functions need to be built into city planning systems, so that new ideas, which have the potential to positively influence urban form, and the wellbeing of residents, can be tested and progressed.

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