

## **DRIVING SLOWER GOES QUICKER: CALMING THE ARTERIAL**

**(THIS PAPER HAS BEEN PEER REVIEWED)**

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## 1. INTRODUCTION

Across New Zealand, arterial roads represent the backbone of our car network. They link city and town centres to suburbs, industrial zones, and regional corridors. However, not all arterials are created equal. Some arterial roads are pushing the limits of roadway capacity, while other arterial roads are designed to the same standards, yet function in a completely different way.

Through their design, these corridors often divide communities, contribute disproportionately to fatal and serious injuries, and inhibit the uptake of walking, cycling, and public transport. Wide central medians, long parking lanes and lack of crossing facilities all contribute to a poor safety record. Current engineering practice is aware of these issues, but largely retains conventional geometric assumptions of wide lanes, flush medians, clear zones, and high design speeds. This results in large swaths of asphalt, not reflecting the actual function of the road within the urban fabric.

The 'Safe Systems' approach recognises that humans make mistakes and that road design must therefore absorb those mistakes without resulting in death or serious harm. However, the way speed management works in practice in New Zealand often relies on raised platforms, traffic signals, enforcement and signage, rather than intrinsic and intentional design. In contrast, Dutch practice integrates physical form and behavioural psychology to create self-explaining streets that naturally moderate speed. These streets are not 'traffic calming' retrofits but a fundamental reimagining of how arterials function.

One of the most promising concepts from this design paradigm is what the Dutch call the "Driving Slower Goes Faster" street. An arterial roadway design, catering for up to 15,000 vehicles a day, but with a design speed of about 40 km/h, safe crossing opportunities and innovative intersection design, without the use of signals.

The purpose of this paper is to explore how New Zealand could implement these corridors (from here on called 'slow-speed arterials') with 40 km/h operating speeds, continuous flow, and multimodal priority. The paper will go into the technical design aspects and interrogate ways to fit this into the existing policy and infrastructure framework. It draws from Dutch case studies, comparative analyses, and practical design experience to outline a feasible pathway to implementation.

## 2. THE DUTCH EXPERIENCE

### 2.1 Historical context and rationale

The concept of slow-speed arterials emerged from a shift in Dutch traffic philosophy in the 1990s. As has been well documented, the Netherlands faced a public crisis over rising traffic fatalities. Despite being a small, densely populated nation, it suffered some of Europe's highest per-capita road deaths. Between 1970 and 1980, public protests under the slogan *Stop de Kindermoord* ("Stop the Child Murder") mobilised thousands of citizens against unsafe streets dominated by motor vehicles.

The Dutch government's response was radical for its time: rather than continuing to widen roads or increase enforcement, planners and engineers questioned whether network planning and road design itself was producing unsafe behaviour. They recognised that human beings are fallible, and that traditional traffic systems placed too much faith in obedience and enforcement rather than intuitive behaviour. This realisation formed the foundation for the *Sustainable Safety (Duurzaam Veilig)* policy framework introduced in the 1990s. It is a comprehensive approach to road safety

that sought to make the road system inherently forgiving of human error.

Within this framework, Dutch engineers categorised all roads into only three fundamental types based on function:

- Flow roads: designed for long-distance, uninterrupted movement (motorways).
- Distributor roads: connecting routes that balance mobility and access, typically with 50 km/h limits.
- Access roads: local streets prioritising access and safety, with 30 km/h or lower limits.

It was within the *distributor road* (arterial and collector roads) category that the *Slower–Faster* road design paradigm is focused on. In the early 2000s Dutch engineers realised that operating speeds on these corridors were too high for their mixed urban contexts, yet the corridors carried vital transport and economic functions. The challenge was to maintain efficient travel for all modes while reducing the risk, and thus the operating speed. A paradox resolved through design rather than enforcement (CROW, 2004).

## 2.2 From control to self-explanation

Traditional traffic engineering viewed driver behaviour as something to control through signage, markings, traffic signals, and policing. The Dutch design paradigm shifted to consider compliance to the rules as something to shape through environmental cues. If a road looked and felt safe only at 40 km/h, then most drivers would intuitively adopt that speed without needing to be told. This insight gave rise to the principle of the “self-explaining road.”

Self-explaining design relies on consistency between the visual, spatial, legal, and functional characteristics of the street. Every design element including lane width, kerb radius, surface texture, building frontage, communicates expectations to users. When these cues align, behaviour becomes predictable, appropriate and (largely) uniform, reducing conflict and removing the requirement for enforcement. For instance, narrow lanes and street trees close to the carriageway subtly signal restraint, while open shoulders and wide curves invite speed.

The rationale behind slow-speed arterials is therefore not moralistic (“drivers should slow down”) but pragmatic (“drivers will drive as the road invites them to”). By designing arterials and collectors to invite slower, steadier speeds without the need for traffic signals, Dutch engineers achieved higher effective throughput. Flow became continuous rather than stop-start. Vehicles no longer rushed to the next red light or queue; instead, they moved rhythmically, maintaining momentum with less braking and acceleration, improving safety, travel time predictability and air quality.

## 2.4 The “forgiving road” philosophy

An important element of the Dutch rationale for the slow speed arterial is the concept of the *forgiving road*. Recognising human error as inevitable is a key part of the Sustainable Safety paradigm. Designers sought to ensure that mistakes would not result in severe injury or death. This principle guided both horizontal and vertical geometry: eliminating high speed conflicts, improving turning angles for improved intervisibility between road users, providing medians for partial refuge, and using physical separation rather than painted lines to define space.

On slow-speed arterials, this philosophy manifests in the standard use of raised and continuous cycle tracks, set back from the roadway at the intersections, continuous medians, separating opposing vehicle flows, and clearly delineated pedestrian crossings with short crossing distances and a safe refuge in the centre of the road. Even when crashes inevitably occur, impact angles and speeds are low enough that injuries are rarely life-threatening. The approach thus harmonises with

the Safe System concept later adopted internationally, including by New Zealand's previous *Road to Zero* strategy.

## 2.5 Integration with urban form and policy

The slow-speed arterial approach did not evolve in isolation. It was reinforced by broader shifts in Dutch urban and transport planning policy during the early 2000s, including compact urban growth, more mixed-use zoning, and strong support for public transport and cycling. As Dutch cities densified, high-speed arterials became physically incompatible with their surroundings.

Municipalities therefore began reclassifying and redesigning streets to align with urban design objectives. The reallocation of space from carriageways to cycle tracks, planting, and public realm was framed not as a restriction but as an optimisation of performance across multiple dimensions: mobility, safety, environment, and economic vitality.

The resulting street typologies reflected a new balance of priorities, with more space for greenery, less noise pollution from vehicle traffic, reduced severance from wide arterials and higher place values.



Figure 1: Example of slow speed arterial in Delft (source: Cyclomedia)

## 2.6 Lessons from the Dutch experience

The Dutch experience demonstrates that lower design speeds do not inherently reduce network efficiency. On the contrary, by smoothing flow, removing traffic signals and reducing the frequency of severe crashes, the overall system performs better. These outcomes were achieved through design consistency, cross-disciplinary collaboration, and a professional license for innovation.

The key lessons relevant to New Zealand are:

1. Speed is a design outcome, not a behavioural flaw. Enforcement alone cannot sustain safe operating speeds; geometry and visual cues must lead.

2. Flow stability matters more than maximum speed. A corridor with vehicles moving steadily at 40 km/h can carry more people than one alternating between 50 km/h and congestion due to traffic signals.
3. Integration across sectors is essential. Dutch success depended on collaboration between transport engineers, urban planners, and social scientists.
4. Cultural change follows physical change. Once streets visibly support safety and civility, driver and community attitudes adapt accordingly.

In summary, the rationale for the Dutch-inspired slow speed arterial is both technical innovation and a professional shift in the design paradigm. It is moving to a system rooted in human behaviour, physical limitations, engineering, sustainable safety, and urban liveability. Its success lies in rethinking speed not as an isolated metric but as an outcome of design. This holistic understanding offers valuable guidance for New Zealand's transportation industry and our work towards safer, more sustainable transport corridors.

### 3. TECHNICAL DESIGN OF SLOW-SPEED ARTERIALS

Designing arterials for lower but more consistent operating speeds requires more than simply posting a new limit. The geometry, materials, and spatial logic of the street must *explain* the behaviour expected of road users. The Dutch concept of the self-explaining road rests on this foundation: that humans adapt their actions to the physical cues around them, not just regulatory. For New Zealand, embracing this philosophy means reshaping the arterial's geometry and surface expression so that 40 km/h feels natural rather than imposed.

#### 3.1 Cross-section geometry

A slow-speed arterial typically comprises two single traffic lanes, one in each direction, separated by a central median of 1 to 2 metres. The narrowness of the carriageway is deliberate. A 3.0 m (kerb-to-kerb) lane width establishes an appropriate design speed of roughly 40 km/h while maintaining sufficient operational flexibility for buses and freight vehicles. The close proximity of vertical elements (kerbs, trees, or buildings) creates side friction that naturally moderates driver speed and removes the need for vertical deflection.



Figure 2: Example of slow speed arterial (source: Cyclomedia)

To ensure continuous vehicle flow and enable safe cycling, this type of arterial road requires separated cycle facilities, preferably as one-way paths on both sides of the carriageway. Widths of 2.0-2.5 m ensure that cyclists can pass each other comfortably while remaining physically separated from traffic. The cycle track is typically buffered from and raised above the roadway but below the footpath, reinforcing its intermediate status in the hierarchy of movement.

Footpaths of at least 2.0 m provide room for walking, mobility devices, and street furniture. Planting strips or rain gardens between cycleway and roadway serve both aesthetic and drainage functions, absorbing runoff and visually narrowing the perceived width of the corridor.

### 3.2 Central median and spatial definition

The central median is more than a separator; it is a behavioural device. Its continuity removes any opportunity for overtaking, shaping driver expectations of steady, unhurried movement. When wide enough (1.5–2.0 m), it becomes a safe refuge for pedestrians and cyclists crossing in two stages. Where space is limited, even a 0.6 m mountable median provides visual definition and removes the option of overtaking and speeding. The cross section below shows how this works in practice. A 3.0 m single vehicle lane, flanked by green space and a separated cycleway and footpath.

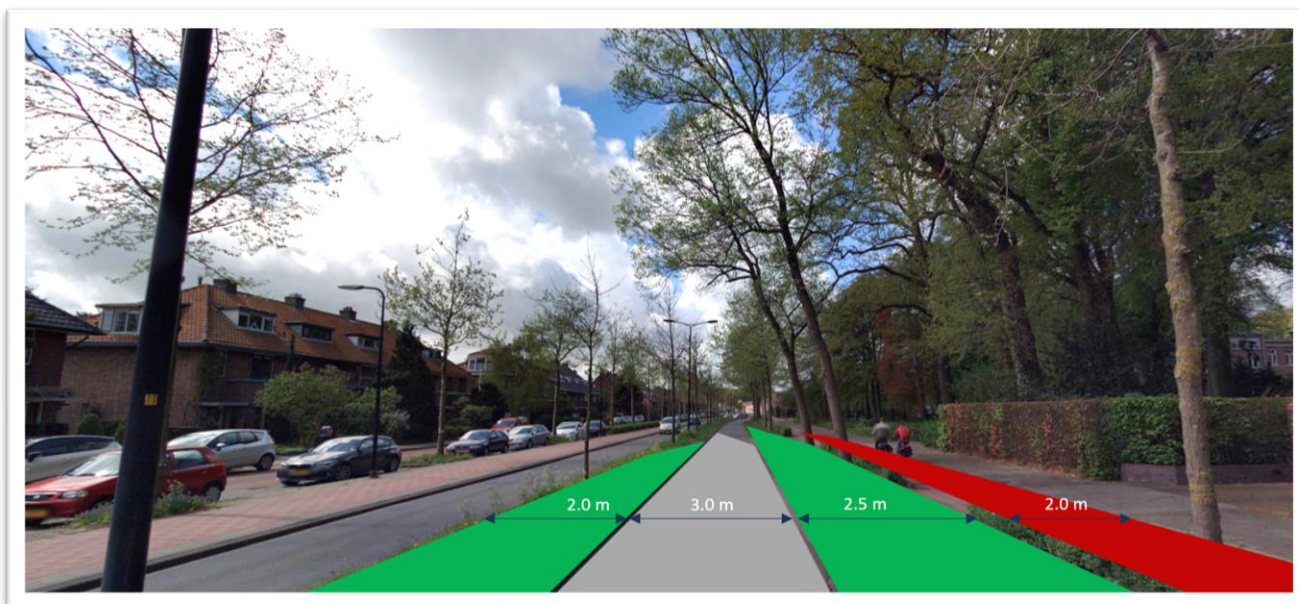


Figure 3: Dimensions of slow speed arterial (adapted by author from Cyclomedia)

Planting within medians softens the corridor and conveys an urban design quality that doesn't exist in conventional four-lane arterials. In the Netherlands, such medians often incorporate infiltration channels or tree pits, integrating stormwater management with speed control. In New Zealand, adopting these devices would complement water-sensitive design practices, helping meet both road safety and environmental targets. Planting strips between cycleway and roadway can incorporate spaces for bin collection points to ensure accessibility even on rubbish pickup days.

### 3.3 Intersections and crossings

Intersections are the critical points of conflict on any arterial. In the slow-speed model, their design prioritises simplicity and predictability over throughput. Dutch engineers typically avoid multi-lane layouts; instead, they rely on compact geometry and priority control to reduce conflict points. Secondary streets yield to the main road, while median refuges allow crossing in two stages, which

greatly simplifies the crossing for pedestrians and cyclists.

At mid-block locations, pedestrians generally yield to cars, however, their crossing distances are short and reduced vehicle speed (through horizontal deflection) enables easy crossings. The narrow lane width ensures a total crossing distance of approximately 6 metres, with a refuge in the centre.

Intersections with other arterials are generally executed as roundabouts (with protected walking and cycling facilities). For minor streets (and major driveways), an oblong staggered priority junction is implemented, anecdotally called a kidney bean intersection. This intersection type allows for easy turning movements across traffic at a reduced speed, while maintaining a rhythm of movement. For residential driveways, either a limited access (left-in, left-out) configuration is utilised, or alternatively a small gap in the median is created to allow full movement.



Figure 4: Oblong staggered left turn with separated cycleways. (source: Cyclomedia)

### 3.4 Speed management through geometry

In conventional New Zealand arterials, speed control on arterial roads is limited and depends largely on raised platforms. In contrast, Dutch arterials embed speed management into geometry. Narrow lanes, short sight distances at crossings, and horizontal deflection an “optical flow” effect: drivers continuously read the environment and self-regulate speed.

The objective to create clusters of vehicles driving at a consistent speed. Some drivers will choose to drive at 40 km/h and thus create a small peloton of drivers behind them (see figure 5), leaving regular gaps for pedestrians and cyclists to cross the road. If all vehicles travelled at the same low speed, crossing opportunities would paradoxically diminish. The art of design lies in maintaining slight variability within safe bounds.

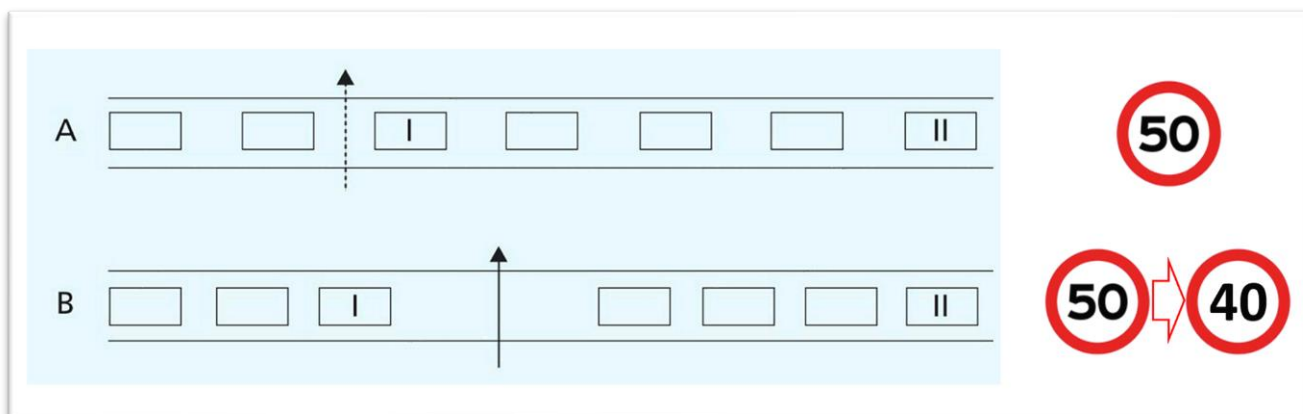


Figure 5: If some drivers reduce speed, gaps are created (source: CROW)

### 3.5 Materials, surface treatments, and drainage

The Dutch safe systems approach (“Duurzaam Veilig”, which translates as Sustainable Safety) relies heavily on material choices reinforcing functional hierarchy (SWOV Institute for Road Safety Research, 2018). Smooth asphalt denotes movement; brick pavers, indicate residential streets with a lower speed limit. The Dutch employ contrasting materials not merely for beauty but as highly intentional tools of communication: texture, colour, and sound together convey where users belong and what kind of behaviour is expected of them. In this context, parking bays are often executed in bricks, while arterial roadways are asphalt. Cycleways are in red asphalt, while footpaths utilise grey concrete pavers.

Prefabricated kerbs and medians enable precise alignment and efficient construction and maintenance. Drainage is managed via stormwater drains embedded in the kerb or drainage pits in the channel. This ensures a clean carriageway edge and preventing ponding. Integrating water-sensitive design features like permeable pavement in the parking bays, bio-filtration planting in the buffer zones supports climate-resilient infrastructure while reinforcing side friction.

## 4. TRANSLATING THE MODEL TO THE NEW ZEALAND CONTEXT

Adapting these principles to New Zealand requires both physical and institutional translation. The geometry that produces self-explanation in the Netherlands must be reconciled with our regulatory frameworks, engineering practices and land-use patterns.

### 4.1 Policy and regulatory alignment

New Zealand’s road safety objectives (Ministry of Transport, 2024) acknowledges the connection between road design and safety, but defaults to more traditional “highway engineering” style of road safety. The document also acknowledges speed as an important factor, but reverts to enforcement as the key driver of compliance. It is important to work within this framework, but the angle for innovation is unlikely to be found within the current road safety objectives.

The *One Network Framework* categorises roads by their “movement and place” functions (Waka Kotahi NZ Transport Agency, 2023). This provides a natural entry point for slow-speed arterials, which sit at the interface of high movement and high place value. We need to move towards a place where design, not regulation defines the operating speed of a road. This is already common on our motorways, where a higher design speed recently resulted in a higher legal speed limit. The same principle should be applied the other way around for our low volume arterials, where a lower

design speed can (but does not have to) result in a lower legal limit.

The *Speed Management Guide* supports context-based speed setting but stops short of prescribing form. Integrating a self-explaining geometry (based on limited lane width, materials usage and side-friction) into this document would bridge the gap between regulatory intent and engineering practice (Waka Kotahi NZ Transport Agency, 2022). Furthermore, the *Road to Zero* strategy's Safe System principles already included "acknowledging human error" and "promoting forgiving design" (Waka Kotahi NZ Transport Agency, 2020). These principles are largely based on the Dutch Sustainable Safety principles and thus align seamlessly with the slow-speed arterial philosophy.

#### **4.2 Urban form and access management**

There are clear and obvious differences between the Dutch and New Zealand urban form. The key one is access management. Dutch cities consist largely of town-house developments without off-street parking, removing the need for driveways. Most eligible New Zealand corridors have very frequent driveways and high vehicle volumes. Achieving continuous medians might thus be difficult, however that should not deter us from implementation. The benefits of this street typology are still significant without a continuous and wide central median, the number of eligible streets might be limited though. The number of driveways that need to cross the median can be reduced through consolidation of access. Shared driveways, service lanes, and right-in/right-out restrictions can substantially reduce conflict points without eliminating access.

#### **4.3 Design standards and materials adaptation**

While Dutch standards favour compactness, New Zealand engineers often consider larger design vehicles. Mountable medians, reinforced pavements at bus stops, and drainage designed for heavier rainfall will ensure resilience. The added cost of roadway construction can be reduced through the use of prefabricated kerbs, and the long term maintenance of this type of street will be reduced. There are very limited road markings required, the total square meterage of asphalt is significantly reduced and the better safety profile will yield high societal benefits.

Colour differentiation should align with New Zealand's visual environment: subtle earth tones rather than bright bricks, subtle green instead of red asphalt and using native planting in the green areas. The goal is to preserve the behavioural logic of Dutch design while expressing a distinctly New Zealand identity.

#### **4.4 Community and political acceptance**

Public resistance to lower speed limits often stems from a perception of lost efficiency. However, this street typology can retain a 50 km/h legal speed limit thus removing this barrier. It does require a public campaign to demonstrate that slow can be fast. Removed traffic signals, more continuous flow and less erratic driving are clear benefits that need to be communicated to stakeholders and the general public. Pilot corridors should measure journey-time variability, not just mean speed. Communications should emphasise smoother flow, safer crossings, and improved access to local businesses.

Political acceptance will depend on reframing success metrics: from throughput per lane to person-throughput, safety outcomes, and user satisfaction. Councils that adopt this broader lens can build public trust in design-led change.

## **5. RECOMMENDATIONS**

To enable successful implementation of slow speed arterial and collector roads, we need a multi-

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level approach and collaboration between New Zealand local authorities, NZTA and the transportation design industry. This section outlines the key steps towards implementation.

## 5.1 Pilot project

The first step is to identify a potential trial site. Ideally a low-risk environment with relatively low (<10,000 AADT) traffic volumes and lower political risk. There are plenty of standard width collector roads that would fit this description. This pilot project should coincide with a planned road renewal project to enable full road reconstruction.

This pilot project should include a significant (before and after) data collection and capacity building effort between the consulting engineers and urban designers to ensure a coherent design and solid evidence base for future iterations.

The pilot project should aim for a proper road reconstruction instead of using quick-build materials. As this design philosophy relies heavily on engineering, it is valuable to test a well designed version of the street, and not a watered down compromise.

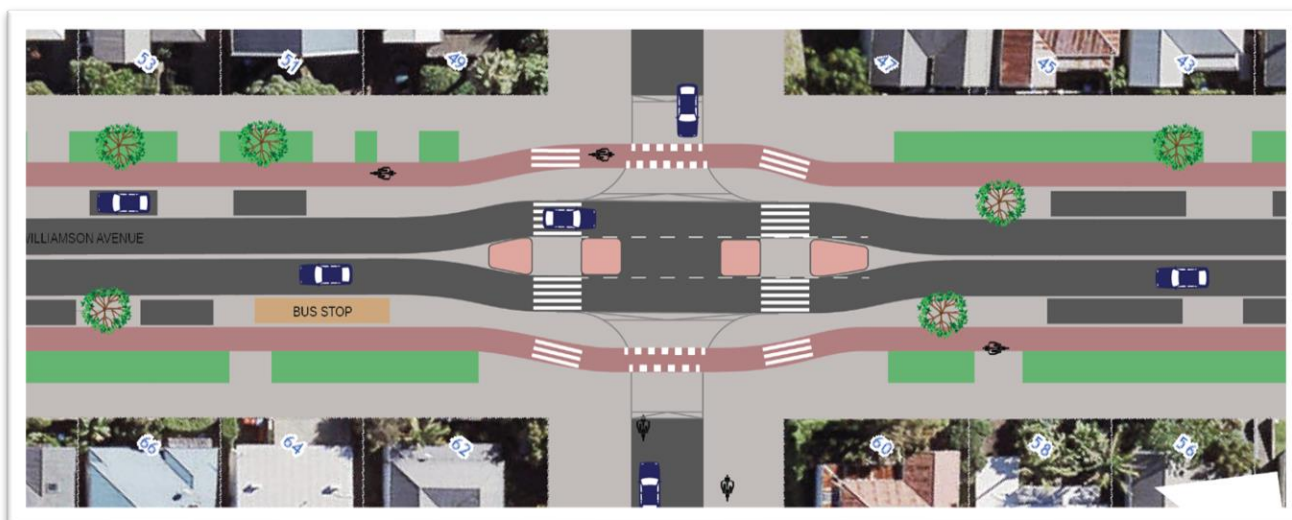


Figure 6: Slow speed arterial concept design for Williamson Avenue in Auckland (source: by author)

## 5.2 Data collection and evaluation

Evaluation must move beyond compliance-based audits toward performance-based and behavioural metrics. Key indicators include:

- **Speed consistency:** standard deviation of vehicle speeds rather than average speed.
- **Cluster formation:** time gaps between platoons and availability of crossing opportunities.
- **Crash rate reduction:** particularly pedestrian and cyclist injury severity.
- **Mode share and accessibility:** changes in walking and cycling volumes.
- **Public perception:** surveys assessing comfort, safety, and local economic impact.
- **Emissions profile:** Air quality monitors should be set up along the corridor to evaluate the impact on air quality.

- **Crossability:** Perceived and actual difficulty to cross the road should be measured.

Data should be collected before, during, and after implementation to enable longitudinal analysis. The results will form the evidence base for nationwide roll-out and inclusion in design standards around the country.

### 5.3 Professional capacity and governance

Designing self-explaining arterials requires interdisciplinary collaboration among traffic engineers, urban designers, behavioural scientists, and landscape architects. Professional development programmes, perhaps delivered through NZTA and Engineering New Zealand, should build literacy in these design principles.

Governance models must ensure consistency across jurisdictions. A national advisory panel comprising central and local government representatives, academia, and practitioners could oversee pilot evaluation, knowledge transfer, and updates to design guidance.

### 5.4 Public communication and long-term vision

Public communication is a core component of success. The design paradigm is inherently counter intuitive for some people and messaging should thus emphasise the importance of consistent movement over maximum speed. Demonstration projects should use clear signage and on-street information to explain intent.

In the long term, the vision extends beyond safety. Slow-speed arterials can support housing intensification, public-transport reliability, and urban regeneration. By 2035, they could become a defining feature of New Zealand's urban identity: streets that move people efficiently while enriching the places they pass through.

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