



Pacific Region Infrastructure Facility



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WORLD BANK GROUP

ARUP

Key Lessons Learned and Insights from Safe and Healthy Streets for Walking and Biking in Tonga Applicable to the Pacific

May 4th, 2026



PRIF Community of Practice Webinar 26

More Walking and Cycling for More Livable Pacific Cities

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Agenda

- *Common Active Mobility Issues*
- *Key Problems from Lack of Active Lifestyles*
- *Tongatapu Walk/Bike Study – Key Activities*
- *Surveys & Data Analytics from Tonga Case Study*
- *Vision/Plan and Indicative Investment Costs*
- *Thematic Packages for Marketing*
- *Donor Meeting for Collaboration*
- *Key Lessons Learned for Pacific Cities*



Common Active Mobility Issues Faced by Pacific Cities



Discontinuities (Narrow/No Sidewalk, Unpaved Road, etc.)



Unfriendly Walk Environment (Parked Vehicles, Limited Shading, etc.)



High Operating Speeds (40–60 km/h) in Town Center and Near Schools



Dark Streets with Poor Visibility



Lack of Visible Zebra Crossing, Signages, etc.



Access-for-All Facilities (Ramps for Wheelchair Users, etc.)

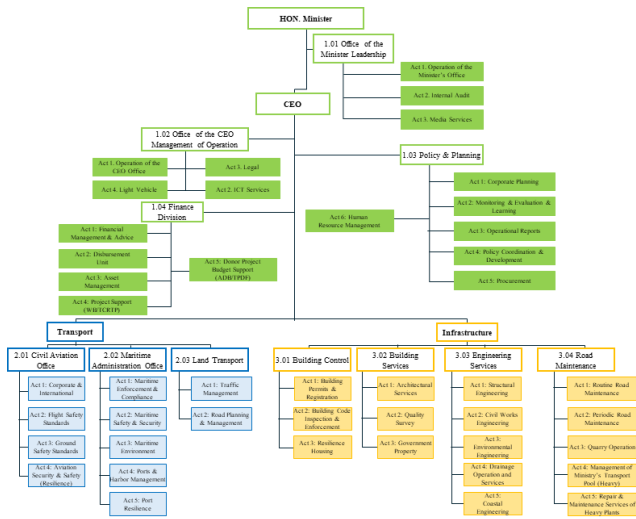


Drainage & Flooding



Stray Dogs

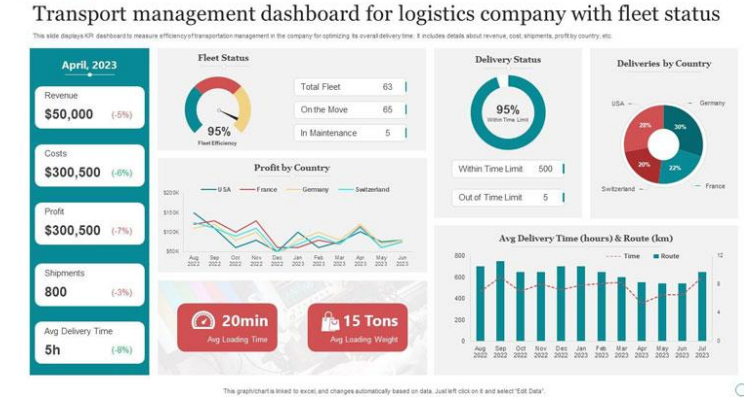
Common Institutional Issues Faced by Pacific Cities



Fragmented Institutional Arrangements Impacts Active Mobility Infrastructure Provision and Maintenance Practices



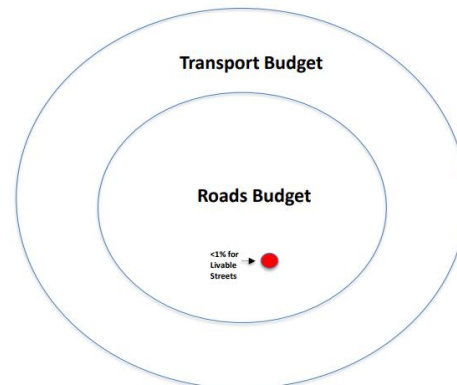
Inconsistent Adoption of Street Design Guidelines in Practice



Lack of Digitized Monitoring or Analyses to Improve Blackspot Areas



Lack of Dedicated Team for Active Mobility



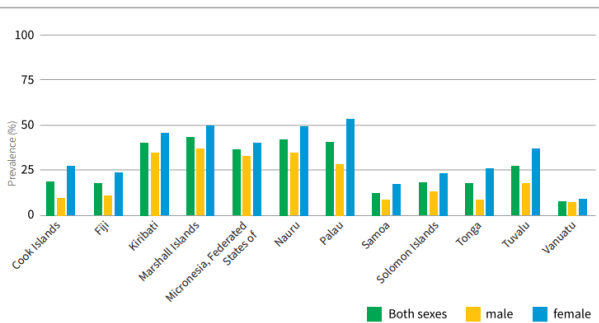
Limited Fund for Active Mobility Improvements



Lack of Coordination between Donors Related to Active Mobility Elements

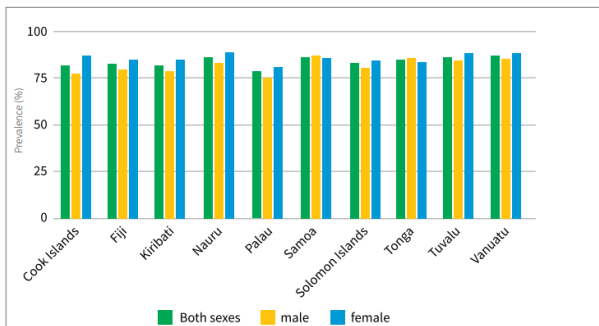
Key Problems from Lack of Active Lifestyles

1. Lack of Physical Activities



* Insufficient physical activity for adults is less than 30 minutes per day at least five days per week (or less than 150 minutes per week).
Source: World Health Organization (5).

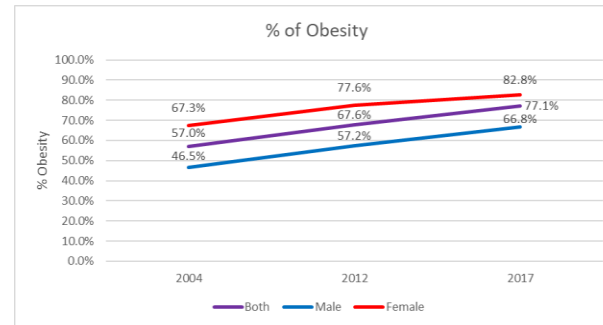
Insufficient Physical Activities – Adults



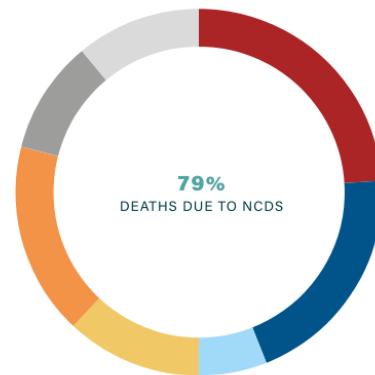
* Insufficient physical activity for adolescents is less than an average of 60 minutes per day.
Source: World Health Organization (5).

Insufficient Physical Activities – Youth

2. Public Health Crisis



High Obesity Rates

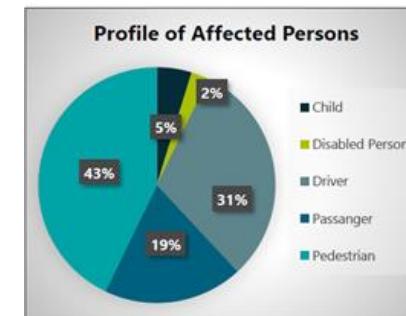


Deaths Due to NCDs

3. Car-Oriented Culture



Reliance on Private Vehicle



Safety and Crash Risk



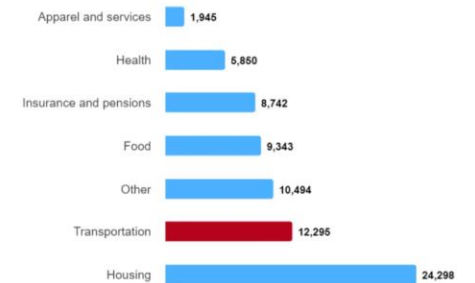
Emissions

4. Economic & Social Impact



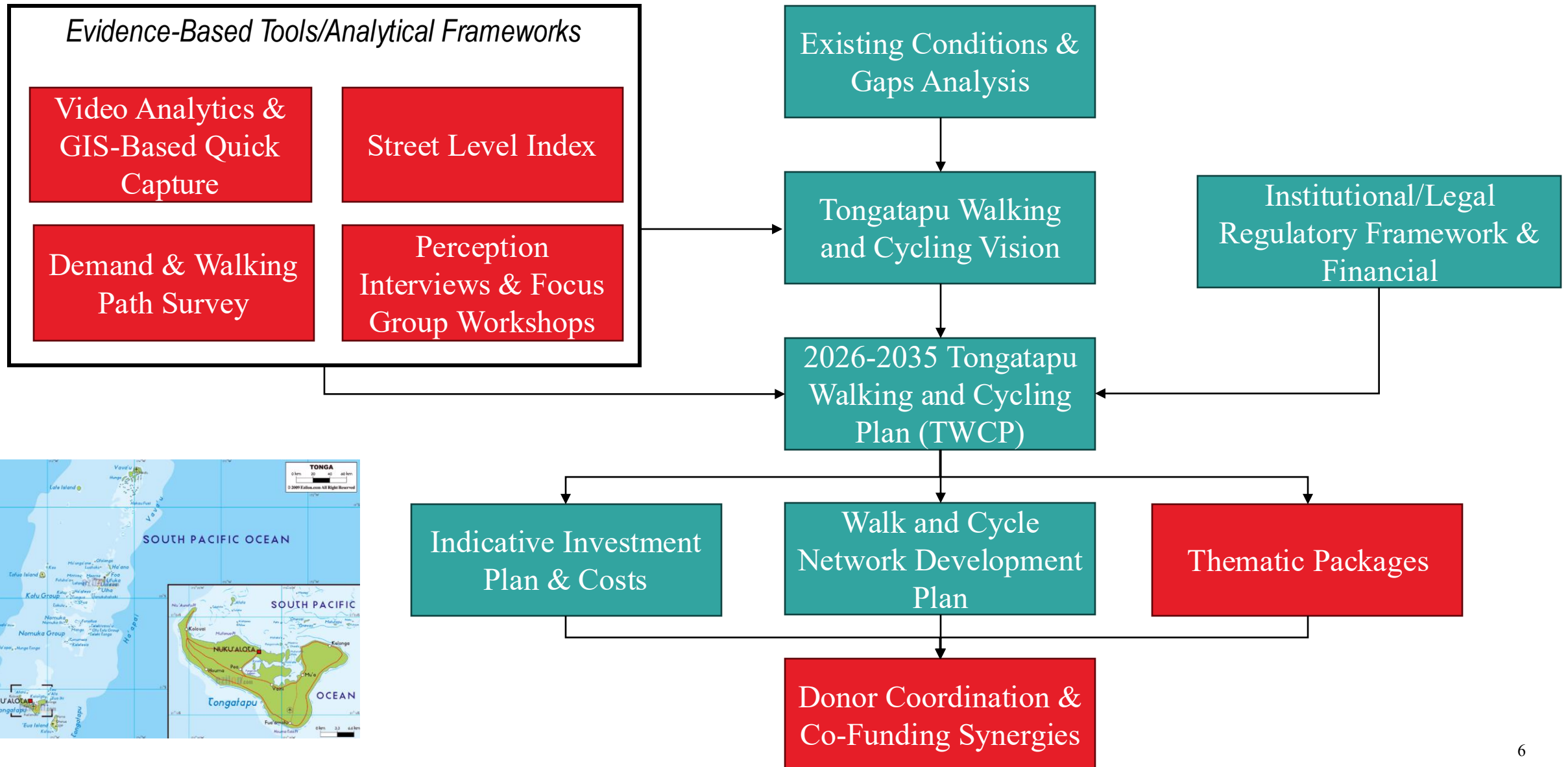
Fuel Price Increase

Average Household Expenditures, 2022



Higher Household Costs for Transport

Tongatapu Walk/Bike Study – Key Activities

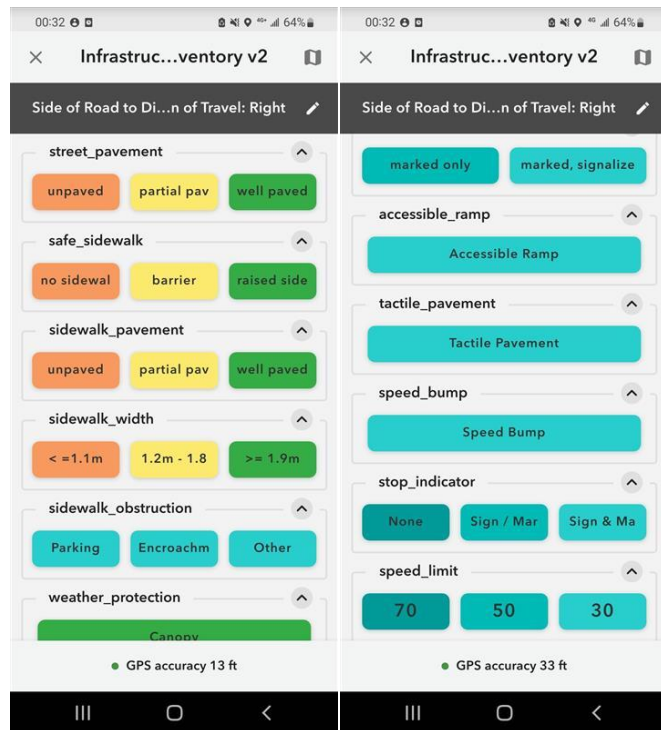


Video Analytics & GIS-Based Quick Capture



Infrastructure Inventory:

- Surveyed over 85+km of island roads and all urban streets in Nuku'alofa
- Recorded 13+ infrastructure conditions including road pavement/type, sidewalk conditions/width, street amenities (canopy, trees, streetlights), obstructions, crossing conditions/signages, traffic calming, etc.



Sidewalk Type



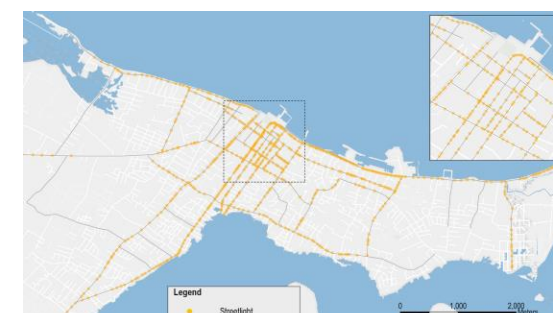
Sidewalk Width



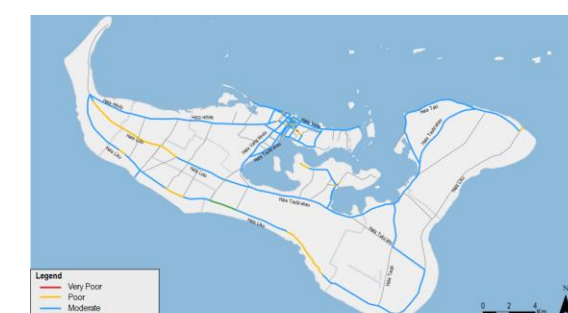
Road Pavement



Obstructions



Streetlight



Road Conditions

Street-Level Index - Detailed Look at Every Street

Rationale & Use:

- Assess street/block conditions from perspective of a pedestrian or cyclist (14 Factors)
- Sidewalk experience, crossing experience, safety/security, etc.
- GIS-based tool to assess street conditions throughout the city
- Gives indication where/how to prioritize investments



Step 1: Split Streets into Links



Step 2: Assess Conditions with Video Analytics and GIS-Based Quick Capture



Step 3: Pinpoint Attributes in GIS



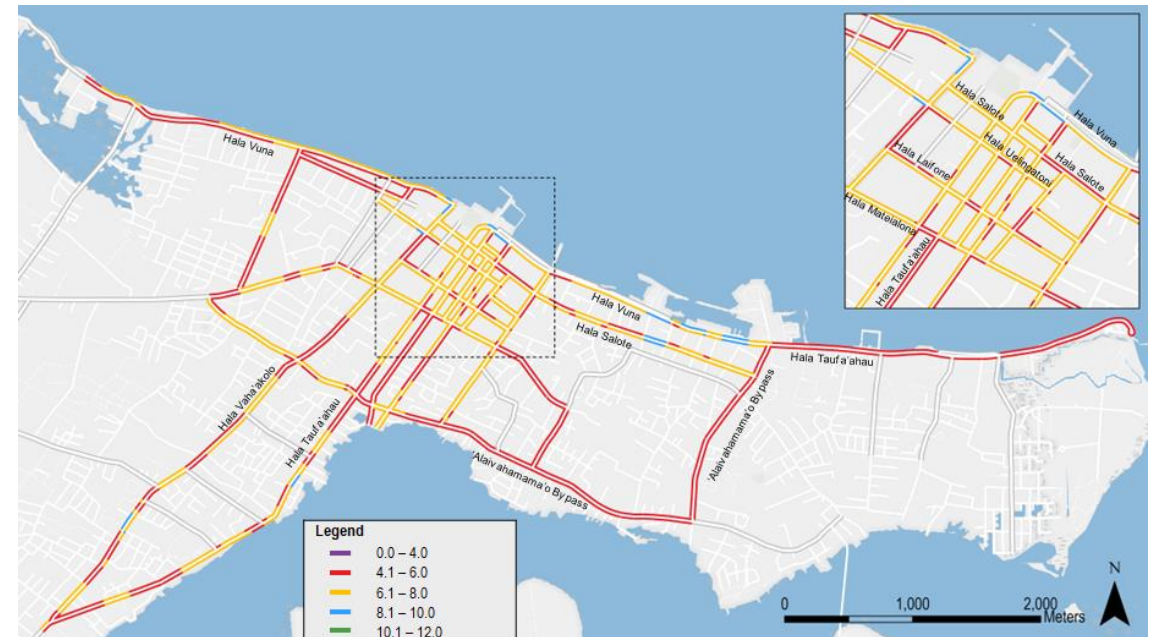
Step 4: Score and Color-Code Individual Metrics

Street Link	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11	Factor 12	Factor 13	Factor 14	Composite Score
Link 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	5.5
Link 2	2	3	4	5	6	7	8	9	10	11	12	13	14	15	6.2
Link 3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	7.1
Link 4	4	5	6	7	8	9	10	11	12	13	14	15	16	17	8.5
Link 5	5	6	7	8	9	10	11	12	13	14	15	16	17	18	10.1

Step 5: Calculate Composite Score in Excel



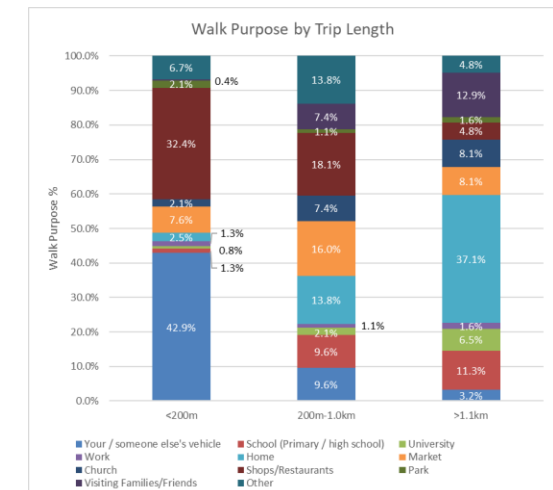
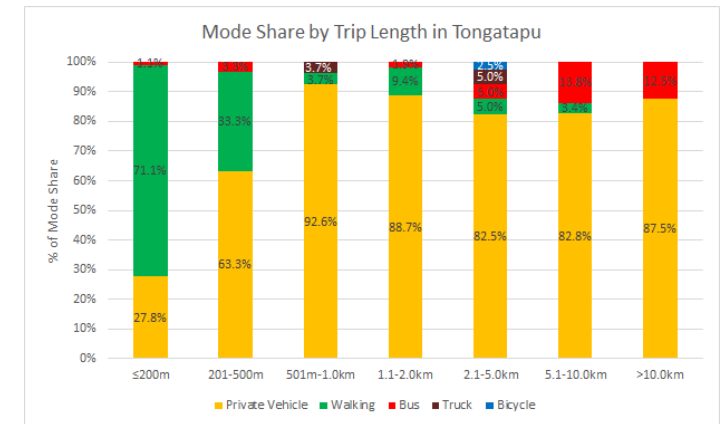
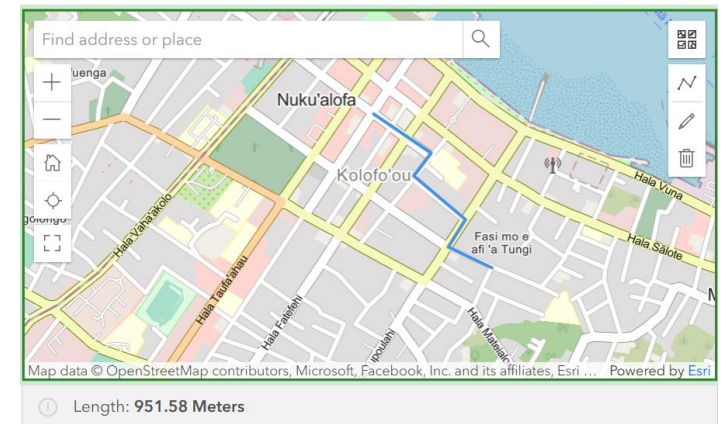
Step 6: Generate Cumulative Street-Level Index and Map



Trip Pattern & Walking Path Survey

Rationale & Use:

- Assess typical walk route in the city to identify specific streets and predominant paths
- 400+ respondents participated to draw their walk itinerary leveraging GIS-based tool
- Dark lines represent more utilized paths



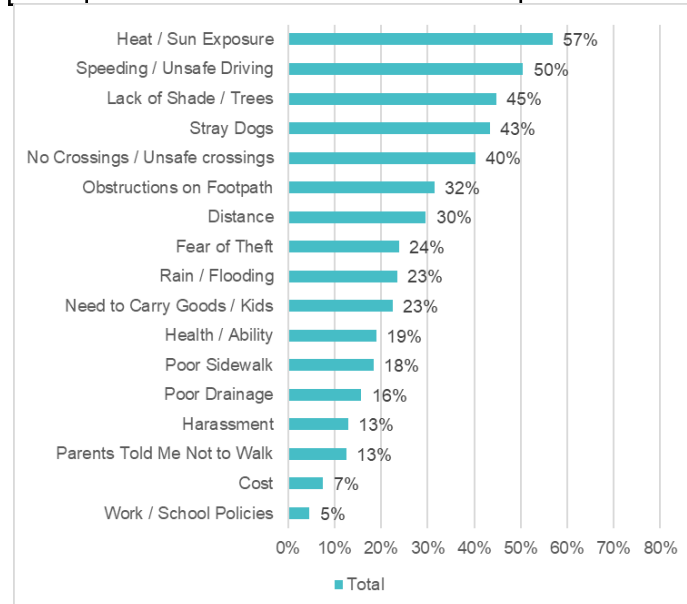
Perception Interviews

Rationale & Use:

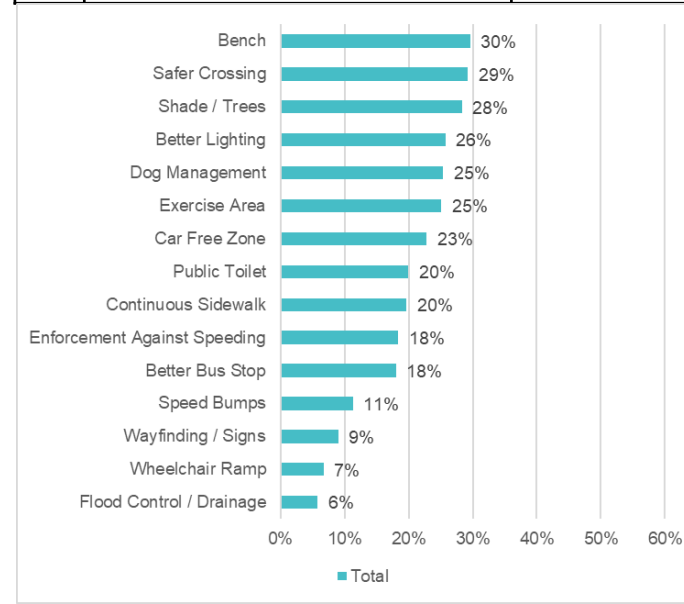
- Understand and quantify subjective user experiences, safety perceptions, and behavioral preferences
- 600+ responses obtained through face-to-face interviews and online questionnaire (both walking and cycling)

Barriers and Desired Improvements (Walking)

#	Barriers (Top Five)	Percentage
1	Heat / Sun Exposure	57%
2	Speeding / Unsafe Driving	50%
3	Lack of Shade / Trees	45%
4	Stray Dogs	43%
5	No Crossings / Unsafe Crossings	40%



#	Improvement (Top Five)	Percentage
1	Bench	30%
2	Safer Crossing	29%
3	Shade / Trees	28%
4	Better Lighting	26%
5	Dog Management	25%



Focus Group Workshops

Rationale & Use:

- Identify key location-specific blackspots from different user groups and include voices from disadvantaged users
- Participants selected preferred solutions from a package of over 20 walk/cycle enhancement options

Student (Tonga High School)



Female



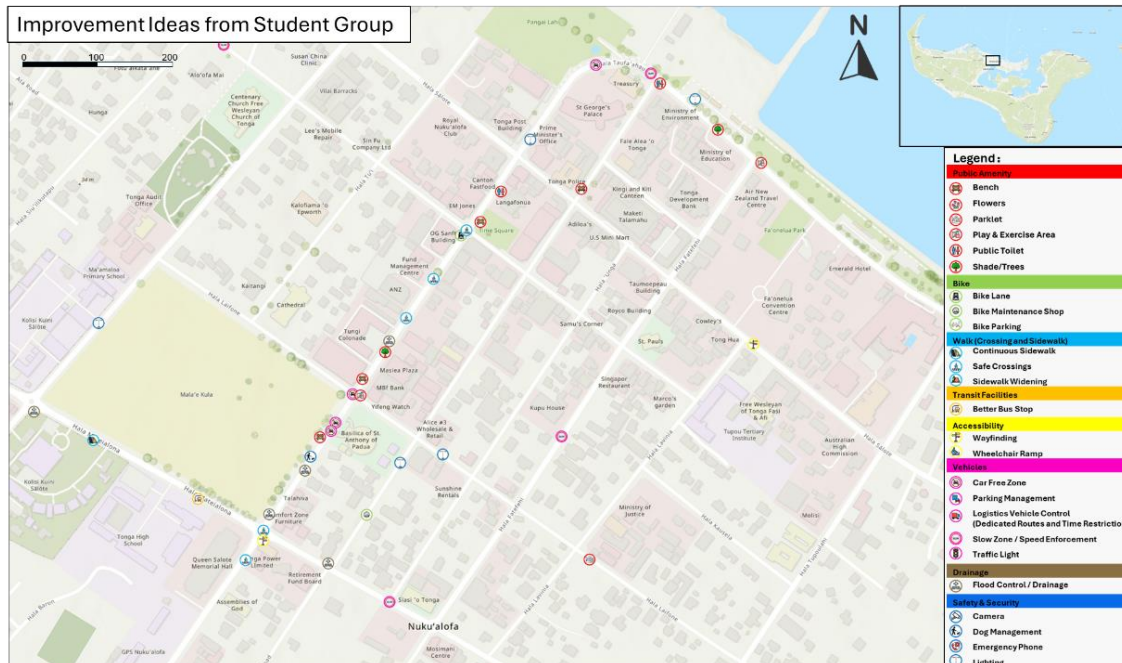
Male



Senior



Disabled



Safe Crossings	Speed Humps	Continuous Sidewalk	Bike Lane	Lighting
Shade/Trees	Bike Parking	Wayfinding	Speed Enforcement	Dog Management
Flood Control / Drainage	Bike Maintenance Shop	Bench	Parklet	Play & Exercise Area
Wheelchair Ramp	Better Bus Stop	Car Free Zone	Public Toilet	Other

Setting of Overarching Vision, Goals, and Objectives **ARUP**

Vision Statement

By 2035, Tongatapu will be a people-first island where walking and cycling are the safest, easiest, and most enjoyable ways to move – connecting communities, schools, and landmarks through climate-resilient streets that empower every person to travel freely and foster active and healthy lifestyles.



Six Overarching Goals

- **Goal#1: People-Centric** – *Creating continuous, comfortable, and connected active mobility network that put people first*
- **Goal#2: Safe & Inclusive** – *Designing safe and inclusive streets that make walking and cycling feel safe day and night*
- **Goal#3: Healthy & Active** – *Encouraging walking/bike as healthy and attractive choices to foster healthy lifestyles*
- **Goal#4: Resilient** – *Future-proofing streets against natural hazards and climate change impacts*
- **Goal#5: Vibrant & Sustainable Tourism** – *Creating showcase walking and cycling corridor/routes that strengthen Tonga's tourism brand*
- **Goal#6: Enabling Institutional Framework** – *Creating an enabling framework to facilitate and encourage active mobility*

Indicative Investment Plan/Cost (US\$)

Goal	Strategy #	Strategy	Cost (US\$) by Phase			Total Cost (US\$)
			Short (1-3 Years)	Medium (3-5 Years)	Long (5+ Years)	
Goal 1: People-Centric & Connected Network	1.1.1	• Create Continuous and Protected Walk Network (Including Tactical Urbanism)	30,000	19,670,000	2,160,000	21,860,000
	1.1.2	• Create Bike Priority Network (Including Tactical Urbanism)	30,000	510,000	0	540,000
	1.2.1	• Provide Walk/Bike Amenities to Complement Network (Bench, Toilet)	759,000	0	0	759,000
Goal 2: Safe, Inclusive & Accessible Streets	2.1.1	• Pilot Pedestrian Priority Zones & Slow Streets (Including Tactical Urbanism)	30,000	220,000	0	250,000
	2.1.2	• Low-Speed Zone Implementation (Including Tactical Urbanism)	30,000	520,000	0	550,000
	2.1.3	• Safe Crossing Improvements (Including Tactical Urbanism)	100,000	580,000	1,660,000	2,340,000
	2.2.1	• Integrate Universal Access into Streets and Designs	0	600,000	0	600,000
	2.2.2	• Pedestrian Lighting and Visibility Enhancement	0	2,400,000	0	2,400,000
	2.2.3	• CPTED & Gender-Sensitive Design	50,000	0	0	50,000
	2.3.1	• Enhance Parking Provision and Control System	182,000	50,000	0	232,000
	2.3.2	• Public Awareness & Road Safety Education	0	50,000	0	50,000
	2.3.3	• Dog Control	100,000	0	0	100,000
	Goal 3: Healthy & Active Communities	3.1.1	• Active Travel to School Program (Tactical Urbanism Programs) – Cost for Infrastructure Included in Item#2.1.1 and 2.1.3	60,000	240,000	0
3.1.2		• Active Commuting Initiatives	50,000	100,000	0	150,000
3.2.1		• Bike Ownership & Financial Support Scheme	0	0	0	0
3.2.2		• Community Bike Hub & Training Program (Leverage Existing Shop)	0	10,000	0	10,000
3.2.3		• Bike-Share for Visitors and Locals (Cost Included in 5.2.1)	0	0	0	0
3.3.1		• Open Streets & Wellness Events	50,000	0	0	50,000
3.3.2		• Health Partnership Program	50,000	0	0	50,000
3.3.3		• Create Community Gathering Points (Parklets)	30,000	0	0	30,000
Goal 4: Climate-Resilient Streets	4.1.1	• Flood-Resilient Path Design Standards	0	0	0	0
	4.1.2	• Create All-Weather / All-Year Network (Road Resurfacing)	0	0	0	0
	4.1.3	• Flood-Resilient Paths (Waterfront)	0	0	2,090,000	2,090,000
	4.2.1	• Island Shading & Cooling Program (Trees)	0	180,000	0	180,000
Goal 5: Vibrant & Sustainable Tourism	5.1.1	• Waterfront & Heritage Walk Loop (Memorial/Historical Plaque)	78,000	0	0	78,000
	5.1.2	• Island-Wide Cycling Trails (Wayfinding Signage, Cultural Plaques, Rest Areas)	0	200,000	0	200,000
	5.2.1	• Bike-Share for Visitors and Locals	0	550,000	0	550,000
	5.2.2	• Active Tourism Marketing & Events	0	0	0	0
Goal 6: Enabling Institutional Framework & Policy Environment	6.1.1	• Establish Active Mobility Unit	0	0	0	0
	6.1.2	• Multi-Stakeholder Working Group	0	0	0	0
	6.2.1	• Update Traffic and Street Design Regulations	0	0	0	0
	6.2.2	• Parking Management & Enforcement Policy	0	0	0	0
	6.2.3	• Funding Mechanisms for Active Mobility	0	0	0	0
	6.3.1	• Active Mobility Monitoring System	0	0	0	0
	6.3.2	• Community Feedback & Innovation Platform	0	0	0	0
	6.3.3	• Capacity Building & Training Program	100,000	100,000	0	200,000
	Total			1,729,000	25,980,000	5,910,000

From Vision/Goals to Thematic Opportunities


 **Goal 1: People-Centric & Connected Network**

 **Goal 2: Safe, Inclusive & Accessible Streets**

 **Goal 3: Healthy & Active Communities**

 **Goal#4: Climate-Resilient Streets**

 **Goal#5: Vibrant & Sustainable Tourism**

 **Goal#6: Enabling Institutional Framework & Policy**

**65+ Actions –
Tongatapu
Walking &
Cycling Plan**

Theme#1: Waterfront Promenade
Multi-use path, streetlights, toilet, etc.

Theme#2: Downtown Active Streets Revitalization
Sidewalk improvements, streetlight, flash beacons, etc.

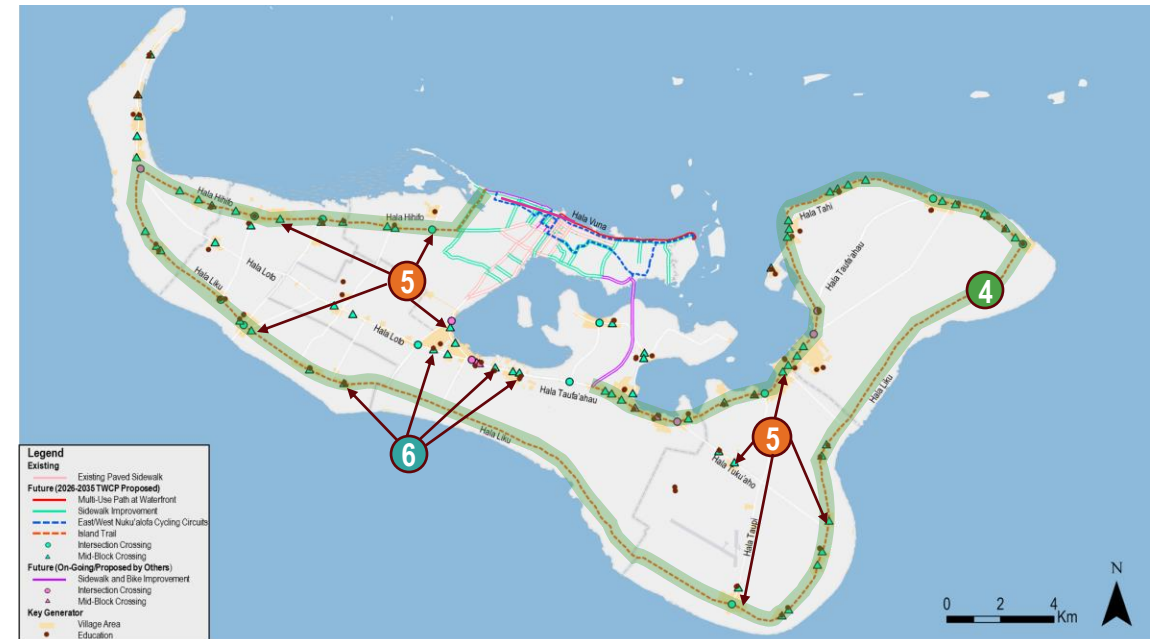
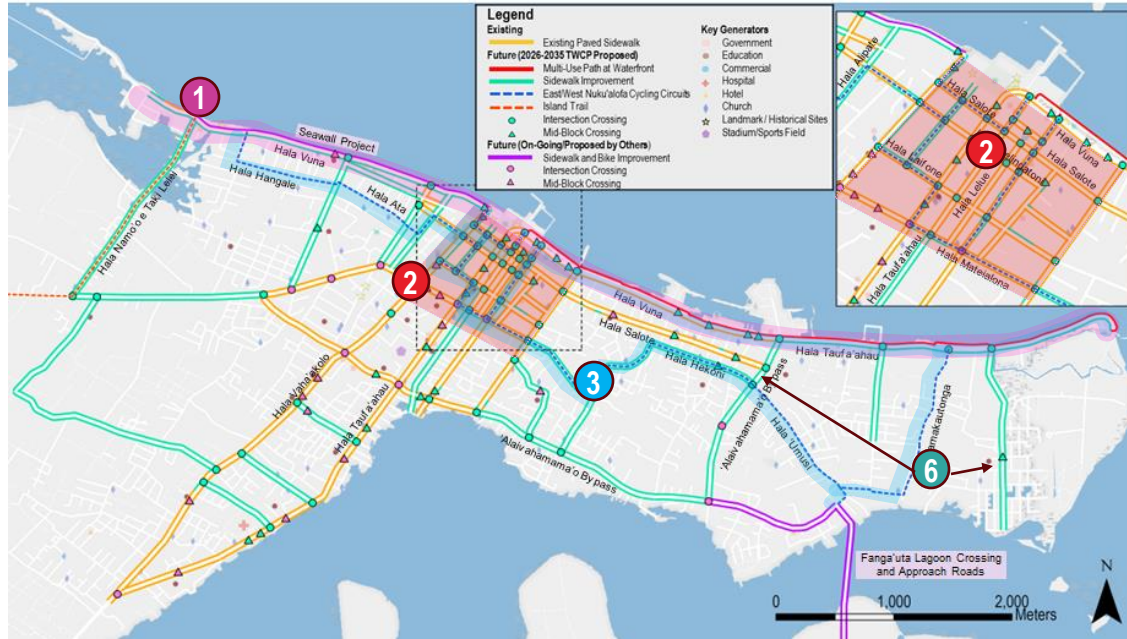
Theme#3: East/West Nuku'alofa Cycling Circuits
Bike boulevards, bike share, etc.

Theme#4: Island Trail
Cultural markers/plaques and wayfinding signs

Theme#5: Rural Crossing Improvement
Flash beacons, streetlight, traffic calming measures

Theme#6: Access to School Safety Priority Zones
Tactical urbanism, safe walking/crossing

Network Development Plan by Theme



- 1** Waterfront Promenade
- 2** Downtown Active Streets Revitalization (Slow Zone, Crossings, Benches, etc.)
- 3** Nuku'alofa Cycling Circuits
- 4** Island Trail
- 5** Rural Crossing Improvement
- 6** Access to School Safety Priority Zones



~5km



~10km



~16km



~84km



~85 locations



~50 locations

Theme#1: Waterfront Promenade



Theme#1: Waterfront Promenade	
Description	Enhancing 5km waterfront multi-use paths
Location	Nuku'alofa waterfront
Cost	US\$2.7 million
Target	Locals and visitors
Agencies	MOI, NSPAO, MOT, MOF, Police, etc.

Major Initiatives

5km 4.0m multi-use path (US\$2M)

Solar pedestrian lights (US\$240K)

New public toilets (US\$240K)

Before - Cross-Section



After - Cross-Section

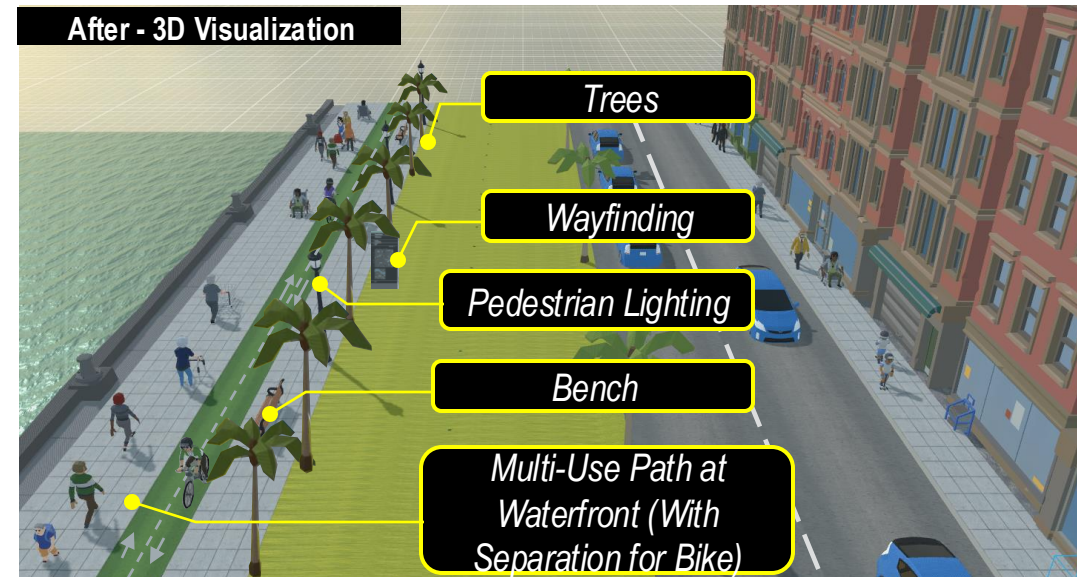


Multi-use path

Before - 3D Visualization



After - 3D Visualization



Solar pedestrian lights



Public toilet

Theme#2: Downtown Active Streets Revitalization

Major Initiatives

53km new / 106km upgrade sidewalks (US\$19.7M)

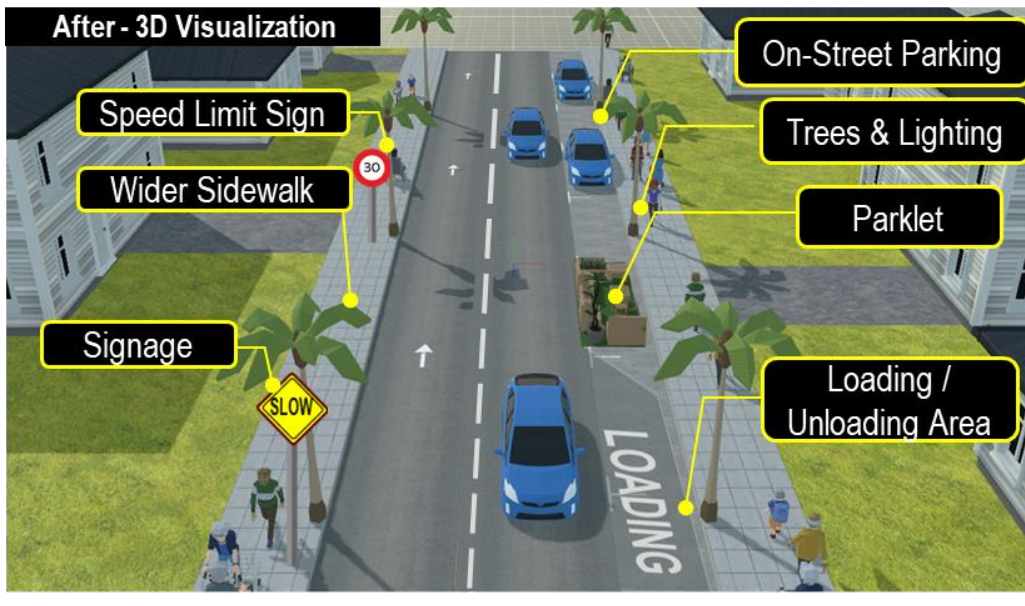
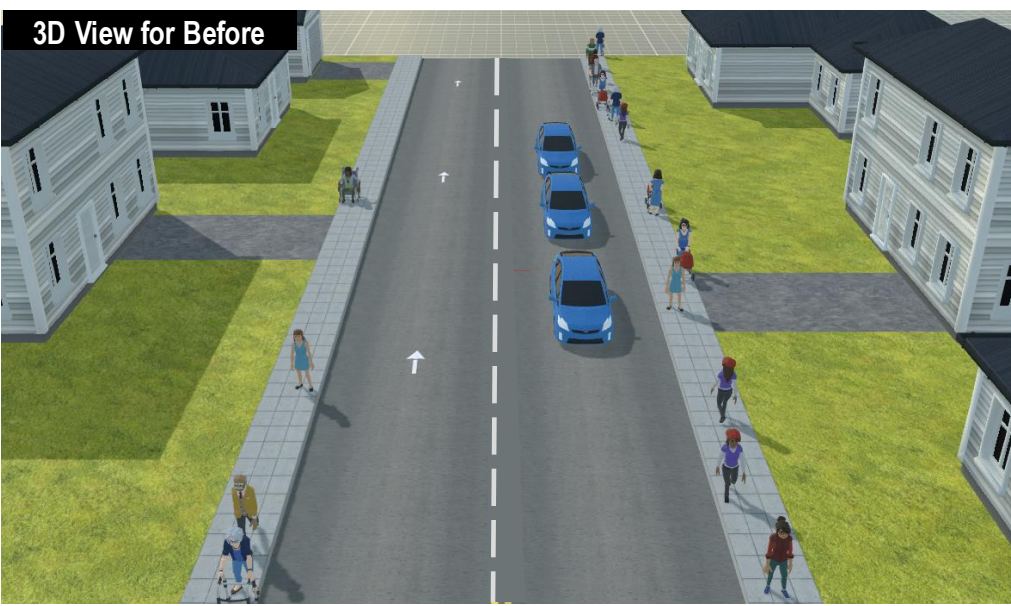
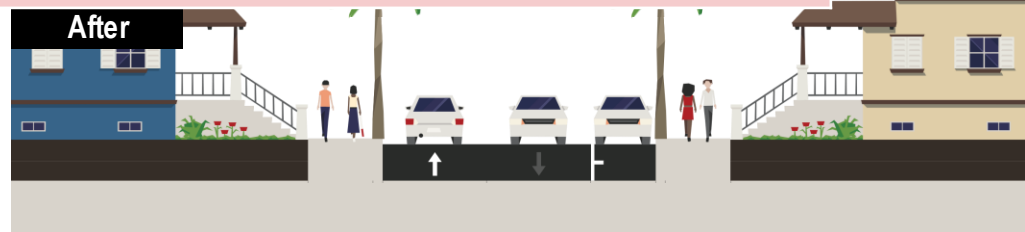
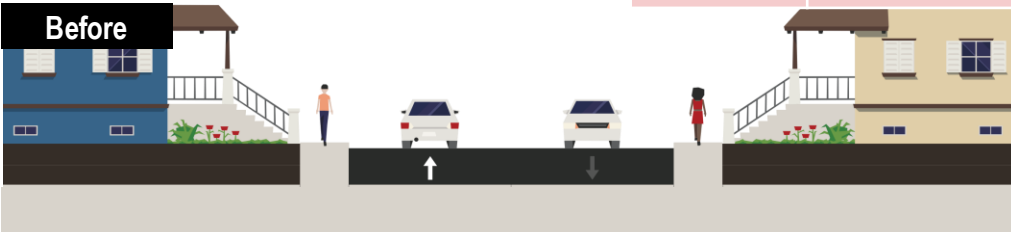
Relocation obstructions (utility poles & trees) from sidewalk(US\$2.2M)

250 pedestrian streetlights (US\$1.2M)

78 upgraded crossings with wheelchair ramps & tactile paving (US\$690K)

Theme#2: Downtown Active Streets Revitalization

Description	Red zone is for low-speed zone only and related signages Revitalize ~160km of Nuku'alofa active streets (including 53km of new sidewalks and 106km of upgraded sidewalks, signages, etc.)
Location	Nuku'alofa
Cost	US\$25.0 million (including sidewalk improvements, low-speed zone, signages, etc. across Nuku'alofa)
Target	Locals and visitors
Agencies	MOI, NSPAO, MOF, Police, etc.



Sidewalk Improvement



Relocation of obstructions

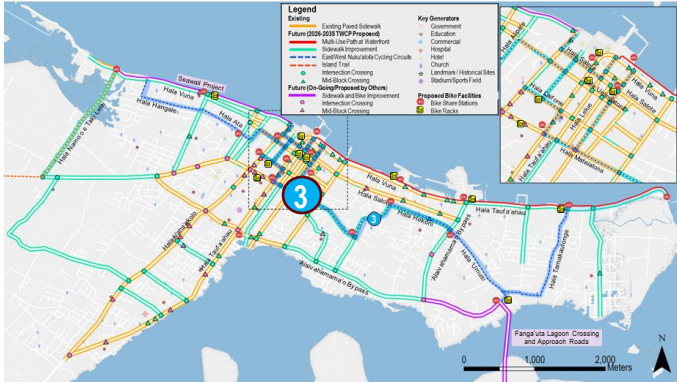


Solar pedestrian lights



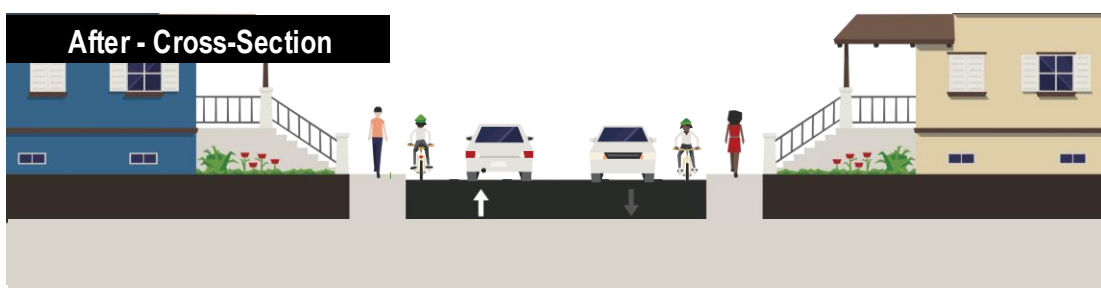
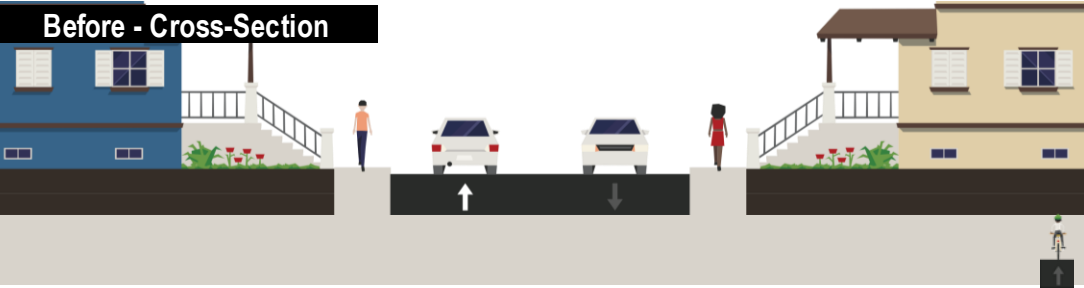
Upgraded crossings

Theme#3: East/West Nuku'alofa Cycling Circuits

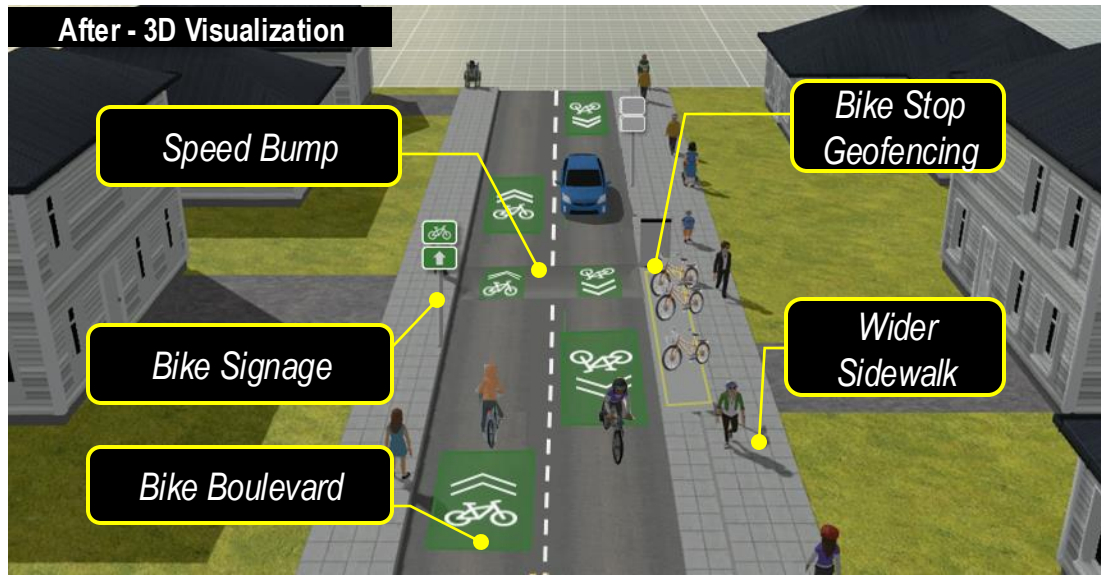
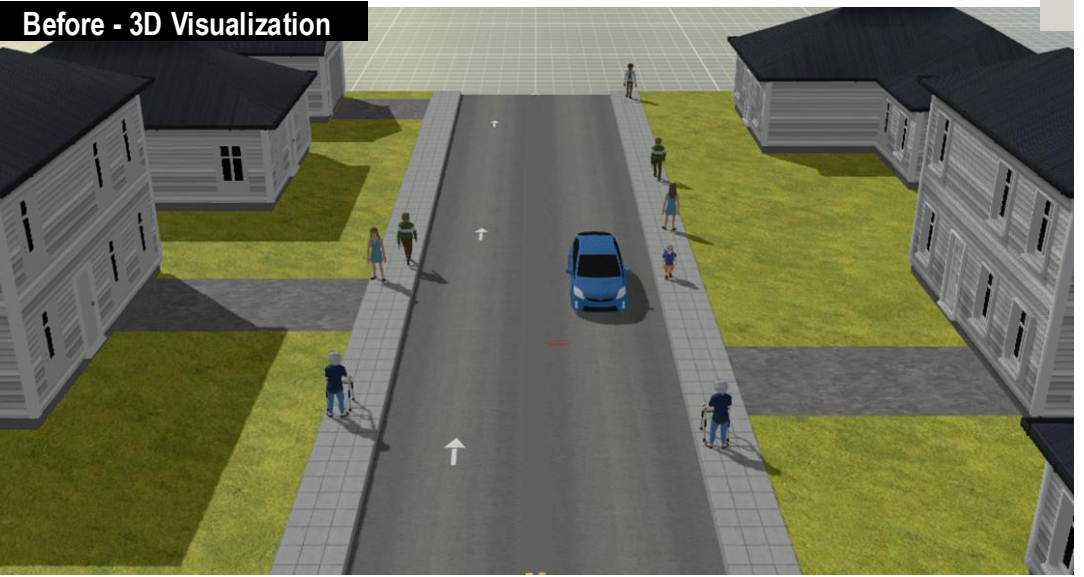


Theme#3: East/West Nuku'alofa Cycling Circuits	
Description	Develop ~11km bike boulevards connecting east and west
Location	Nuku'alofa
Cost	US\$1.4 million
Target	Locals and visitors
Agencies	MOI, NSPAO, MOF, Police, etc.

- Major Initiatives**
- 11km bike boulevard (US\$510K)
 - Bikeshare (100 bikes/20 stations) (US\$490K)
 - New public toilets (US\$240K)



Bike boulevards



Bikeshare



Public toilet

Fatefehi Road (Current)

Fatefehi Road (Envisioned)

Theme#4: Island Trail



Theme#4: Island Trail	
Description	Develop ~84km cycling trail across Tongatapu island
Location	Tongatapu (Rural Areas)
Cost	US\$0.2 million
Target	Visitors and locals
Key agencies	MOI, NSPAO, MOF, etc.

Major Initiatives

Rest pavilions, bike racks, signage & cultural/historic markets (US\$200K)

Before

After



Rest areas



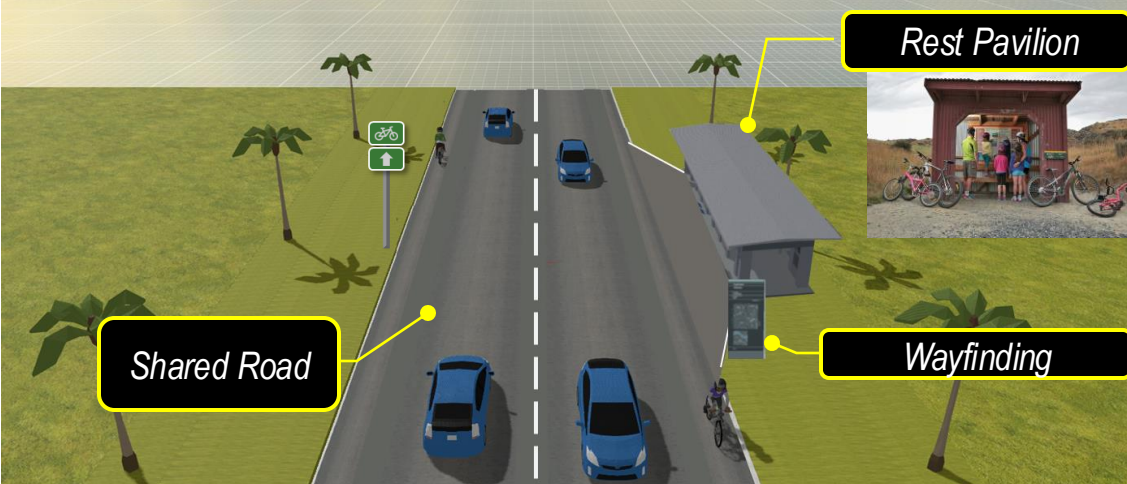
Bike racks



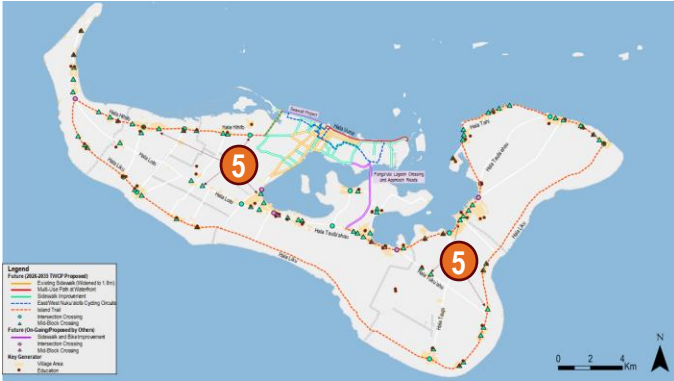
Wayfinding signs

3D View for Before

3D View for After



Theme#5: Rural Crossing Improvement



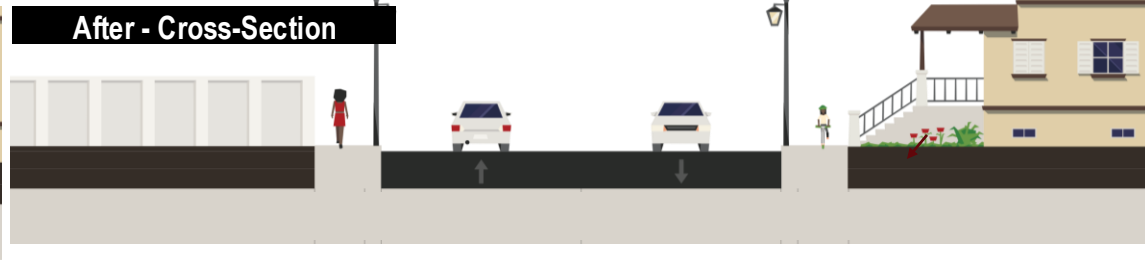
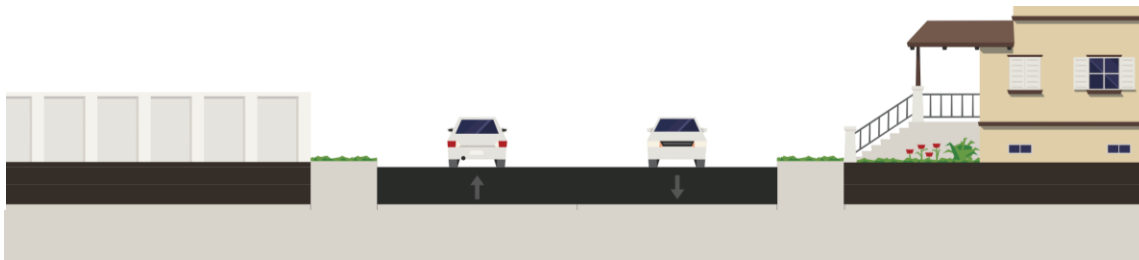
Theme#5: Rural Crossing Improvement	
Description	Improve 130+ crossings across Tongatapu (including near schools)
Location	Tongatapu (Kununuku)
Cost	US\$3.1 million
Target	Visitors and locals
Agencies	MOI, MOF, etc.

Major Initiatives

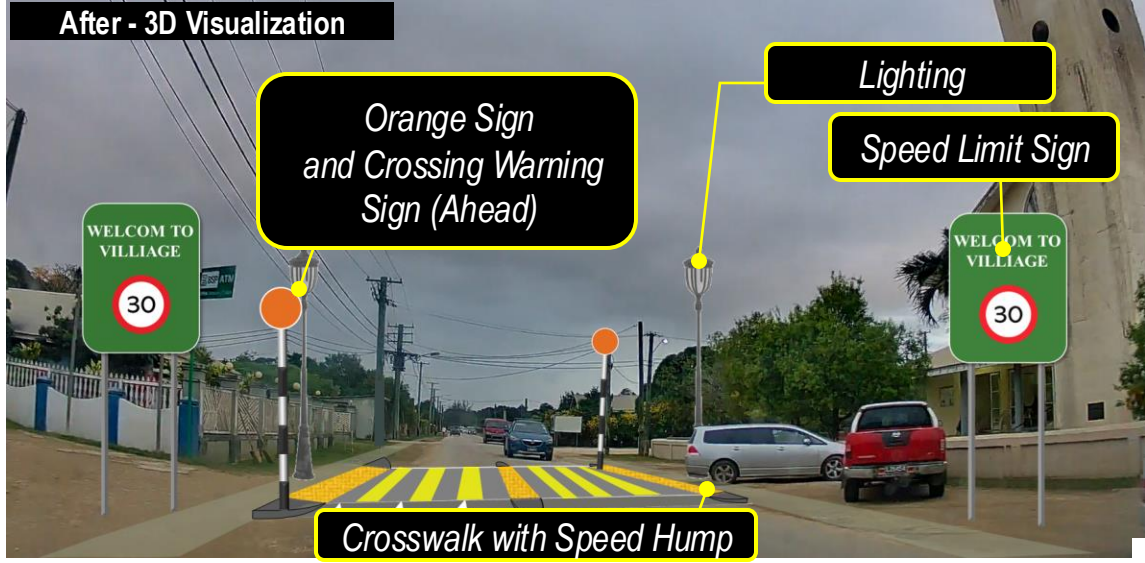
Flashing pedestrian beacon (US\$1.2M)

200 pedestrian streetlights (US\$960K)

Traffic calming at 70 locations (US\$300K)



Flashing pedestrian beacon



Pedestrian streetlights



Traffic calming

Theme#6: Access to School Safety Priority Zones



Theme#6: Access to School Safety Priority	
Description	Create safe crossings zones at 50 schools through tactical urbanism
Location	Tongatapu
Cost	US\$0.3 million
Target	Students
Agencies	MOI, MET, MOF, etc.

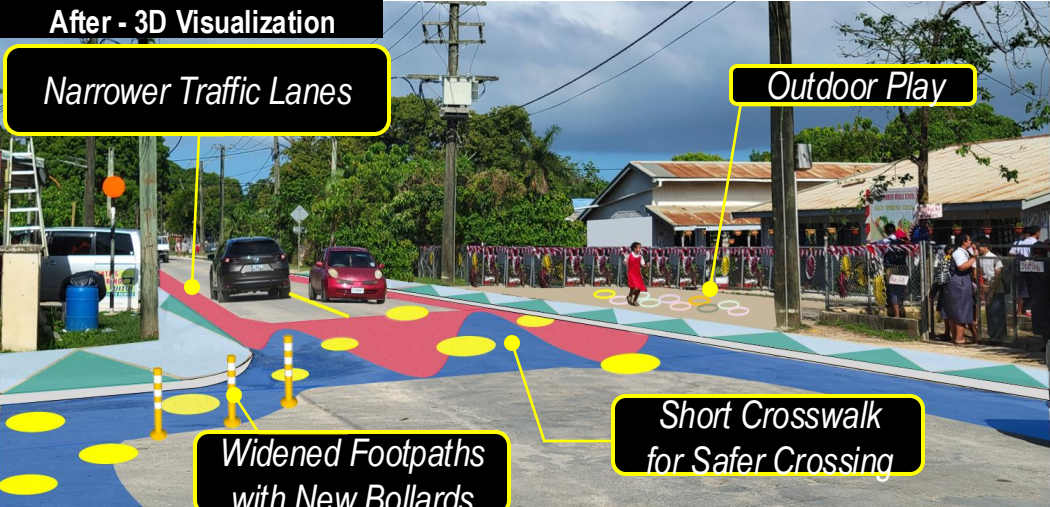
Major Initiatives

Pilot tactical urbanism at 10 locations (US\$60K)

Tactical urbanism at 40 locations (US\$240K)



Examples of Tactical urbanism



Donor Meeting – Identifying Areas of Potential Collaboration



- 12+ relevant transport and infrastructure initiatives by donor
- About 14% of the TWCP cost potential for co-funding
- Identified key partners for synergy and investment opportunities to coordinate multisectoral effort

Theme#1: Waterfront Promenade (US\$2.7M)	5km 4.0m multi-use path (US\$2M)
	Solar pedestrian lights (US\$240K)
	New public toilets (US\$240K)
Theme#2: Downtown Active Streets Revitalization (US\$25.0M)	53km new / 106km upgrade sidewalks (US\$19.7M)
	Relocation obstructions (utility poles & trees) from sidewalk (US\$2.2M)
	250 pedestrian streetlights (US\$1.2M)
	78 upgraded crossings with wheelchair ramps & tactile paving (US\$690K)
Theme#3: East/West Nuku'alofa Cycling Circuits (US\$1.4M)	11km bike boulevard (US\$510K)
	Bikeshare (100 bikes/20 stations) (US\$490K)
	New public toilets (US\$240K)
Theme#4: Island Trail (US\$200K)	Rest pavilions, bike racks, signage & cultural/historic markets (US\$200K)
	Flashing pedestrian beacon (US\$1.2M)
Theme#5: Rural Crossing Improvement (US\$3.1M)	200 pedestrian streetlights (US\$960K)
	Traffic calming at 70 locations (US\$300K)
Theme#6: Access to School Safety Priority Zones (US\$300K)	Pilot tactical urbanism at 10 locations (US\$60K)
	Tactical urbanism at 40 locations (US\$240K)

Key Applicable Lessons Learned for Pacific Cities

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- **Comprehensive process deployed** with evidence-base & outreach initiatives that could also be deployed in other Pacific cities/islands
- Decision-makers best react to **easy-to-understand graphics/charts** – leveraging analytical tools/frameworks such as street-level index
- **Data tools/analytics** applied to Tonga can also be applied to other Pacific cities, although data cleaning & consolidation required
- **Case studies exist in the Pacific (i.e., stray dog management)** – use them!
- **Focus groups** for women & disadvantaged (elderly, disabled, etc.) conducted to ensure buy-in and feedback from all
- **Thematic Packages** well received by key stakeholders – looked at as a “concrete” and marketable outcome easily understood to galvanize support
- Infrastructure is important, but tailoring of **regulatory & institutional frameworks and funding mechanisms needed** (particularly maintenance/monitoring and prioritize active mobility funding)
- **Donor funding and support essential** to identify potential synergy and investment opportunities and ensure multi-sectoral efforts are well integrated and coordinated



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