ACKNOWLEDGEMENT
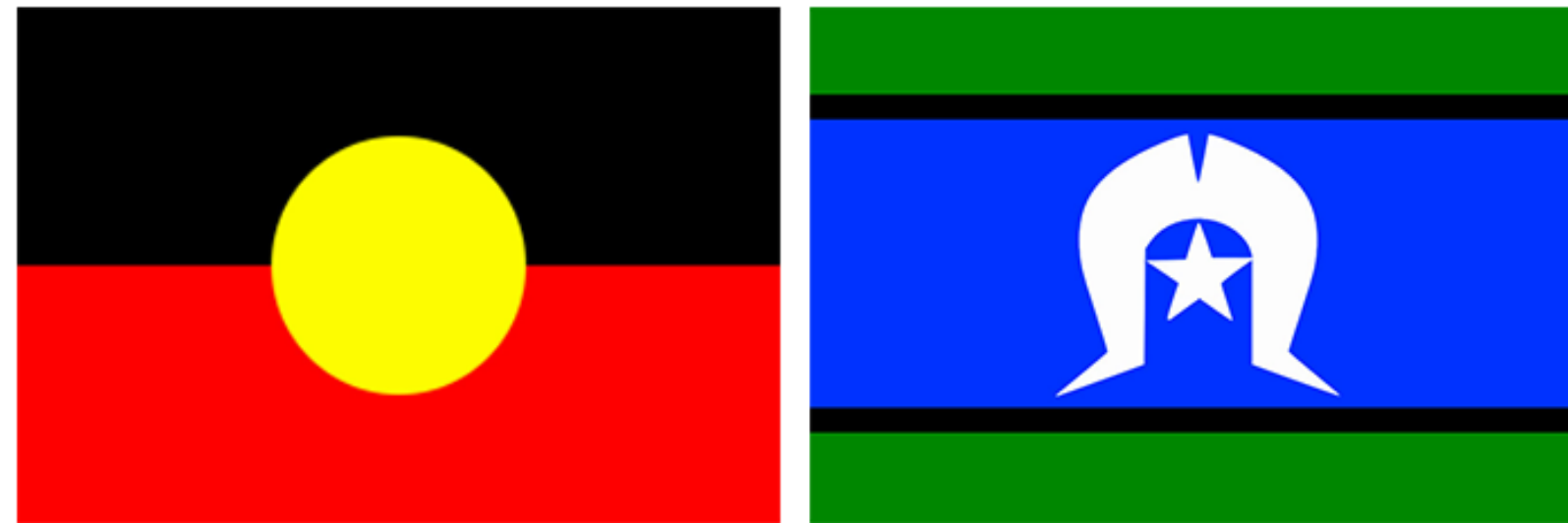
We acknowledge Aboriginal and Torres Strait Islander people as the Traditional Owners of the unceded lands on which we work, learn and live.
We pay respect to Elders past, present and future.

Unlocking Sustainable Urban Solutions for Melbourne

Key Question

How can Melbourne enhance urban mobility, connectivity, and sustainability while addressing traffic congestion and environmental challenges?

Situation

Public Mobility: Frequent delays and disruptions in public transport reduce reliability and frustrate commuters

Private Mobility: Increasing reliance on private cars due to urban sprawl and the prohibition of e-scooters in Melbourne's CBD

Sustainability: Pollution from motor vehicles continues to be a major health and environmental concern

Solution

Eco-Vision Hub
Transforming Fitzroy into a 15-minute city pilot with bike lanes, pedestrian-friendly infrastructure, and community hubs

TrackXpress
A train-integrated logistics system between Southern Cross and Box Hill stations, utilizing existing railways for sustainable goods transport

SmartFlow
A dynamic lane allocation system on the M3 highway from City to Box Hill, reducing traffic congestion by managing lanes based on real-time demand

Melvement App
A sustainability-focused app that rewards residents for eco-friendly actions, from using alternative routes to reducing emissions through energy-generating tiles

Impact

- **Improved Public Health:** Reduced traffic congestion and emissions, leading to cleaner air and healthier communities.
- **Stronger Community Connectivity:** The Eco-Vision Hub and Melvement app foster stronger social ties, with a focus on sustainability and active living.
- **Efficient Goods Transport:** TrackXpress improves the efficiency of goods delivery while reducing road congestion.
- **Sustainable Urban Growth**: SmartFlow ensures a more efficient and environmentally conscious traffic management system, minimizing peak-hour traffic jams and emissions.

Public mobility

1. **Deficiency in reliability and credibility of the public transport system:** Frequent train line disruptions or bus delays usually leads to frustration and complaints (Melbourne Microfinance Initiative, 2024)
2. **Low efficiency of freight productivity:** Freight operators need to ensure efficient and reliable movement of goods through and around Melbourne, while congestion is always the barrier.

Private mobility

1. **Prohibition of e-scooters in CBD:** Due to the public safety concern, Melbourne's city council voted to ban rented electric scooters from the central business district in August (BNN Bloomberg, 2024)
2. **The outward expansion of city:** Melbourne's suburbs keep growing, linking these areas to the main transport network becomes increasingly difficult, leading more people to choose private cars for convenience (Melbourne Microfinance Initiative, 2024).

Urban planning

By 2030, aim to reduce traffic in the busiest areas, prioritize pedestrians in 'Little Streets,' and create bike lanes (city of Melbourne)

Connectivity

Melbourne's monocentric urban form is limiting the economic potential of its suburbs and leading to inefficiencies in infrastructure and service delivery, such as congestion.

Sustainability

Pollution from motor vehicles may cause thousands more deaths than road accidents, 11,105 people die prematurely from that (The Guardian, 2023)

Eco-vision Hub

Fitzroy will be used as the pilot area. In this hub, a 15-minutes life circle, which has been space-time range has been built by residents when they get around to fulfill their living needs. It embedded the concept of sustainability and convenience for the public.

Solar-Wind Hybrid Street Light

Pedestrian Energy-Generating Tiles

Parking Lot Piezoelectric Sensors

Protected Bicycle Lane

15-Minutes Life Circle

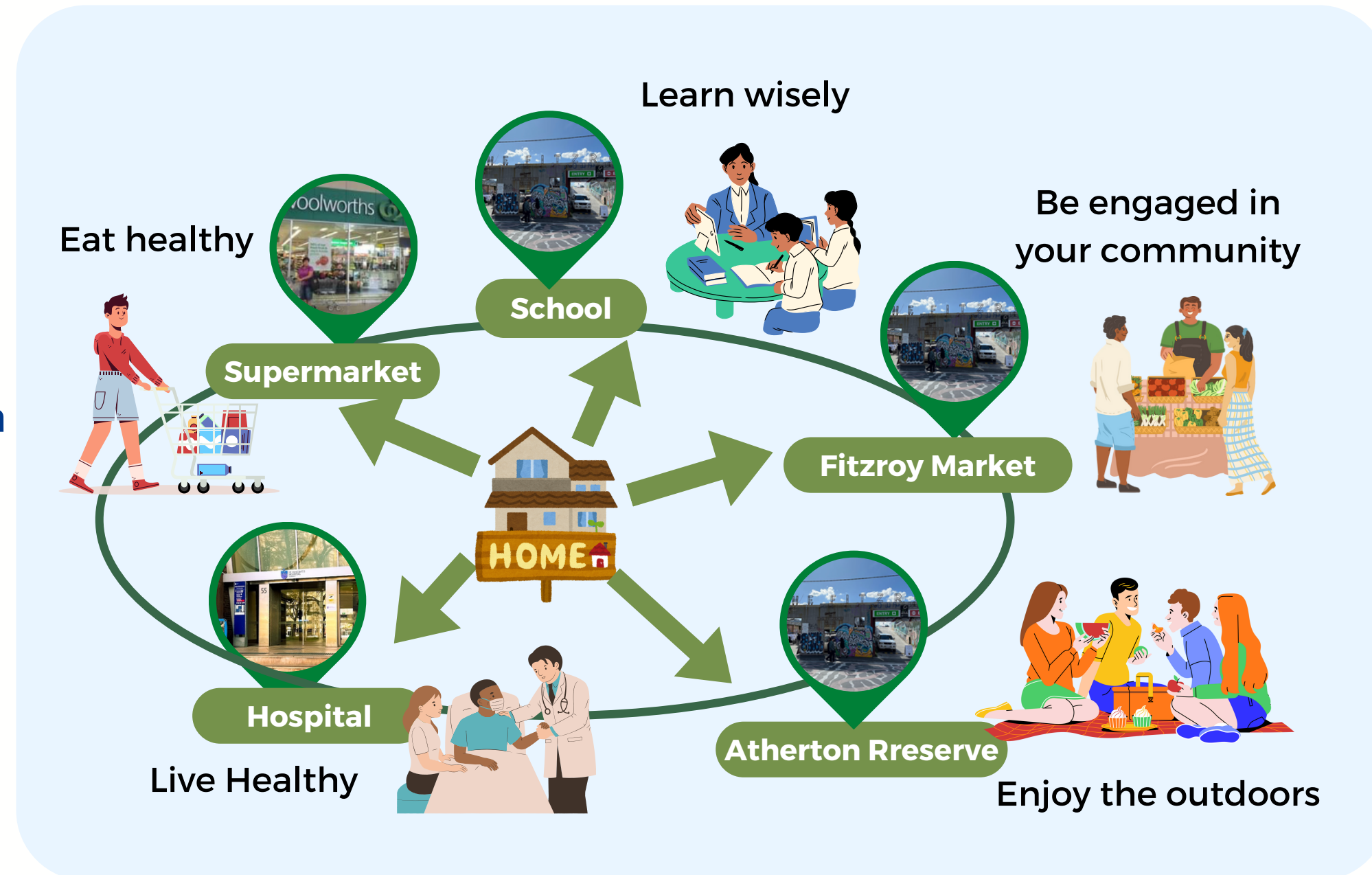**Urban Planning**   **Sustainability**   **Connectivity**

Features:
Residents can access essential services and amenities within a 15-minute walk or bike ride from their home.

Implementation:
Community Centre: Establish community centre to let residents attend workshops, fitness classes, sustainable activities held in communities.
eg. Fitzroy market, maintaining its functions of being a vibrant weekend flea market, expanding its possibilities of being weekdays-activity centre and carpark.

Benefits:
1) Enhance convenience and easy access to essential amenities by riding or walking
2) Foster connectivity, community connections and sense of belongings

Protected Bicycle Lane

Urban Planning   **Sustainability**   **Private Mobility**

Features:
Protected bicycle lane on the road: add road for bicycles to encourage people to ride bikes
Sustainable Median Strips: Use physical barriers like planters or curbs to separate these bike lanes from heavy traffic, ensuring a secure environment for cyclists.

Implementation: Use a network algorithm developed by Malte Schröder, working backwards to design perfect cycling routes within the available budget and higher bikeability score

Benefits: Reduces carbon emissions and air pollution

Kinetic Energy Utilisation I

Urban Planning **Sustainability**

Principle: This technology converts kinetic footsteps into electricity to power high footfall areas.

Features:
1. Step on a pressure plate topped with a tile made from recycled car tires
2. Energy passes through electromagnetic generator
3. Human's downward weight is transformed into rotational kinetic energy
4. Energy is transmitted immediately to nearby infrastructure

Implementation:
1. Pedestrian footpath: Stored in battery system for further use and embedded in the pavement lights to work at night
2. Kinetic Dancefloor Tiles: Energy Floors invented custom tile for Coldplay's world tour, this can be applied in our experiment place.

Benefits:
1) Safety and Security: Adequate lighting enhances visibility
2) Long-term cost-effectiveness: High initial costs but might gain return if applied it in high-traffic areas

PEDESTRIAN FOOTPATH

KINETIC DANCEFLOOR

Kinetic Energy Utilisation II

Urban Planning   **Sustainability**   **Private Mobility**

Principle: Kinetic energy is produced when vehicles slow down or create friction over speed bumps

Features: Embedding Piezoelectric sensors in speed bumps, the pressure will generate small amount of electricity.

Implementation: Stored in battery system for further use and contribute to nearby low-power infrastructure (Parking lot lights or electric vehicle chargers) to reduce the reliance of the grid.

Benefits:
1) Wide Applicability: Can be installed in any heavy traffic situation
2) Low Maintenance: Piezoelectric materials are durable and can function for long-term use.

The operating principle also existed in luxury EV, BMW iX's adaptive recuperation system converts the kinetic energy produced during deceleration and braking into electricity, storing in the high-voltage battery for the vehicle's drive.

Parking Lot Piezoelectric Sensors

Produce Kinetic Energy

Piezoelectric Sensors
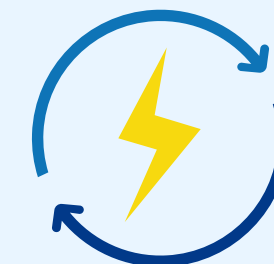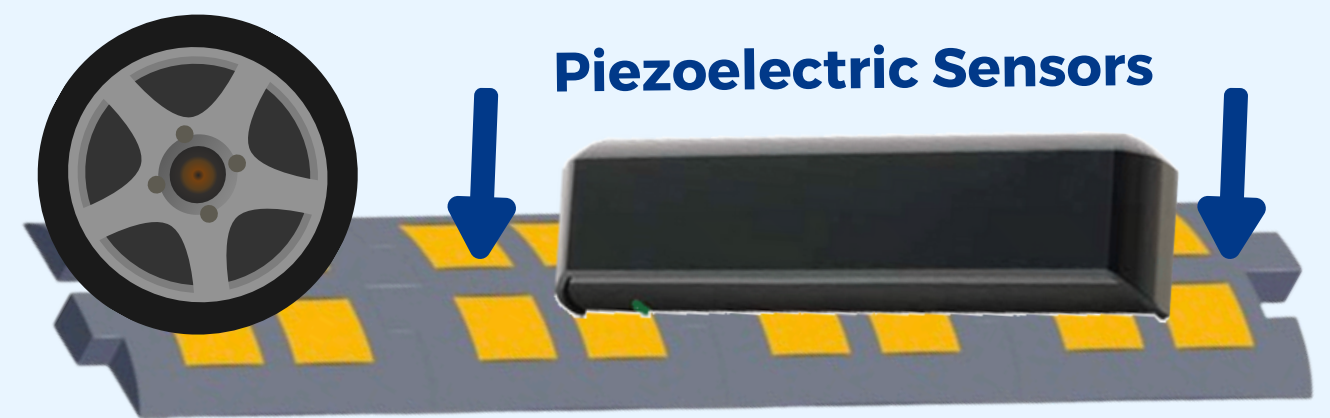
Convert to Electricity

Solar and Wind Energy Utilisation

Urban Planning   **Sustainability**

Principle: Kinetic energy is produced when vehicles slow down or create friction over speed bumps.
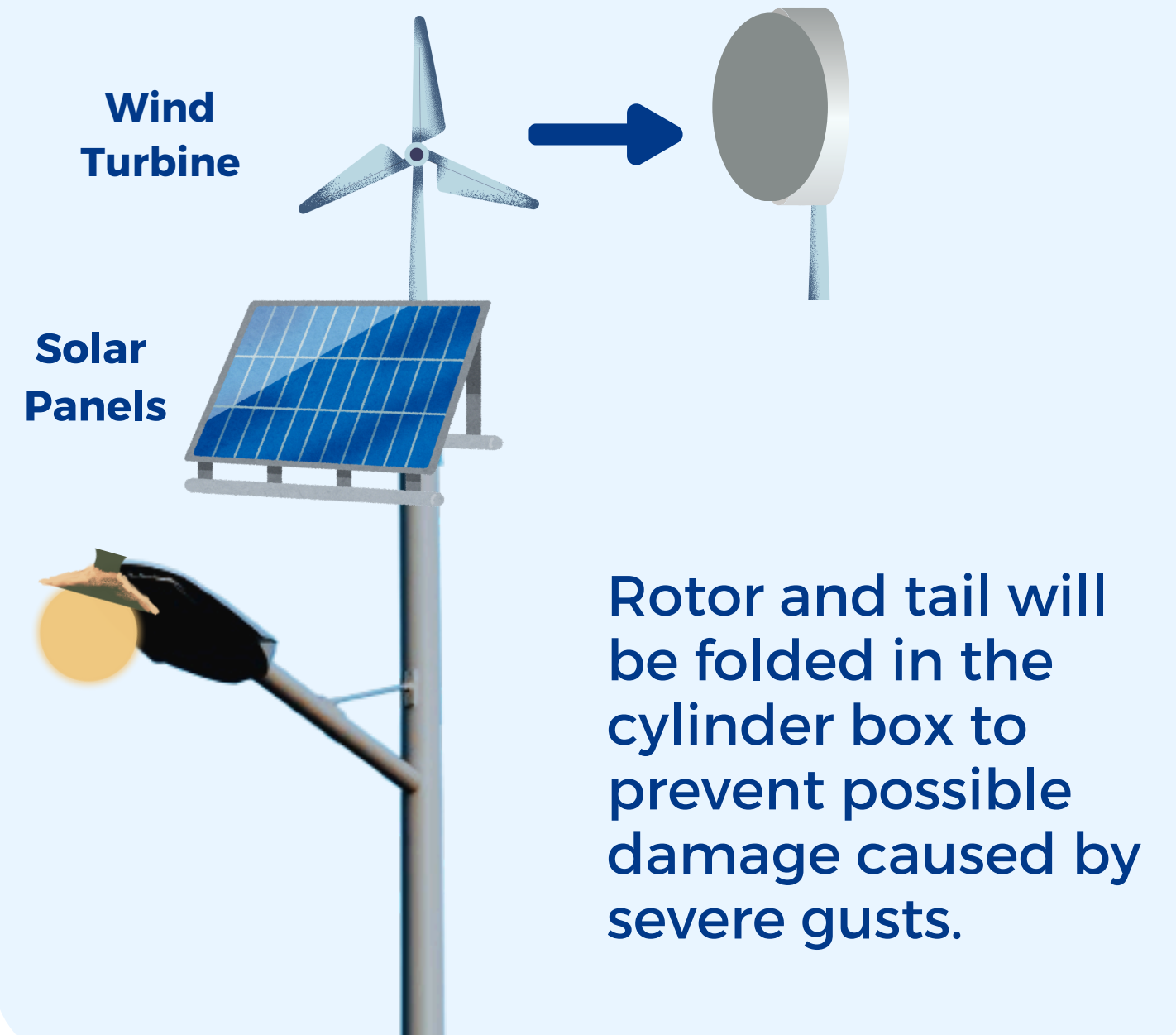
Features:
- **Solar Panels:** High-efficiency photovoltaic panels installed on top of the street light to capture sunlight, converting it into electricity.

- **Wind Turbine:** A small vertical-axis wind turbine built with the light pole to harness wind energy and power small street lights. When facing the extreme weather, the device will automatically monitor the Beaufort wind force scale, and protect the wind turbine by folding it into a cylinder box.

Implementation: All the street poles on the road
Benefits: Energy Efficiency: Maximizes energy production by utilising two sources of renewable energy, ensuring continuous operation in various weather conditions.
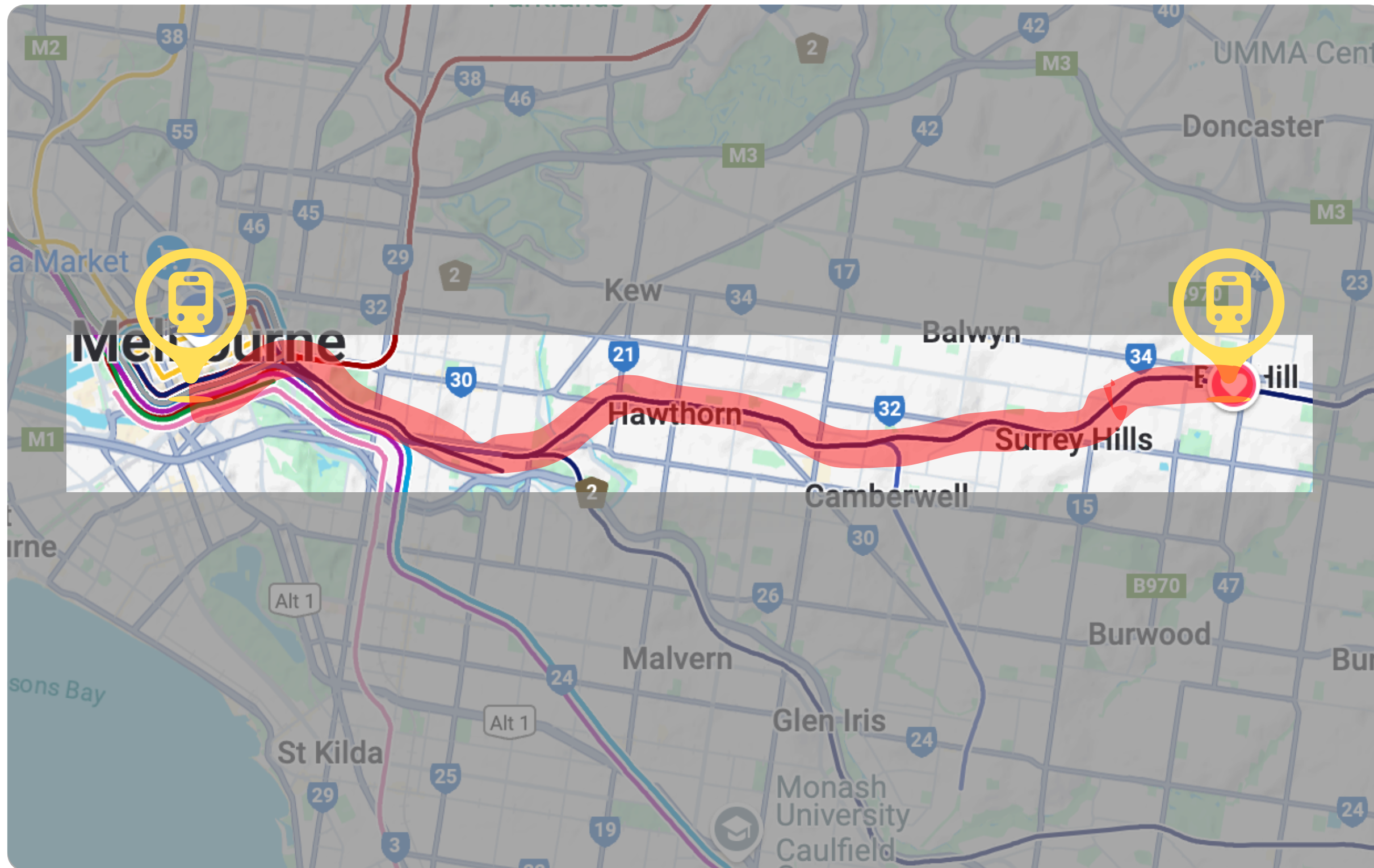
Solar-Wind Hybrid Street Light

Wind Turbine

Solar Panels

Rotor and tail will be folded in the cylinder box to prevent possible damage caused by severe gusts.

← → ↻   BMW YOURMELBOURNE 2024

TrackXpress: Fast, Convenient, and Sustainable
Southern Cross to Box Hill Station Train-Integrated Logistics Pilot
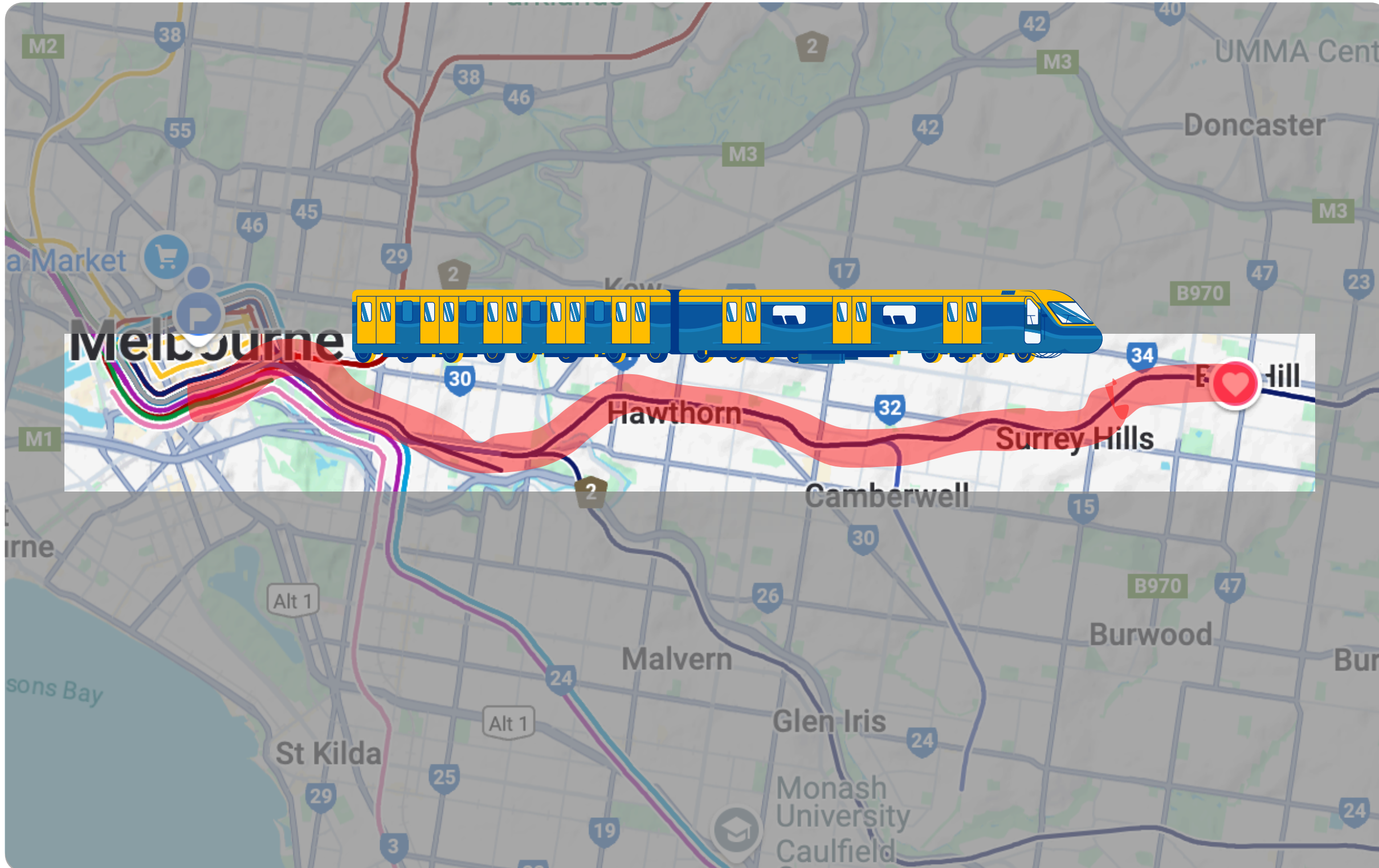

1. STAFFED PICK-UP POINTS

Staffed pick-up stations will be set up at Southern Cross and Box Hill stations to handle customer orders and parcel deliveries. These points will provide personalised service, ensuring secure handover of packages.

TrackXpress: Fast, Convenient, and Sustainable

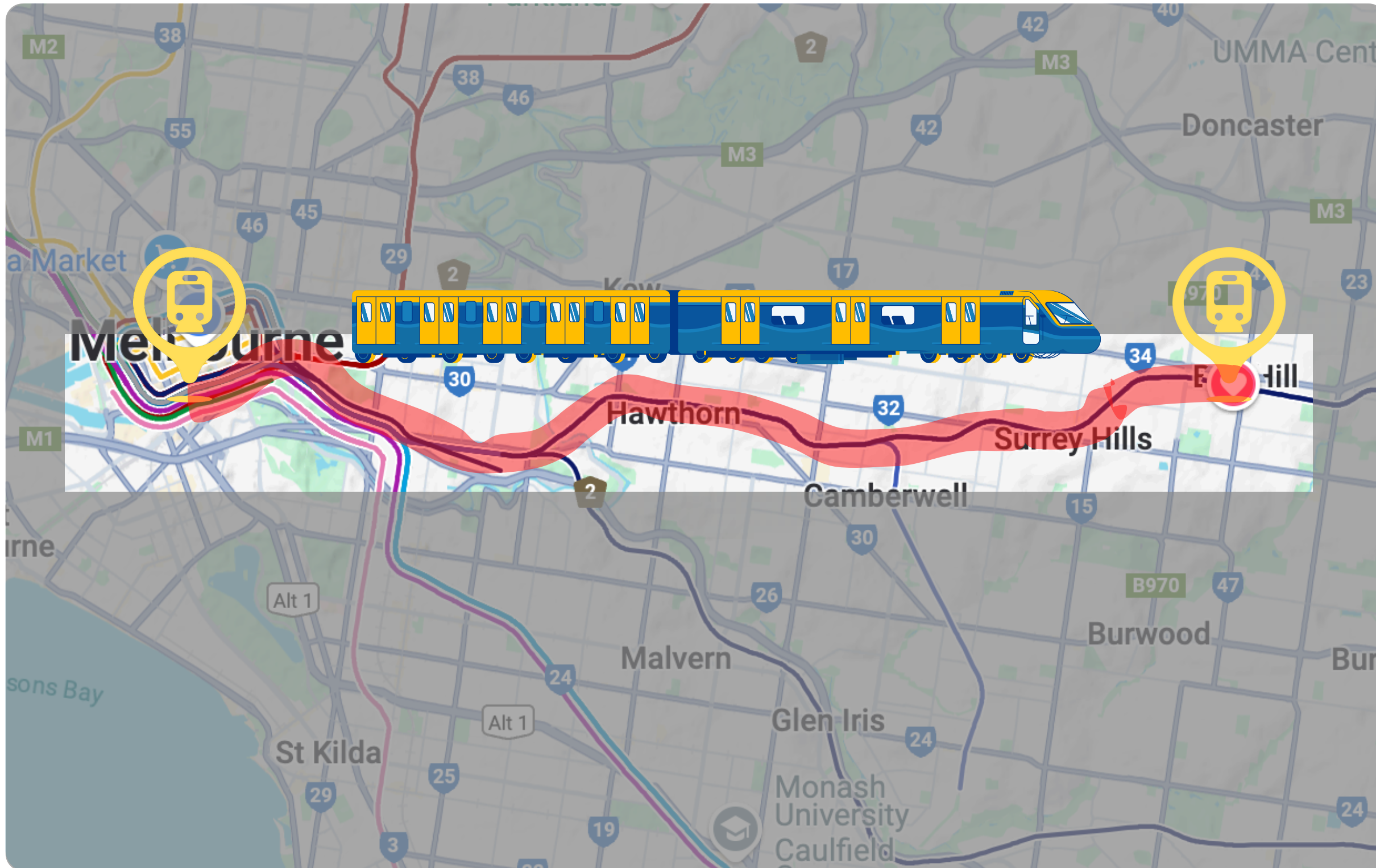Southern Cross to Box Hill Station Train-Integrated Logistics Pilot

2. FREIGHT CARRIAGE INTEGRATION

- A dedicated carriage for parcel transportation will be attached to the rear of passenger trains running between stations. This allows goods to be moved efficiently without adding traffic to the roads.
- Loading and unloading of parcels will be managed by staff at both Southern Cross and Box Hill stations, ensuring quick transitions between train arrivals and parcel distribution.

TrackXpress: Fast, Convenient, and Sustainable
Southern Cross to Box Hill Station Train-Integrated Logistics Pilot

3. MOBILE APPLICATION INTEGRATION

- Customers can use the app to place orders, schedule deliveries, and track their parcels in real-time. The app will notify customers when their parcels are ready for pick-up.
- After receiving **a unique PIN code** via the app, customers can retrieve their parcels from the staffed pick-up points at either station.
- The app also facilitates payments and allows users to select preferred delivery times or pick-up windows based on the train schedules.
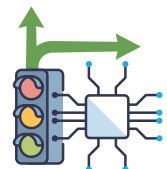
SmartFlow – Dynamic Lane System

Key Components of SmartFlow -- M3 Highway City to Box Hill Pilot

1. ROAD EXPANSION

- **Additional lanes** will be constructed where feasible, increasing the road's capacity to handle more vehicles.
- Lanes **used for different vehicles** during peak and non-peak hours.

2. ADAPTIVE TRAFFIC SIGNAL

- **Smart signals** at key intersections (e.g., Box Hill, Doncaster), adjusting based on real-time traffic flow.

3. DYNAMIC LANE ALLOCATION

- **Morning Peak (6 AM - 10 AM):** Inbound lanes prioritised for buses, carpools, and freight.
- **Evening Peak (4 PM - 7 PM):** Lanes switched to prioritize outbound traffic.

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SmartFlow – Dynamic Lane System

Detailed Example of SmartFlow in Action

Imagine it's 7:30 AM, and you're driving toward the city on the M3 during the morning rush hour.

AS YOU APPROACH THE M3, YOU'LL SEE SMART DIGITAL SIGNAGE

SMART SIGNALS AT KEY INTERSECTIONS ADJUSTING BASED ON REAL-TIME TRAFFIC FLOW

DYNAMIC LANES WILL BE USED DURING MORNING AND EVENING PEAKS.

Evening Rush Hour (4 PM - 7 PM)

- Lanes reallocated to prioritize **outbound traffic**
- More lanes for **general vehicles**
- **Bus and carpool lanes** maintained for efficient travel

BUS AND CARPOOL ONLY   GENERAL TRAFFIC   FREIGHT ONLY

BOX HILL

DONCASTER

KEW

CBD

1   2   3   4

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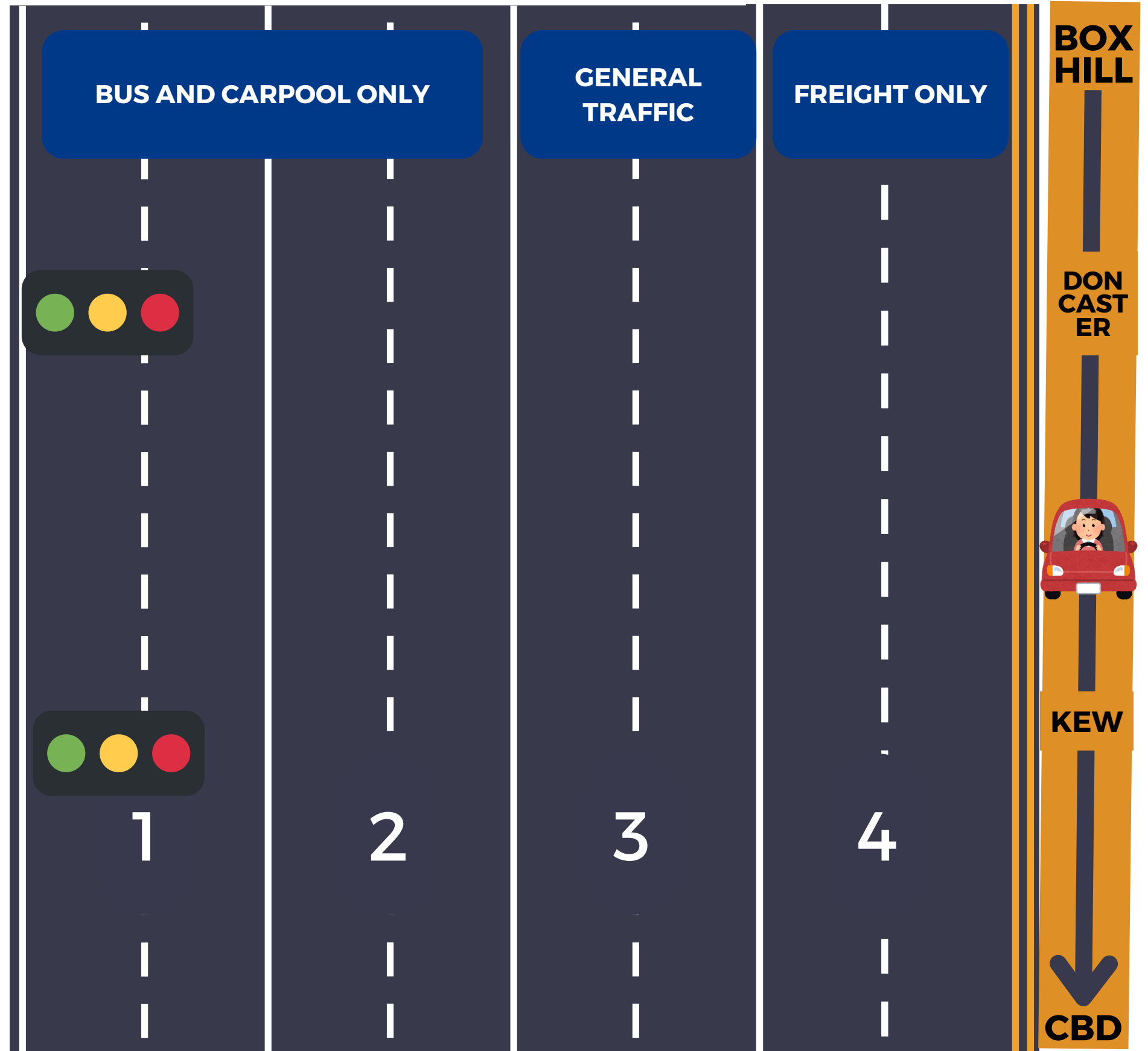
Melvement

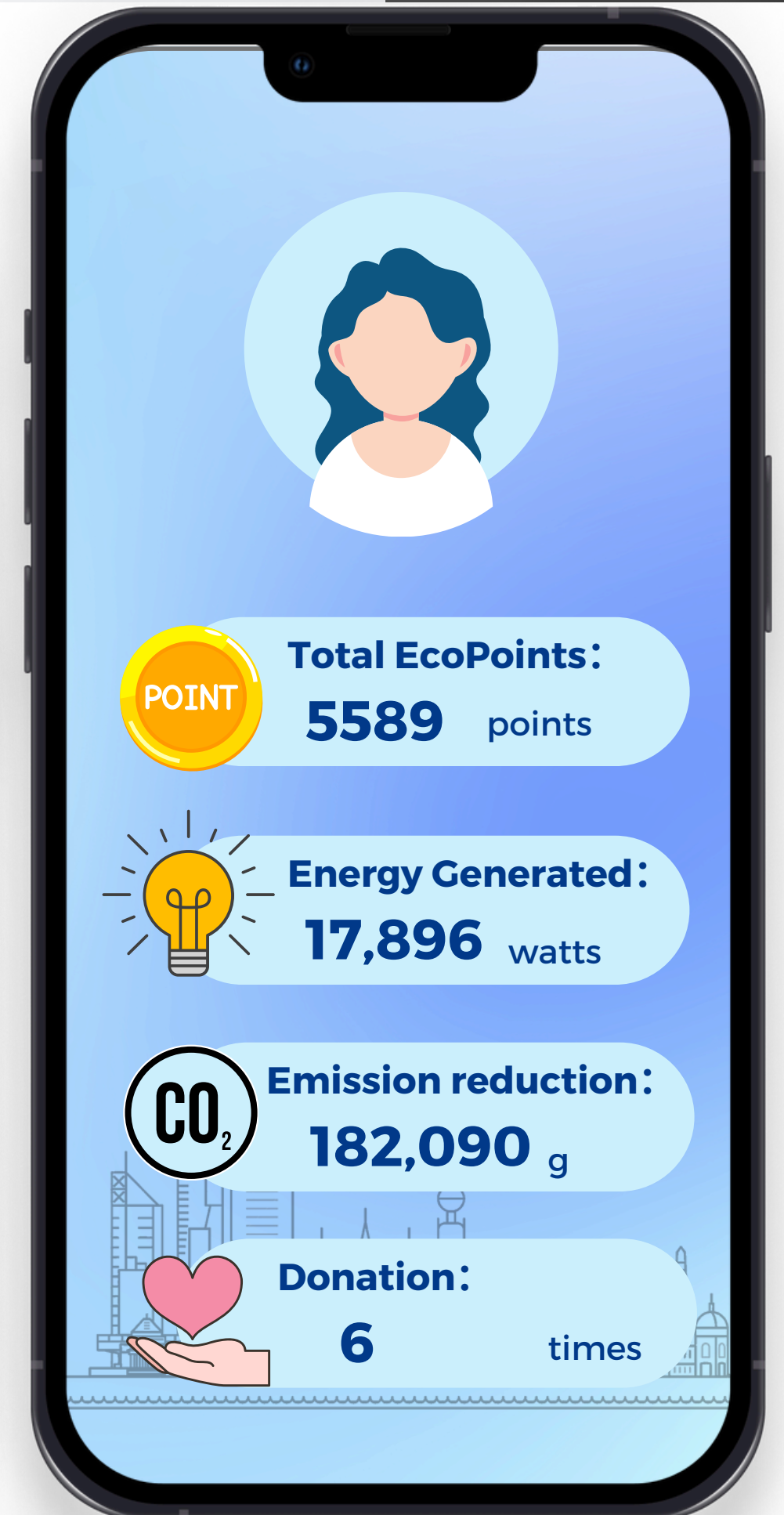Melvement is a sustainability-focused app designed for Melbourne residents. It encourages eco-friendly living through features like smart map navigation, walking step counters, and transction points system and so on. The app promotes individual impact on the environment while helping users navigate the city efficiently, all while earning points and energy for sustainable actions that can be redeemed for rewards.
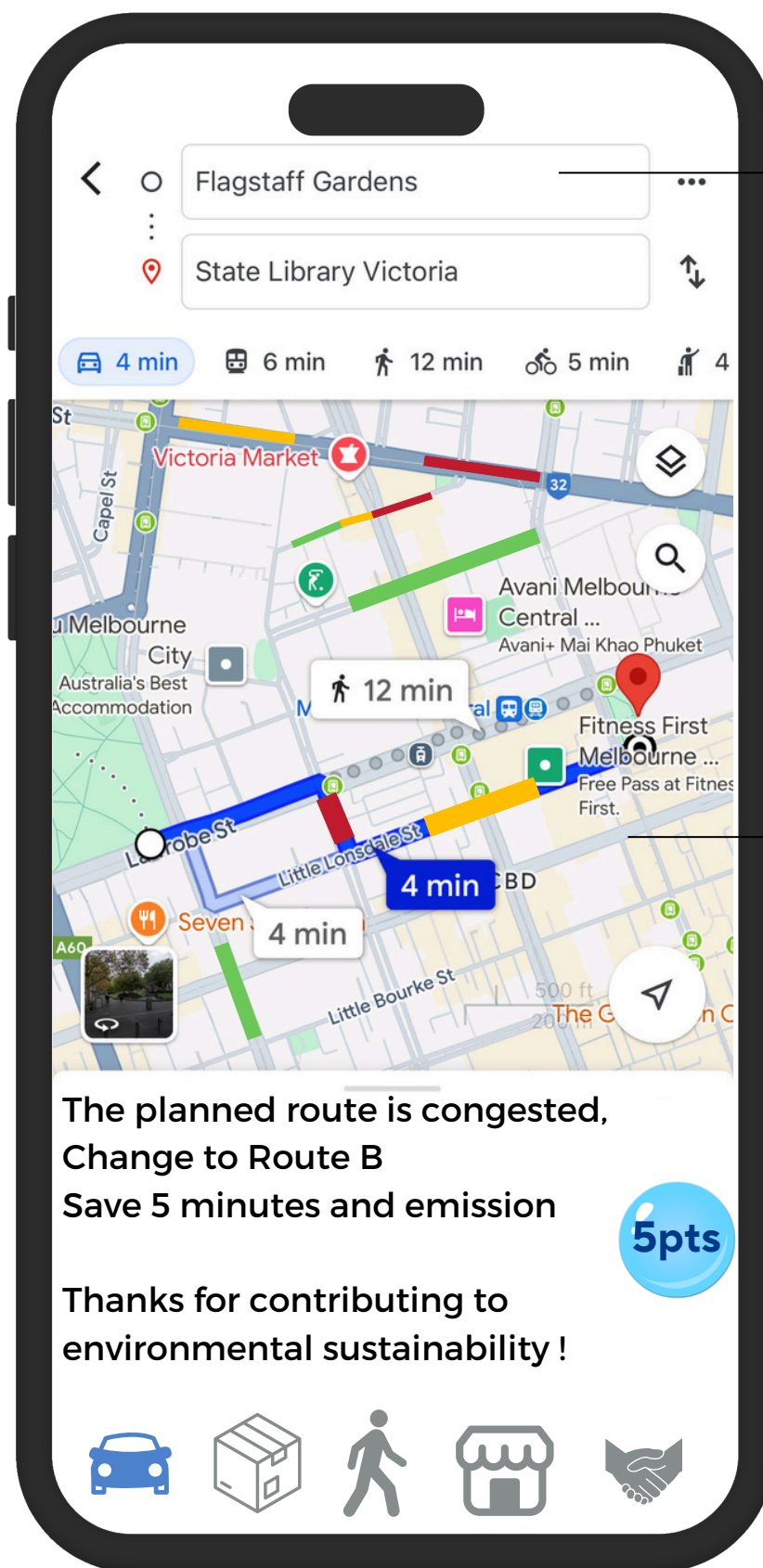
Melvement

Your Melbourne, Calling to your Movement

Total EcoPoints: **5589** points

Energy Generated: **17,896** watts

Emission reduction: **182,090** g

Donation: **6** times

← → ↻   BMW YOURMELBOURNE 2024

Function 1

EcoRoute Navigator

● **Feature:**
A dynamic map that displays real-time traffic conditions using color codes

▬▬ Smooth flow
▬▬ Moderate congestion
▬▬ Heavy congestion

The planned route is congested, Change to Route B
Save 5 minutes and emission

Thanks for contributing to environmental sustainability !

5pts

● **Mechanism**

The app intelligently recommends alternate, less congested routes, minimizing delays and reducing the exhaust emission caused by waiting.
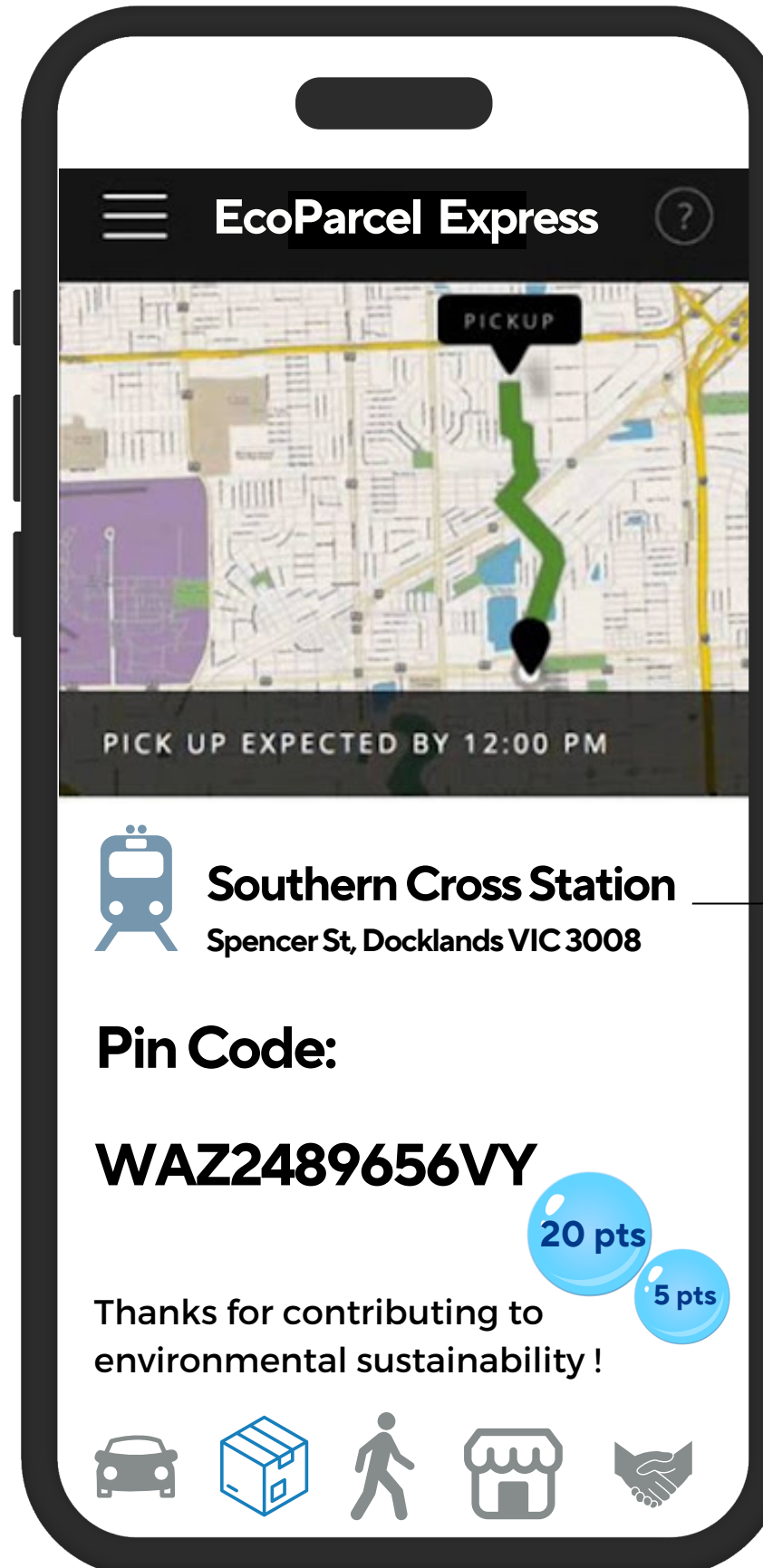
● **Rewards**

Users earn EcoPoints for following alternative routes. These points can be accumulated to redeem benefits, make public welfare donations, etc., enabling Melbourne citizens to contribute to sustainable development through daily trivial matters.

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Function 2

EcoParcel Express

● **Feature:**

EcoParcel Express integrates parcel logistics with the city's train system, making urban logistics faster, more efficient, and sustainable.

EcoParcel Express

PICK UP EXPECTED BY 12:00 PM

🚆 **Southern Cross Station**
Spencer St, Docklands VIC 3008

Pin Code:

WAZ2489656VY

20 pts
5 pts

Thanks for contributing to environmental sustainability !

● **Mechanism**

A dedicated carriage transports parcels, and loading/unloading is synchronized with train arrivals for quick distribution. Customers can track parcels, schedule deliveries, and receive PIN codes for secure pick-up via the app.

● **Rewards**

The app rewards efficient, low-impact parcel retrieval, with extra points for timely pick-up and minimal delays.
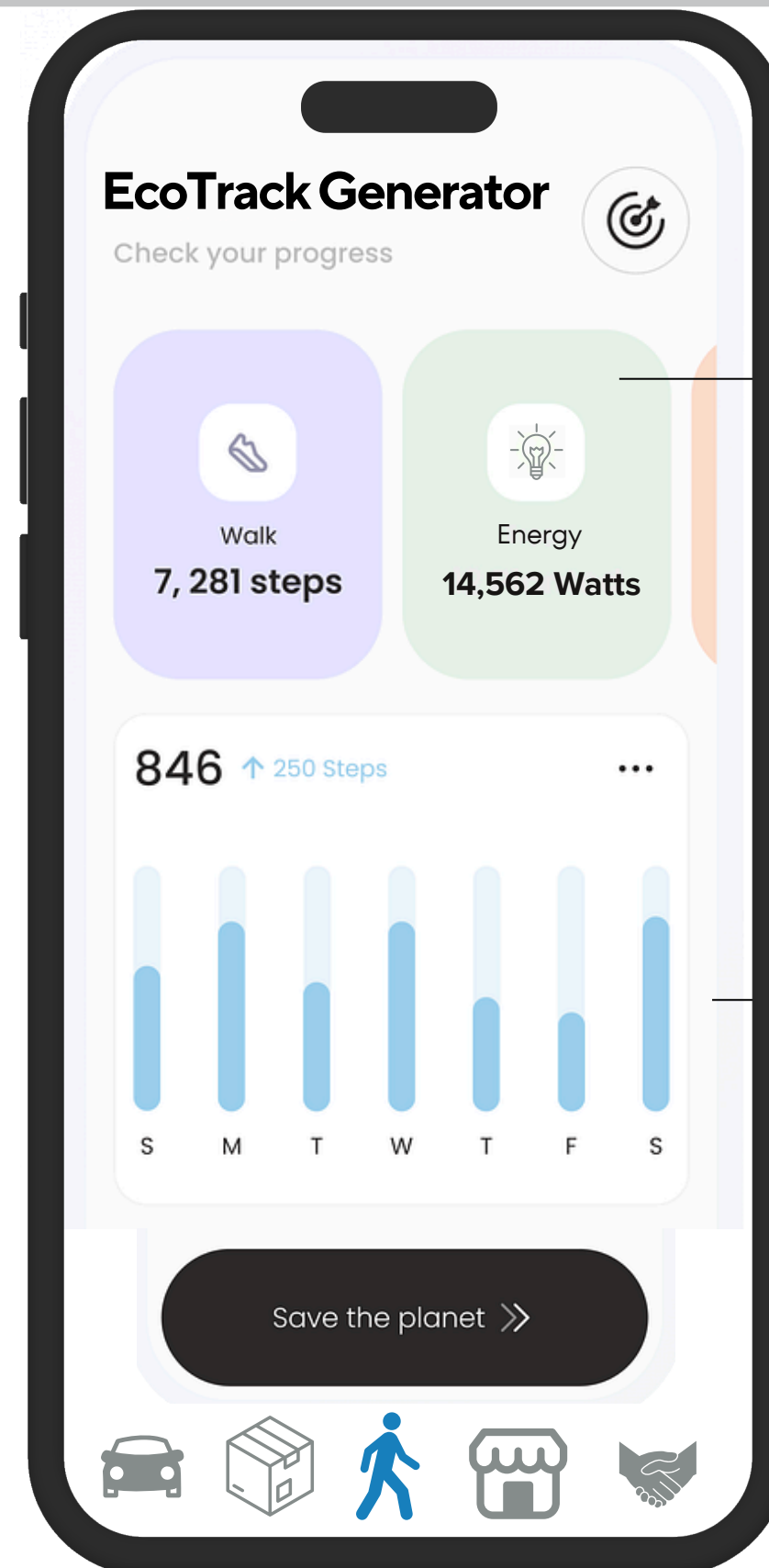
- Earn EcoPoints when choosing the EcoParcel Express feature to collect parcels from Southern Cross or Box Hill stations.
- By scheduling parcel pick-up during off-peak hours, you gain bonus EcoPoints for reducing congestion at busy times.

Function 3

EcoTrack Generator

● **Feature:**

By tracting the kinetic tiles, **the energy from footsteps and vehicle friction, will be converted it into power for nearby residential or city infrastructure.** This transforms daily actions into contributions toward Melbourne's sustainable future.

EcoTrack Generator
Check your progress

Walk
7, 281 steps

Energy
14,562 Watts

846 ↑ 250 Steps   ...

S   M   T   W   T   F   S

Save the planet »

● **Mechanism**

As users walk or drive through the kinetic tiles, the energy generated powers small urban facilities, creating a renewable energy loop.
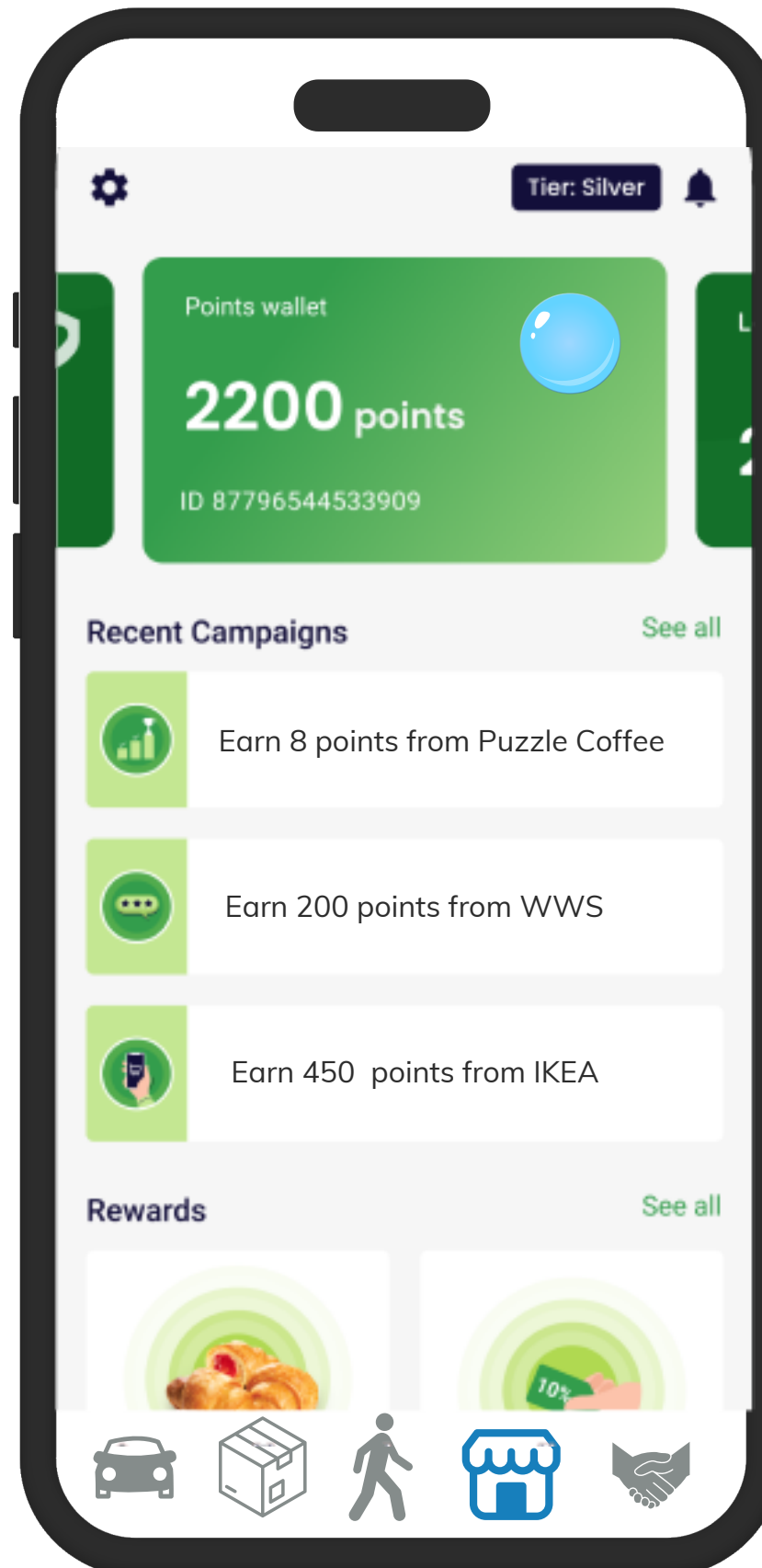
● **Rewards**

Users earn EcoPoints based on steps tracked on kinetic tiles and additional points for parking in energy-efficient spots equipped with these tiles. This promotes walking and the adoption of sustainable urban technology.

Function 4

EcoSavvy Rewards

- **Feature:**
Designed to motivate users to make eco-friendly purchasing decisions by rewarding them with points for every transaction. The program aims to cultivate a community of environmentally conscious shoppers who contribute to sustainability efforts.

Points wallet

2200 points

ID 87796544533909

Tier: Silver

Recent Campaigns   See all

Earn 8 points from Puzzle Coffee

Earn 200 points from WWS

Earn 450 points from IKEA

Rewards   See all

● **Mechanism**

- **General Transactions:**
Earn 5 points for every AUD $1 spent
- **Local Business Purchases:**
Earn 10 points for every AUD $1 spent
- **Eco-Certified Products:**
Earn 15 points for every AUD $1 spent on eco-certified or sustainable products

● **Rewards**

Users can easily track their points, see available rewards, and get suggestions for eco-friendly purchases through the Melmovement app. They can receive updates on how many points have been donated and the specific environmental impact of their contributions, enhancing the sense of community engagement.
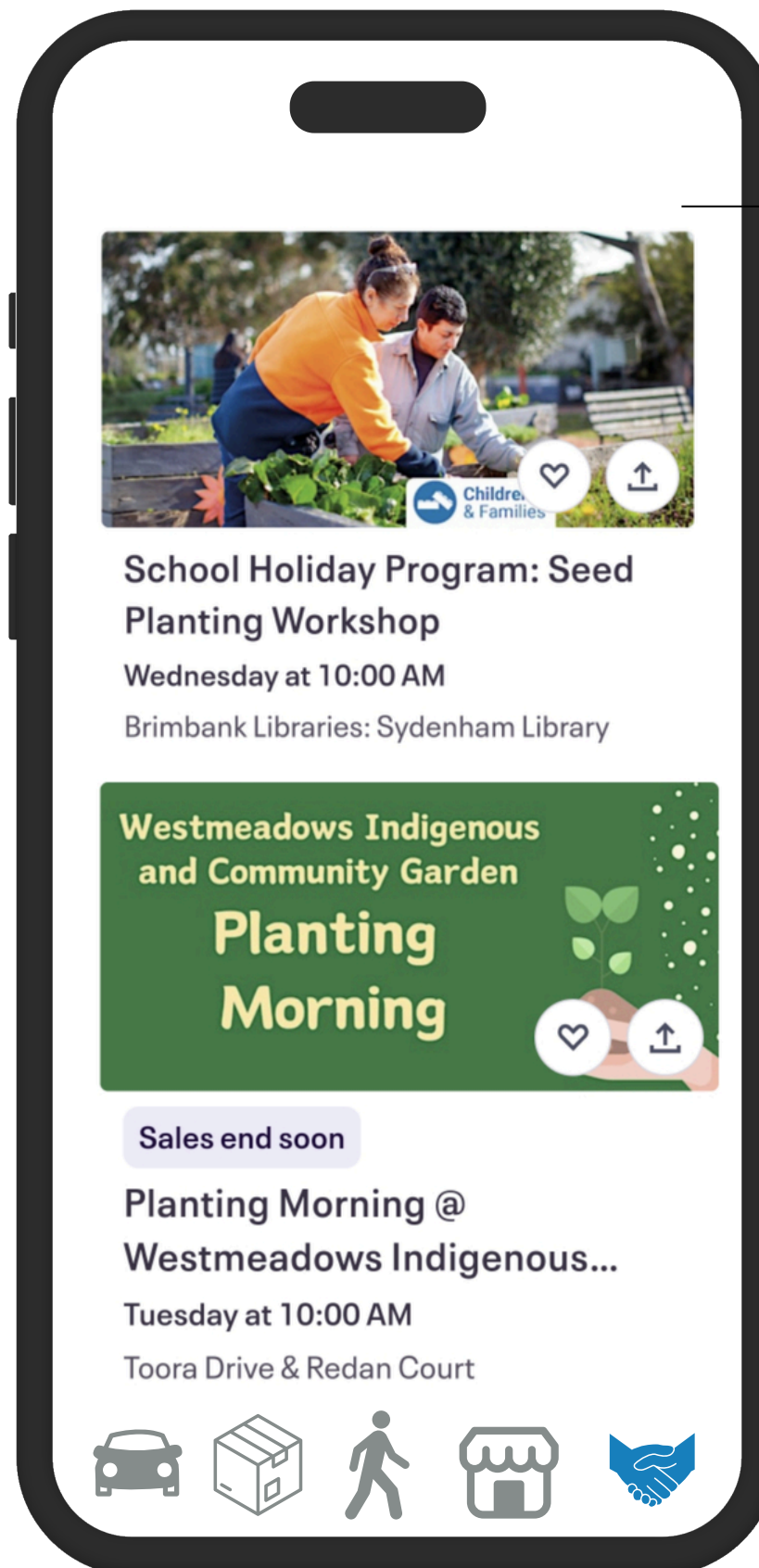
Function 5

EcoAction Events

Feature:

Designed to connect users with a variety of environmentally-friendly events opportunities like community clean-ups, and tree planting initiatives. The function promotes active participation in local sustainability efforts and rewards users for their contributions, creating a vibrant community of eco-conscious individuals.

School Holiday Program: Seed Planting Workshop
Wednesday at 10:00 AM
Brimbank Libraries: Sydenham Library

Westmeadows Indigenous and Community Garden
Planting Morning

Sales end soon
Planting Morning @ Westmeadows Indigenous...
Tuesday at 10:00 AM
Toora Drive & Redan Court

🟢 **Mechanism**

Users can browse a comprehensive calendar of upcoming green activities and earn points based on their participation level in different activities

🔴 **Rewards**

Accumulated points can be redeemed for various benefits such as discounts, charity donations. They can share their participation and experiences on social platforms to inspire others and raise awareness. Highlight top volunteers and events on a leaderboard, fostering a sense of accomplishment and friendly competition within the community.

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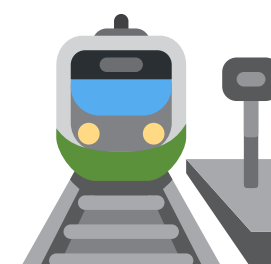
Empowering Sustainable Urban Mobility and Living

Driving Positive Social and Environmental Change...
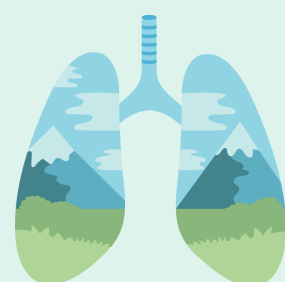
SMOOTHER TRAFFIC, CLEANER AIR

Expanding roadways and introducing smart lane systems reduces peak-hour congestion:

- **Quicker commutes,** improving work-life balance.
- **Lower emissions,** promoting a healthier environment.

STREAMLINING GOODS TRANSPORT

*Logistics hubs at key train stations improve delivery efficiency:*

- **Faster deliveries and cost savings** for local businesses.
- **New jobs created** through logistics and sustainable transport.

CONNECTING COMMUNITIES

The 15-minute city ensures access to essentials and green spaces, fostering:

- **Stronger community** ties and less isolation.
- **Active lifestyles,** improving physical and mental health.
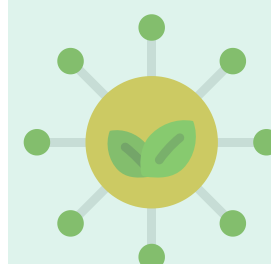
INCENTIVIZING GREEN CHOICES

The sustainability rewards app encourages eco-friendly habits:

- **More people** walking, cycling, and using clean energy.
- **Stronger community involvement** in sustainability efforts.

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