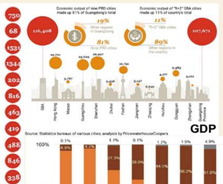
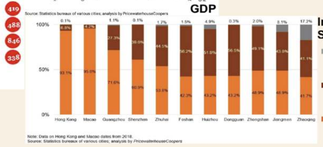
METABOLIC CORRIDOR

GROUP B1: LiXinru ChenYuanzhe Wukeyi

BACKGROUND

Greater Bay Area Development



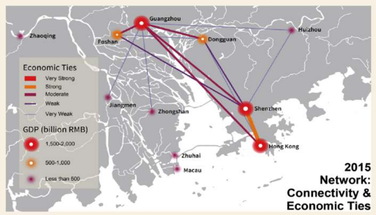


Source: Statistics bureaux of various cities; analysis by PricewaterhouseCoopers

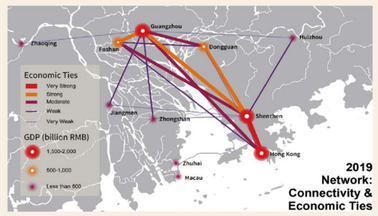
The Greater Bay Area has been on the top of the GDP list of China.

The Plan of Greater Bay Area boosted the volume of import & export trade in recent years, and it will continue to be an essential development in the future.

Cities in GBA lives much population, while the Hong Kong is the densest one among the area. Large population brings labour and demand, promoting the development of the whole area.



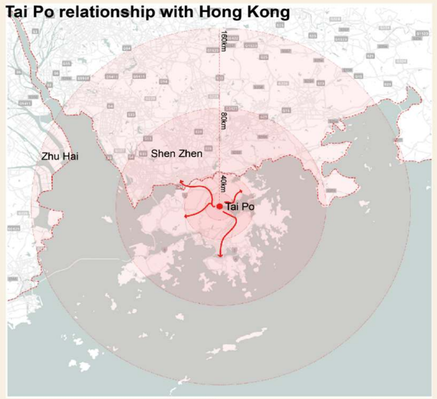
2015 Network: Connectivity & Economic Ties



2019 Network: Connectivity & Economic Ties

Economic Ties are enhanced due to the plan of the GBA. Shenzhen as the primary growth node, will only get bigger as time goes by. In 2018 Shenzhen surpassed Hong Kong and emerged the largest economy in the GBA.
The Bond between Shenzhen and Hong Kong has enhanced from Strong to Very Strong since 2015 to 2019, representing for increased interactions, trades, collaborations between the two cities, which can be reflected on the increased transportation demand crossing the border.

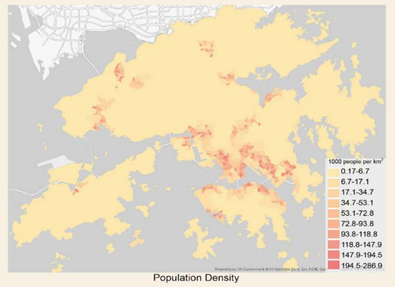
Tai Po relationship with Hong Kong



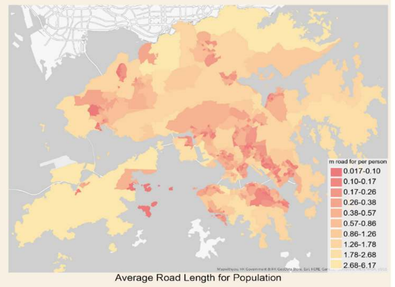
From the perspective of logistics, Tai Po has the potential to become the logistics center of the whole area including Mirs Bay with efficient accessibility reaching out to many places, both on the land and sea.

Located in the edge of the Close Interaction Circle between Hong Kong and Shenzhen, Tai Po may serve as the gateway from central Hong Kong to the Northern Metropolis area, which brings much travels through Tai Po and oppotunity of development in Tai Po.
Serving as the link from Hong Kong to the Dapeng Bay / Mirs Bay Ecological Recreation Circle, Tai Po itself already has much ecological resources like the butterfly valley and the bicycle lane. Tai Po may increase its connection to the circle, improve the functions of relaxing and sightseeing of the public open spaces, and be more attractive not only to the residents but also tourists.

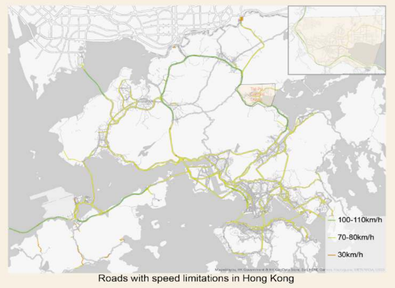
Geographically Tai Po locates in between Hong Kong's city centre and Shenzhen. For its relativeliy good accessibility to the surrounding areas, it holds a great potential in becoming a logistic centre and threshold in Hong Kong.



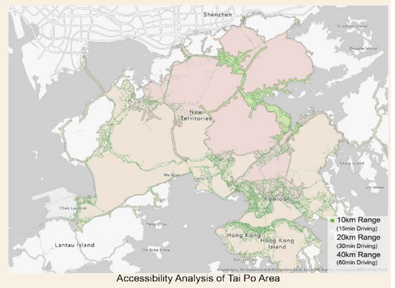
Population Density



Average Road Length for Population



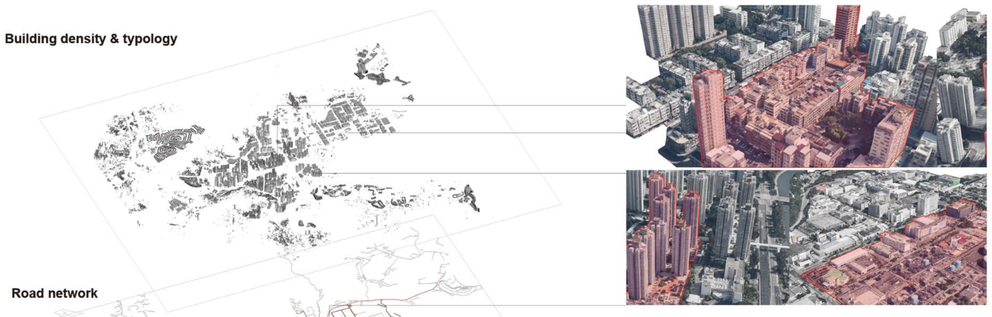
Roads with speed limitations in Hong Kong



Accessibility Analysis of Tai Po Area

SITE CONTEXT

Building density & typology



Old town has denser and lower buildings. New town has relatively lower density and taller buildings. Industrial area near water body and open green space.

Road network

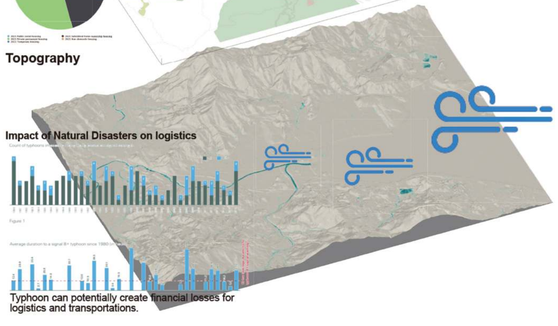
New town area has spacious roads and streets for vehicles, though the pedestrian comfort was improved only slightly.

Goods Types And Trades

Land use

Domestic Households by Type of Housing

Topography



Impact of Natural Disasters on logistics

Typhoon can potentially create financial losses for logistics and transportations.

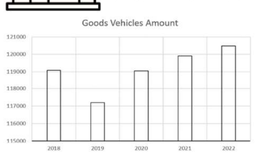
Original open spaces turned into parking space due to the needs for loading goods and private parking.

Most streets in old town have smaller scale and cause distrubance between pedestirans and vehicles.

SWOT ANALYSIS

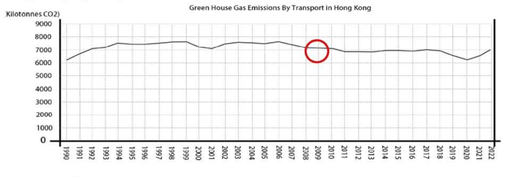
Strength

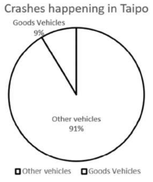
Tai Po has well-established residential areas, including a mix of private and public housing as well as rural villages and modern buildings. The largest sector in Sha Tin consists of Trade and transportation industries, accounting for 43.39% of establishments in the city. Taipo has a very leading freight economy.For transport infrastructure, it has a good network of cycling paths and greenways, and the roadway network has good accessibility within the area.



Weakness

Tai Po area faces traffic congestion on the Tolo Highway and the Tai Po Road, which are the arterials connecting Tai Po and other parts of Hong Kong.In terms of freight transportation, the increasing number of trucks here has led to an increase in greenhouse gases in recent years, an increase in the number of car accidents, and so on. The increase in the number of trucks has been limited, which has also constrained the economic development of the Taipo.





Opportunity

Tai Po can become more livable and more sustainable by enhancing the urban design and transport modes. For sidewalks, it may enhance their walkability and accessibility, and connectivity between different types of transport may be improved. Furthermore, for a bus-reliant public transportation network, changing to electric vehicles may reduce emissions and improve the overall efficiency of the system. It may also leverage its resources in culture and nature reserves to promote eco-tourism and heritage conservation.

POPULATION 2020
1.2 MILLION

GDP PER CAPITA 2020
$29,445

RANKING* 2020
125TH MOST POPULATED
65TH HIGHEST GDP PER CAPITA

MOST INTENSIVE INDUSTRIES** 2021
FINANCIAL ACTIVITIES
TRADE AND TRANSPORTATION
LEISURE AND HOSPITALITY

TOP KNOWLEDGE CLUSTERS** 2021
MISC. CONSUMER SVCS
FINANCE
PERSONAL CARE

Threat

Tai Po area faces threats from environmental degradation, urban sprawl, and social polarization. For example, it is vulnerable to air pollution, noise pollution, flooding, and landslides, due to its proximity to major roads and industrial areas. It is also under pressure from urban development, especially for public housing projects, which may encroach on its rural landscape and green belt. The existing congestion may develop into a more serious problem as the overall improvement of the area causes more demands on traffic.

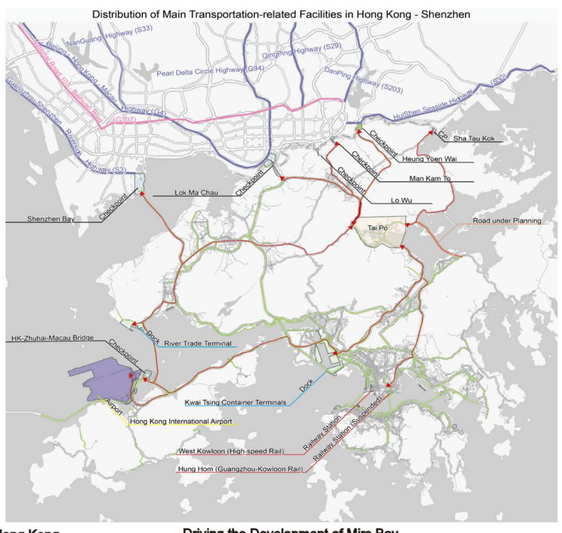
VISION

Becoming
A LOGISTICS CENTER
in Hong Kong

Driving
THE DEVELOPMENT
of the whole Mirs Bay

Building
AN AUTOMATED AND INTEGRATED CARGO AND LOGISTICS SYSTEM

Providing
A NATURE-FRIENDLY AND LIVABLE PLACE
for future rapid development

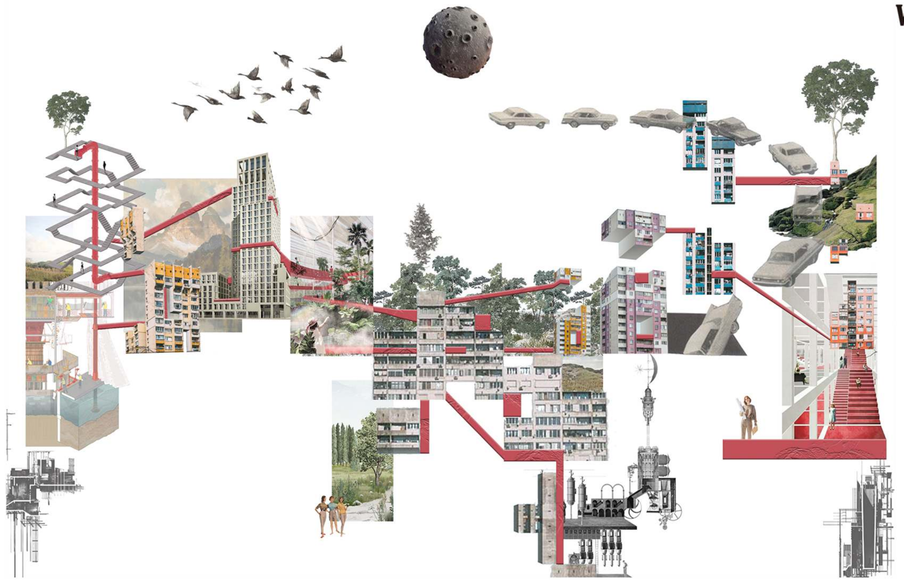


Becoming a Logistics Center in Hong Kong

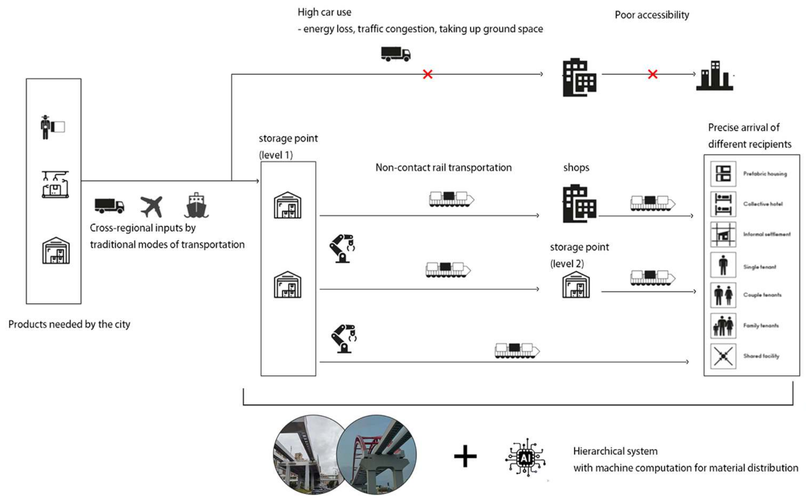
Build an Automated Logistic System

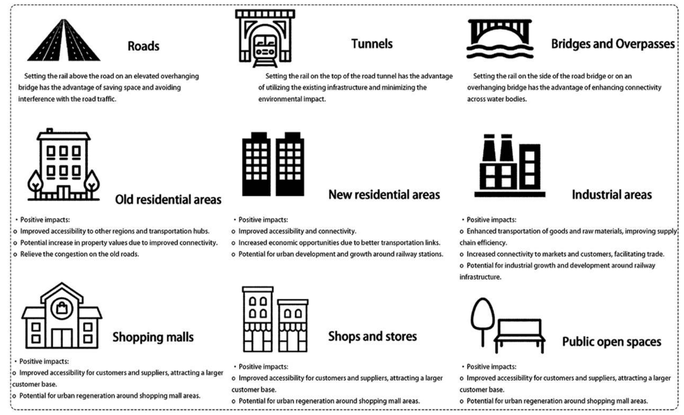
Driving the Development of Mirs Bay

A nature-friendly and livable place for future rapid development



VISION REALIZATION





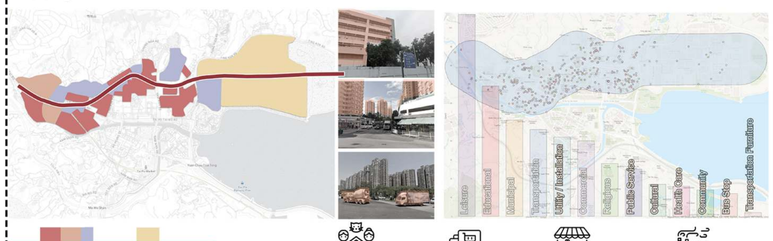
The system would feature a fleet of autonomous cargo vehicles, equipped with weather-resistant technology and able to withstand extreme weather conditions, including typhoons. These vehicles could be programmed to transport goods and supplies between various points along the metabolic-logistic corridor, including warehouses, factories, and distribution centres.

The system could also incorporate smart sensors and realtime data analytics to optimise delivery routes and schedules, reducing energy consumption and greenhouse gas emissions. Additionally, the system could be integrated with existing public transport infrastructure, allowing for seamless and efficient transportation of both people and goods.

CHARACTERISTICS OF THREE CORRIDORS

Corridor 1

Supply and Merchandise



New Transportation system of Products and Materials

This corridor connects mainly the new residential area, the industrial area, and the shopping malls within the Tai Po district. For material flows within the Tai Po area, the corridor provides a **channel for the transportation of products** from the industrial area to the commercial area and the merchandise distribution from the commercial area to the residential area, which **relieves the pressure of traffic flow** caused by the material flows through the road and provides more adequate road capacity for the cross-regional material flows. Meanwhile, this corridor provides a direct connection between the western entrance and the eastern entrance of the Tai Po and offers an alternative to vehicular transportation for **cross-regional material flows**, which **reduces cross-regional logistics costs and improves the efficiency of the logistics system.**

Corridor 2

Tai Po link

Linking the Old and the New

The corridor mainly serves as a **link** between new residential areas, old residential areas, new commercial areas (shopping centers), and old commercial areas (markets and vendors) in Tai Po, which facilitates the logistics between the areas and makes it more convenient for the distribution and transportation of commodities and **promotes the economic development** of the Tai Po area. In terms of traffic pressure relief, the corridor runs along several main roads connecting the old and new areas, which can **reduce the traffic flow on the main roads** that cannot be further expanded, and at the same time, **reduce the traffic demand for the new main roads,** which makes the overall land use planning of the area more rational, and supports the renewal of the old town and the rational operation of the new town.

Corridor 3

Tologistics Highway

Tolo Highway Optimization

The corridor travels along Tolo Harbor Highway and is intended to **divert freight traffic from Tolo Harbor Highway traffic.** Tolo Highway, as an important traffic artery linking the New Territories and Kowloon, often faces heavy traffic flow and traffic accidents. The corridor can reduce the number of freight vehicles on Tolo Highway, thus **optimize the overall traffic flow** on Tolo Highway. At the same time, the corridor provides **new logistics access** from the Kowloon area to the northern part of the New Territories, which **facilitates new development plans in the northern part of the New Territories.**

CASESTUDIES

Case 1: H-BAHN

Dortmund, Germany

The H-Bahn in Dortmund is a driverless passenger suspension railway system. The system can operate on a schedule or on demand, whereby a passenger requests a carriage by pushing a button, **similar to summoning an elevator**.
The maximum operating speed is 50 km/h.

The carrier is **a hollow rectangular box girder with a slit in the bottom** through which the cabin is suspended at the running gear, whose two axles carry the load with a rubber wheel on both sides providing both suspension and propulsion. A cable provides a continuous wireless data connection **between the train and the control center**.

The longest span between support pillars is 38.5 meters (126.3 ft), where it crosses the university road, which bisects the two campuses. Just beyond the road, the H-Bahn crosses through a nature reserve at its maximum elevation of about **16 meters (approx. 50 feet) above ground.**

Advantages:
Unmanned operations lead to simple operations.
Less ground space usage due to the supporting structure of a single pillar with a cantilever structure to align the rail, and can be operated above the vehicular lanes.
Good operation stability in bad weather as the wheels run in a closed environment.
Relatively smaller operating noises due to the rubber wheels, comparing to the medal wheels of raillines.
Less disturbance to original structures or buildings.

Disadvantages:
Low operating efficiency due to low operating speed and one-rail-connection between some stations.
Bad instant response to emergencies, panic may occur for passengers.
The stability of the construction under hurricane wind load is to be determined since the monorail is now constructed in regions without many hurricanes.
Not well-integrated with neighboring urban areas as the rail is usually set along the road.

Case 2: Air-Rail

Wuhan, China

The Air Rail Tourist Line is one of the supporting infrastructure for tourism, aims to create a large ecological corridor in the Optics Valley. It has a constructed length of 10.5 kilometers with six stations, and can connect the tourism resources such as National Forest Park and Archaeological Site Park at both ends. It can transfer to Wuhan Railway Line 11 and the L2 line of OV Tram, which makes it convenient for passengers to enjoy the ecological corridor of OV and the attractions along the line.

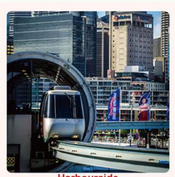
"The first commercial Air Rail planned and constructed in China"

Advantages:
Unmanned operations lead to less labour usage.
Lower ground space use as the rail aligns on the elevated bridges.
Relatively better stability for two wheel's rail
Good obstacle-overcoming ability like crossing the rivers or existing green belts.
Less disturbance to original structures or buildings.

Disadvantages:
Relatively slow operating speed compared to the light rails.
Not enough capacity to meet the demand of commuting passenger flows.
Not well-integrated with neighboring urban areas as the rail is set in sightseeing route instead of commuting route.

Case 3: Sydney Harbourlink

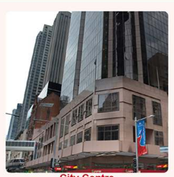
Sydney, Australia

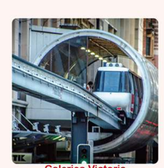

Harbourside

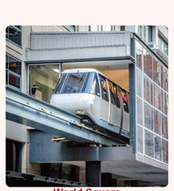

Darling Park


Convention


Paddy's Markets


City Centre


Galeries Victoria


World Square


City Centre Station - Railway Entry

Stations are linked to the buildings by footbridge or pedestrian sidewalks, or even become parts of the buildings that the rail go through the building in the City Centre Station. However, the Harbourlink did cause a negative visual impact, which became a main reason for its dismantle.

The Sydney monorail was a single-loop monorail system that connected various attractions and facilities in Sydney, Australia. It was opened in 1988 and closed in 2013. It had eight stations and a total length of 3.6 kilometers. The Sydney monorail was one of the few examples of **the Von Roll Mk III straddle-beam monorail technology**, which was also used in Japan, Malaysia, and the United States. There were eight stations on the 3.6-kilometre (2.237 mi) loop, with up to six trains operating simultaneously. It served major attractions and facilities such as a Museum, an Aquarium, and the Convention & Exhibition Centre.

A control rail was also provided for train control, and a generator was provided to clear trains from the track in emergencies. Each station stop took 40 seconds, including the time to decelerate, board passengers, and accelerate again. A complete circuit of the route took 12 minutes. It was originally intended for the system to operate automatically, but after a number of breakdowns soon after opening, it was decided to retain drivers, who occupied the first car of each train.

Some of the reasons for its closure were **low patronage**, high maintenance costs, and the **need to redevelop** the Darling Harbour area. Criticisms noted that the monorail is **not integrated with Sydney's wider public transport** network and has never been truly embraced by the community. While it has been a controversial part of Sydney's history for more than 20 years, the monorail is reaching the end of its economic life and the NSW Government cannot justify **costly upgrades** like the purchase of new vehicles required to keep it running.

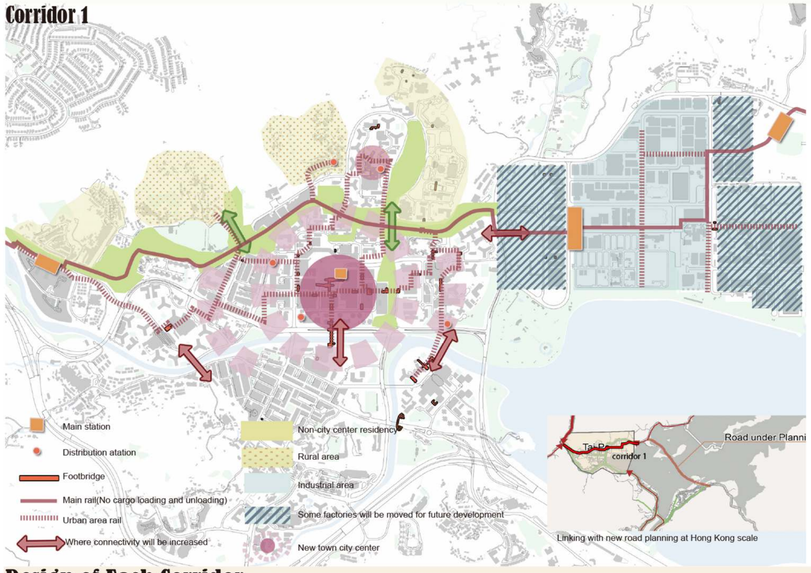
A mix of independent passengers and groups (54% visitors to Sydney, 24% leisure seekers, 22% commuters)regularly use the Monorail. It offers tour operators/event planners/groups **an efficient alternative** to coach city transfers that **avoid traffic congestion**. Being **electrically powered**, the Monorail is non-polluting at street level and is environmentally friendly.

Advantages:
Great combination with the surrounding urban areas as the pictures of each station shows.
Good obstacle overcoming ability for it crossed a harbour between the Harbourside and Darling Park stations.
Easy route arrangement due to the looping operation.
Good accessibility for transferring between transportation modes.

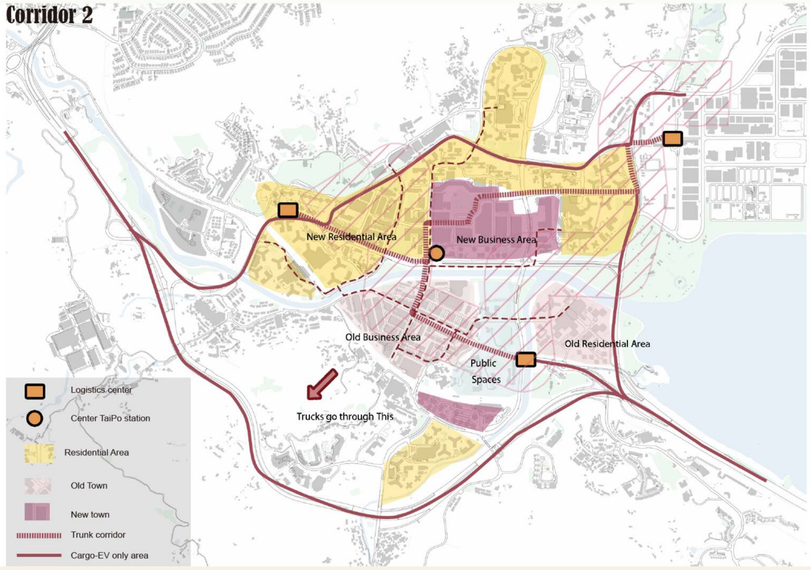
Disadvantages:
Bothered the scenery viewing tours within the city, which also became one of the main reasons that it was closed.
Higher construction cost than the light rail.
Higher operation cost than the metro lines.
Bad opposite-direction travelling accessibility for the loop only goes one-direction.

Framework of Each Corridor

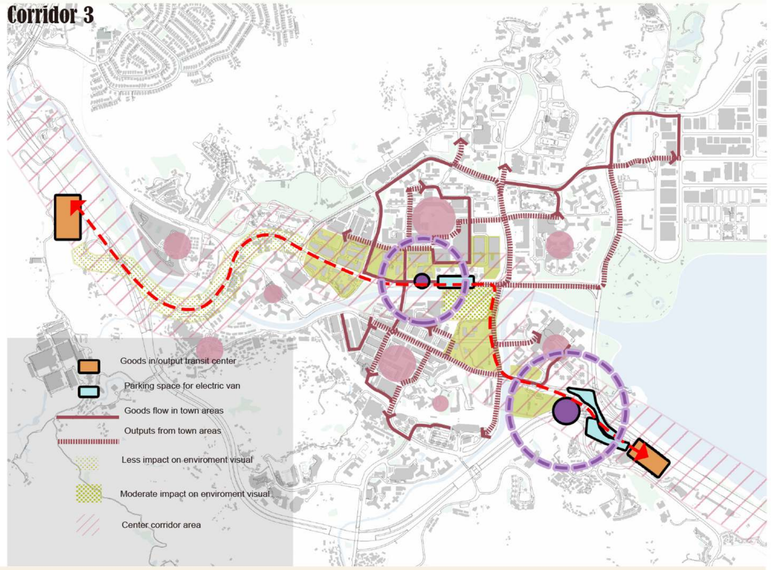
Corridor 1



Corridor 2



Corridor 3



Design of Each Corridor

4 STEPS FOR THIS CORRIDOR

1 build a goods MTR system

1 Building supermarket stations and logistics and Combining it with an existing building
2 featuring a fleet of autonomous cargo vehicles
3 incorporate smart sensors and real-time data analytics to optimise delivery routes and schedules

2 down size some roads

Researchers and the U.S. Department of Transportation (Federal Highway Administration) have found that road diets can be expected to reduce overall crash frequency by 19% to 43%, with the higher crash reductions occurring in small urban areas than in metropolitan areas.

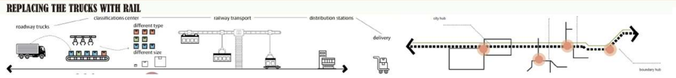
3 Highway to Boulevard conversion

1 widening of footpaths/sidewalks
2 widening of boulevards (landscaping strips)
3 Adding cycle lanes on one or both sides of the ro

4 Adding public transportation(reserved tramtracks,) to the freight rail system as needed.

1 Reduced the gap of regions
2 Easier commuting, more population inflow and faster development

REPLACING THE TRUCKS WITH RAIL

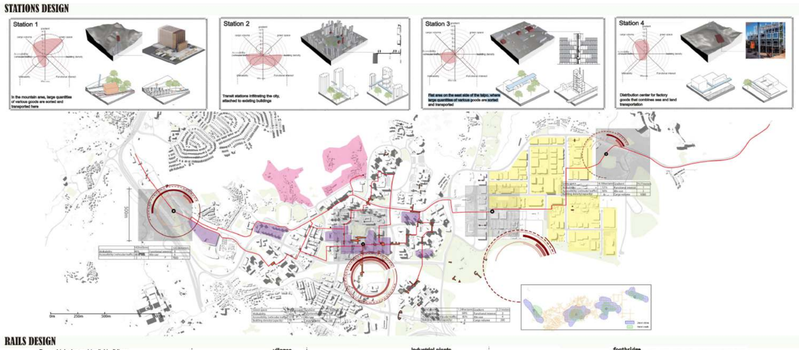


SYSTEM DESIGN

Long trains in the city center can be split into shorter trains to serve outlying suburbs. Serving outlying suburbs matches capacity to demand and provides high-frequency services across the network.

It can automatically get on and off the track according to the assigment instructions and drive to the destination through a short distance. Savings in cargo handling from rail to car.

STATIONS DESIGN

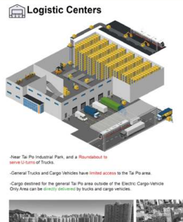


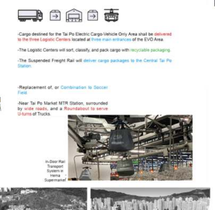
RAILS DESIGN

SECTIONS BEFORE & AFTER

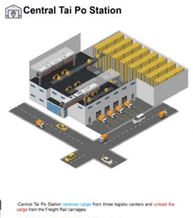
STREET SCOPE

Logistic Centers





Central Tai Po Station



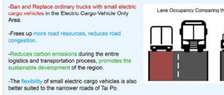
Electric Cargo-Vehicle Only Area

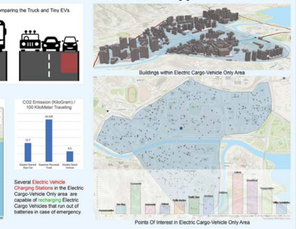
-Ban and Replace ordinary trucks with small electric cargo vehicles in the Electric Cargo-Vehicle Only Area.

-Frees up more road resources, reduces road congestion.

-Reduces carbon emissions during the entire logistics and transportation process, promotes the sustainable development of the region.

-The flexibility of small electric cargo vehicles is also better suited to the narrower roads of Tai Po.





Now

-Narrow pedestrian sidewalks
-Mixed traffic of motor and non-motor
-Trucks occupy much road capacity
-Lack of greenery
-Trucks are restricted to park beside the lane and unload
-Conflict points occur when traffic is dense and mixed
-Lack of public open space
-Wide vehicular lane

5 Years from Now

-Wider pedestrian sidewalks
-Mixed traffic of motor and non-motor
-Tiny EVs occupy less road capacity
-Increase of greenery
-EVs shall unload at desinated locations
-Conflict points are less hazardous since less large vehicles on the road
-More public open space
-Narrowed vehicular lane

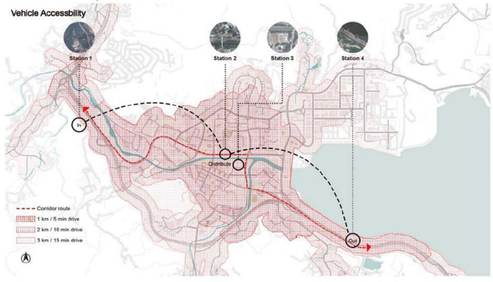
15 Years from Now

-Widened pedestrian sidewalks
-Separated of motor and non-motor
-Tiny EVs became basically automated
-More greenery
-Smart EVs increase efficiency of system
-Downgraded roads and less vehicles
-New public open space on Elevated Platform
-Narrowed(+) vehicular lane

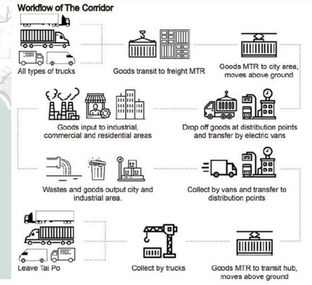
25 Years from Now

-Elevated pedestrian sidewalks above rail
-Bicycles became the only personal travel mode
-Tiny EVs became fully automated
-More(+) greenery
-System of the smart EVs adjust the roads
-Bike lanes are expanded to meet the demand
-New style of public open space
-Single-directional vehicular lane

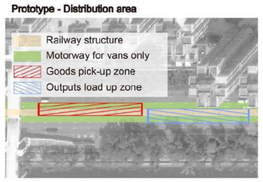
Vehicle Accessbility



Workflow of The Corridor



Prototype - Distribution area



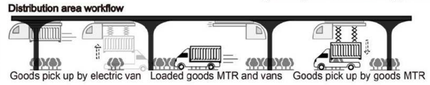
Aims

1. Reduce the number and type of vehicles used for the transportation of goods in urban areas.
2. Reduce the number of lanes on main roads in urban areas.
3. Increase open space and greening within the urban area.
4. Improve the micro-environment and micro-climate within the urban area.

Strategies

1. Unify of the size and type of vehicles used for the transport of goods and their departure and consolidation from the same place.
2. The space saved by the reduction in the number of vehicles on the road is used to provide open space for pedestrians.
3. Increased landscaping and replace vehicles from gasoline powered to electricity powered.

Distribution area workflow



Section

Illustration of Distribution Area

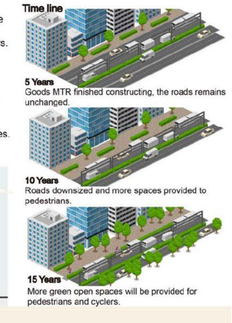
Influences On Surrounding Environment

There will be moderate visual impacts for pedestrians and drivers.

Space saved from downsizing the roads.

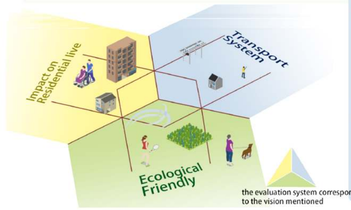
Downsized road spaces.

Time line



Section

Corridor Comparison and Evaluating Standards



the evaluation system corresponds to the vision mentioned

-Feasibility and economic

-Gradual Implementation
-Construction Cost
-Payback after Completion
-Demand in Covered Area
-Transporting Capacity
-Transporting Energy Consumption
-Interaction with Existing Roadway
-Restrictions on the Cargo

-Transport System Design

-Transporting Capacity
-Transporting Energy Consumption
-Interaction with Existing Roadway
-Restrictions on the Cargo

-Pollution during Construction

-Excavation or Filling
-Materials Sustainability
-Construction Period Length
-Demolishability
-More Greenery
-Adaptability to Extreme Weather
-Climate Actions Adaptability
-Eco-Resources Utilization

-Impact to Environment

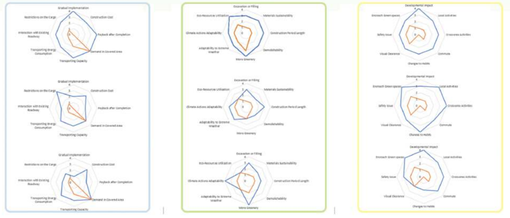
-Greenery Providing Ability
-Adaptability to extreme weather
-Degree of adaptation to climate change
-Positive Effect to Tai Po's Eco-Resources

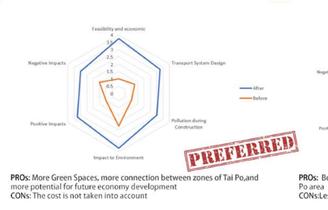
-Positive Impacts

-Developmental Impact
-Local Activities
-Cross-area Activities
-Commute
-Changes to Habits
-Visual Clearance
-Encroach Green spaces

-Negative Impacts

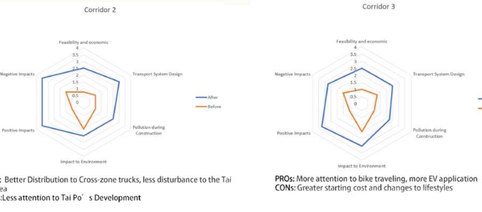
-No major changes to the existing travel structure of the population
-Visual Clearance
-Encroach on Existing Green spaces
-Safety Issue





PREFERRED

PROs: More Green Spaces, more connection between zones of Tai Po,and more potential for future economy development
CONs: The cost is not taken into account

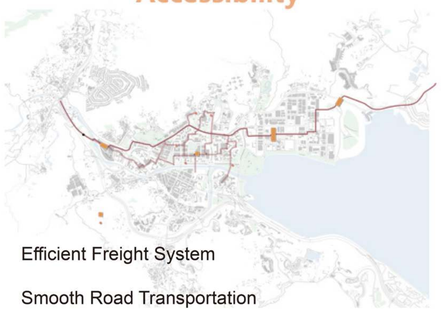


PROs: Better Distribution to Cross-zone trucks, less disturbance to the Tai Po area
CONs: Less attention to Tai Po' s Development

PROs: More attention to bike traveling, more EV application
CONs: Greater starting cost and changes to lifestyles

GOALS AND STRATEGY

Accessibility

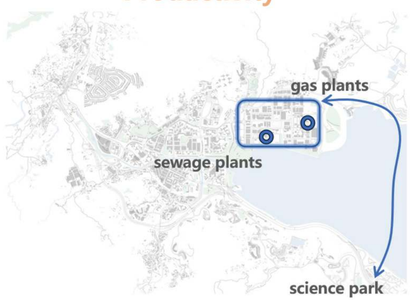


Efficient Freight System

Smooth Road Transportation

built a walkable City

Productivity



Develop industrial structure to support future economies: Moving highly polluting gas and sewage plants away from the city's edge and replacing them with clean energy plants and new industries

Sustainability

Continuous and diversified open space for activities

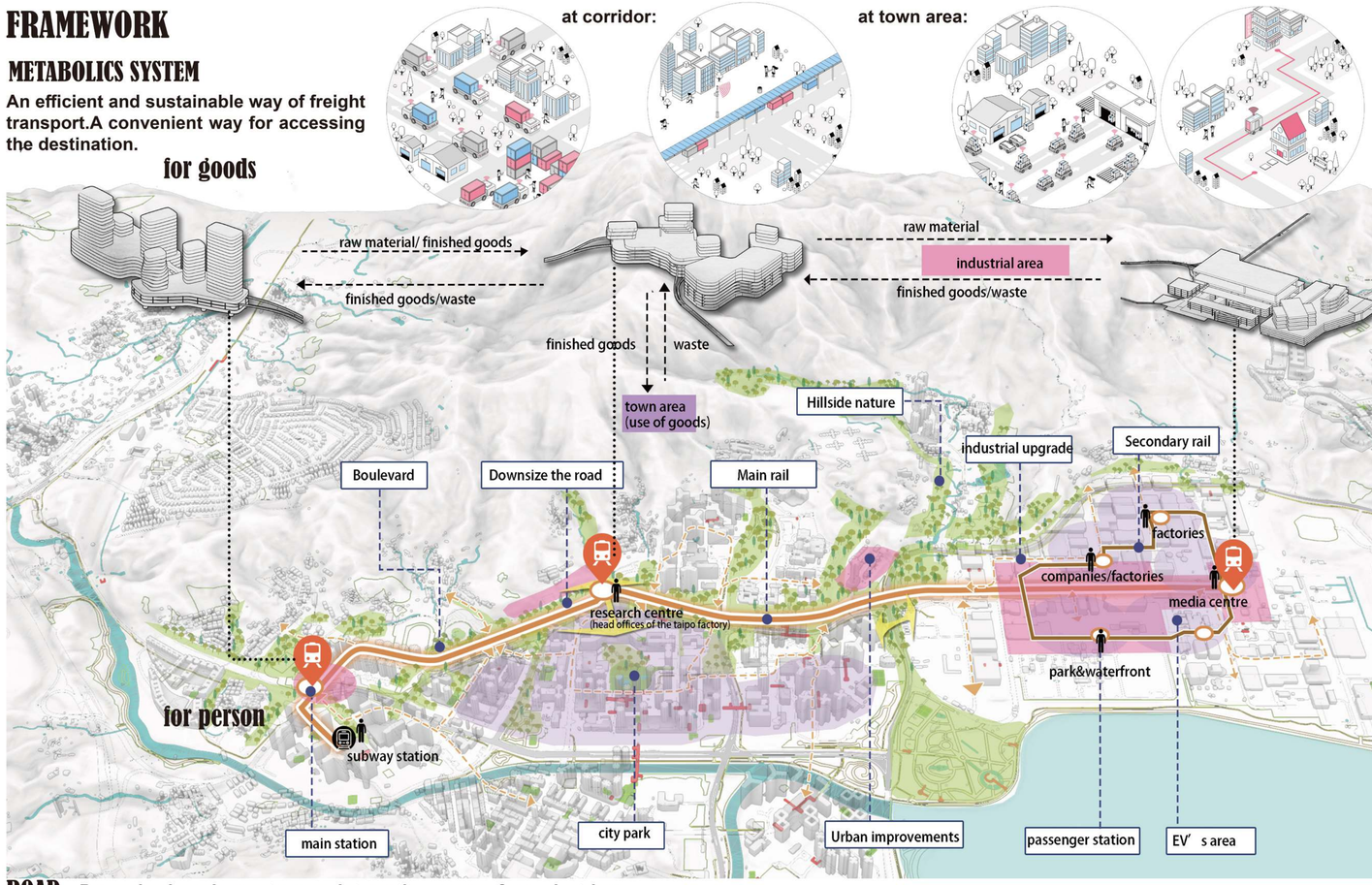
Narrow the gap:
strengthen urban-rural synergies and value chains.
strengthen regional connectivity(old-new/ industrial-center city)

Lower freight costs

FRAMEWORK

METABOLICS SYSTEM

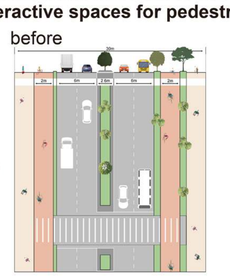
An efficient and sustainable way of freight transport.A convenient way for accessing the destination.



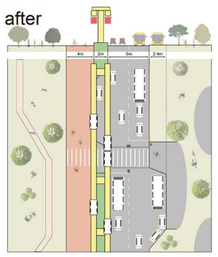
ROAD **Downsized roads create more interactive spaces for pedestrians.**

Poliicies:
1. Under normal circumstances, goods in TaiPo can only be delivered by rail system and EV vans;
2. Under normal circumstances, only public transport, taxis, EV vans and special vehicles can use motorlanes in the corridor;
3. EV vans cannot stop and deliver goods using motorlanes under the rail system.

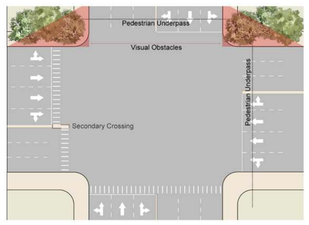
before



after



before



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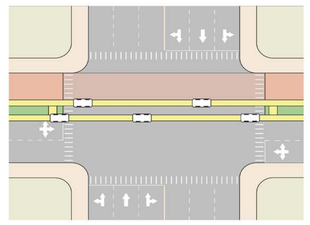
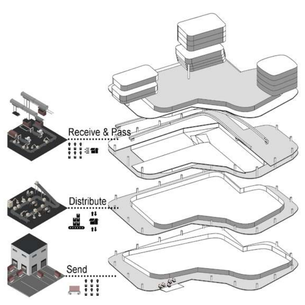
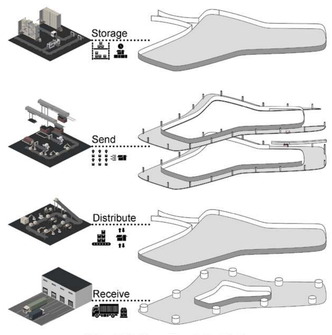


STATIONS **Different functions of each station.**



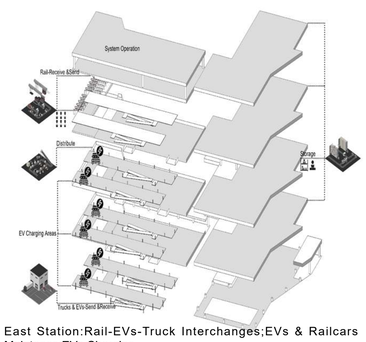
Mid Station: Rail to EVs

Truck to Rail Transfer, Access to Tolo Highway



West Station: Truck to Rail

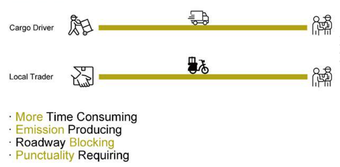
Rail to EV Transfer, Serve the Tai Po Central Town Area



East Station:Rail-EVs-Truck Interchanges;EVs & Railcars Maintence;EVs Charging

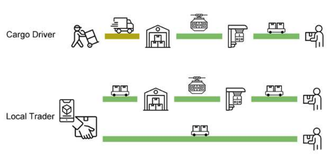
Truck-Rail-EV Interchange, System Operation and Maintence

Before



· More Time Consuming
· Emission Producing
· Roadway Blocking
· Punctuality Requiring

After



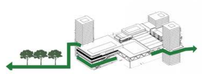
· Less Time Consumption
· Emission Reduced
· Roadway Utilized
· Order Delivery at Any Time

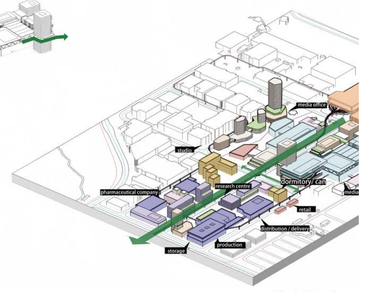
MASTERPLAN

Legends

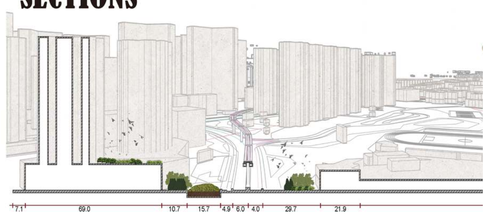
- Tolo Highway Station
- Tai Po Central Station
- Tai Po Innopark Station
- Food industry campus
- Healthcare industry campus
- Media industry campus
- New POI - cultural park
- New residential and commercial mix use buildings
- Town area green and open spaces
- Industrial a open spac
- Rail transp
- Rail transp route
- Bus stop
- Rail syster work
- EV van at
- Design bo
- EV routes

FOCUSED AREA





SECTIONS



A
A'
B
B'
C
C'
D
D'

one
two
three

1 Sports ground
2 Urban woodland
3 Meadow land
4 Children playground
5 Outdoor cafe
6 Outdoor reading space
7 Community service hub
8 Temporary markets

Town area detailed plan

Inno park a

STREET SCAPE

media centre
Studios
Recreation
Media Company
Theatres
Offices
Offices

food factory
raw materials
Production
Warehouse
Packaging
Quality Control
Distribution

pharmaceutical company
factory
research
factory
dormitory
dormitory

Tolo Highway Station area

reading terrace
children playground
basketball playground
community plaza
tennis court
amusement park

Tai Po Central Station area

roof playground
roof garden
leisure and viewing terrace
centre square
culture and sports park
dog park

ation

A'

B - B'

C - C'

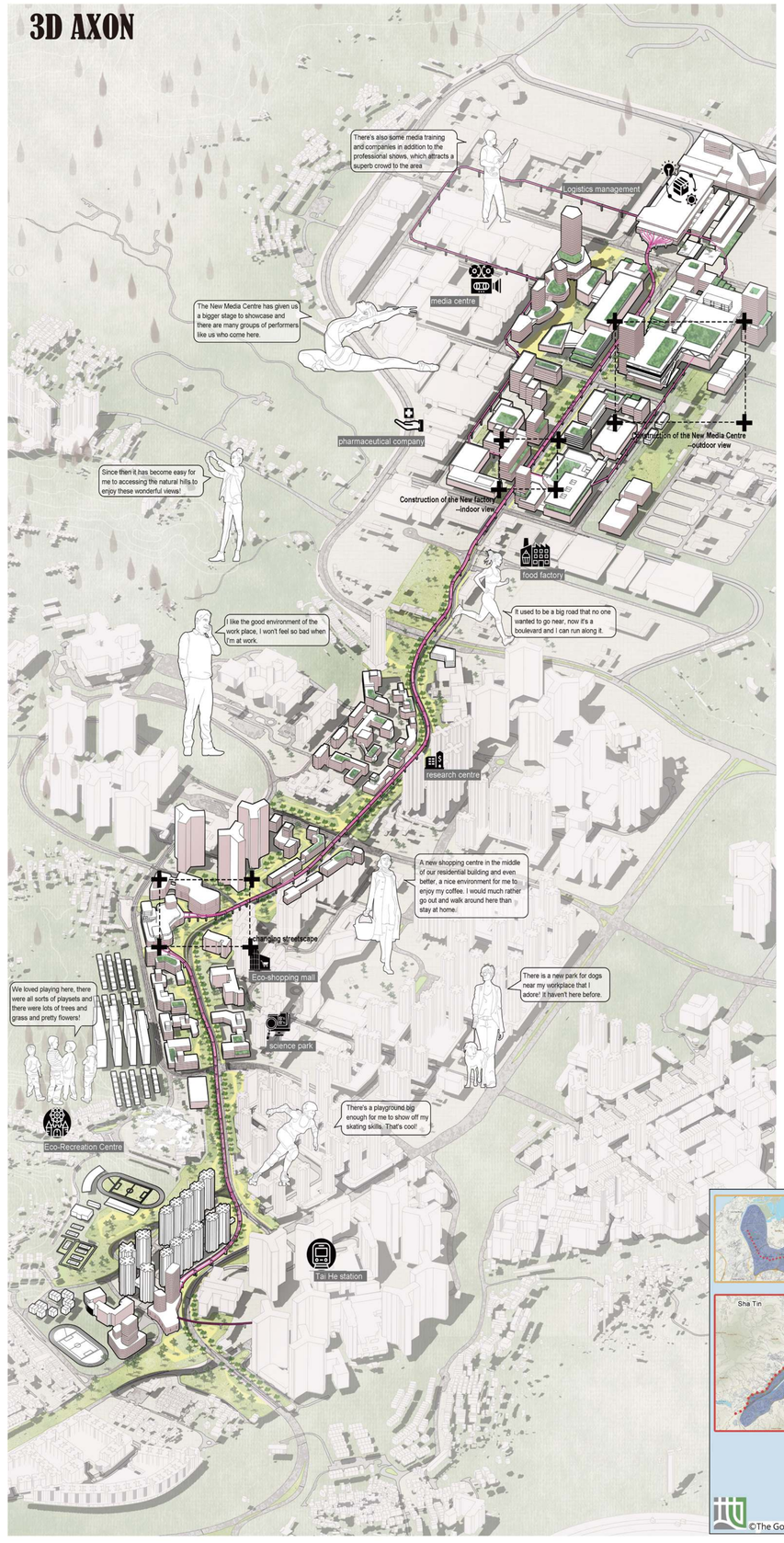
D - D'

E - E'

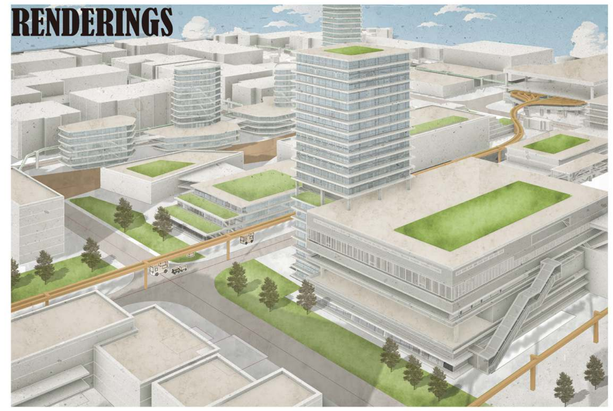
Total Land Use (m²)	1,494,987
Total Construction Area (m²)	2,721,622
Building Footprint Area (m²)	471,435
Green Area (m²)	411,436
Floor Area Ratio	1.82
Green Ratio (%)	27.5

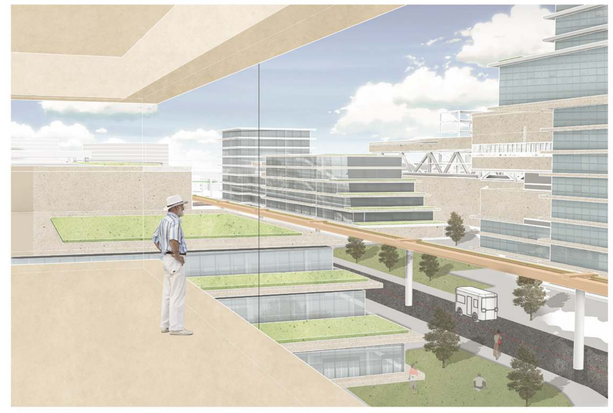
IMPACT ON TOWN AREA

3D AXON



RENDERINGS





FUTURE PROMOTION