Urban Planning 2.0:
from Urban Planning Analytics to AI City Planning Assistant

URBAN
REDEVELOPMENT
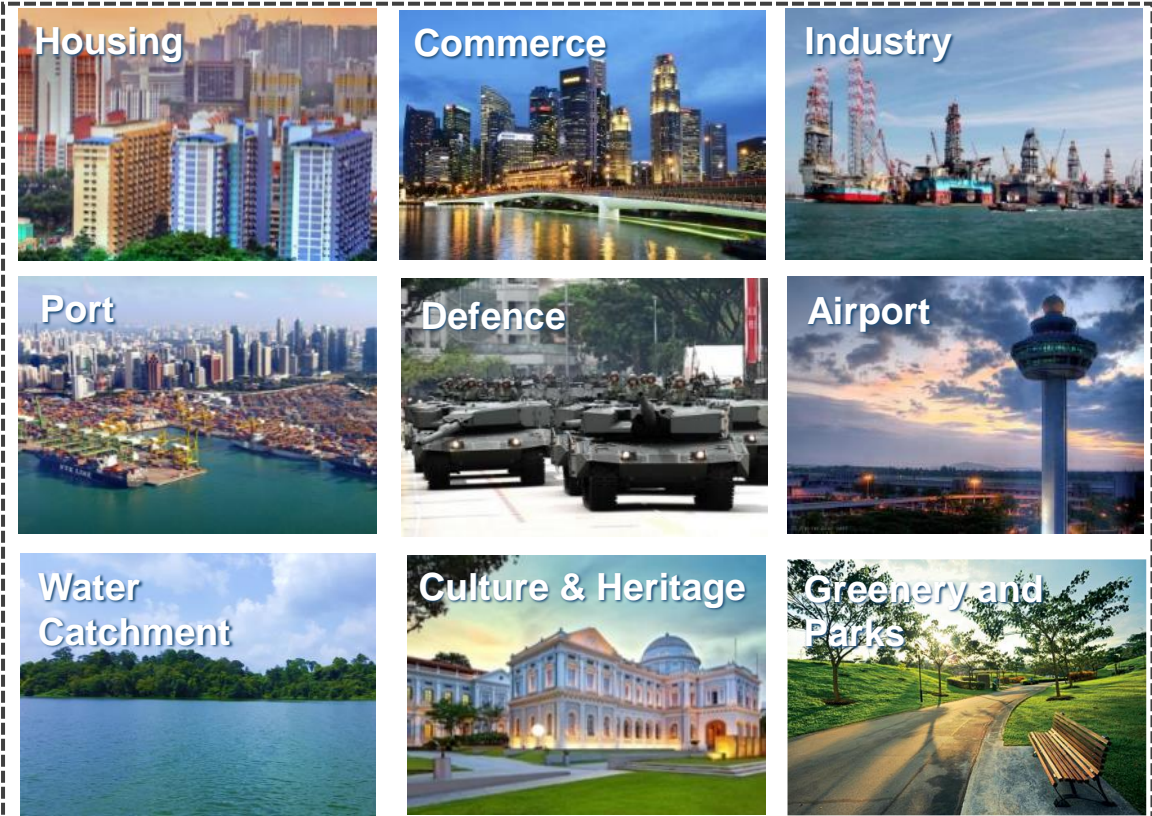AUTHORITY

![Panoramic view of the Singapore skyline featuring Marina Bay Sands, Gardens by the Bay, and the Singapore Flyer against a partly cloudy sky.]

URBAN REDEVELOPMENT AUTHORITY

Singapore's National Land Use Planning and Conservation Authority

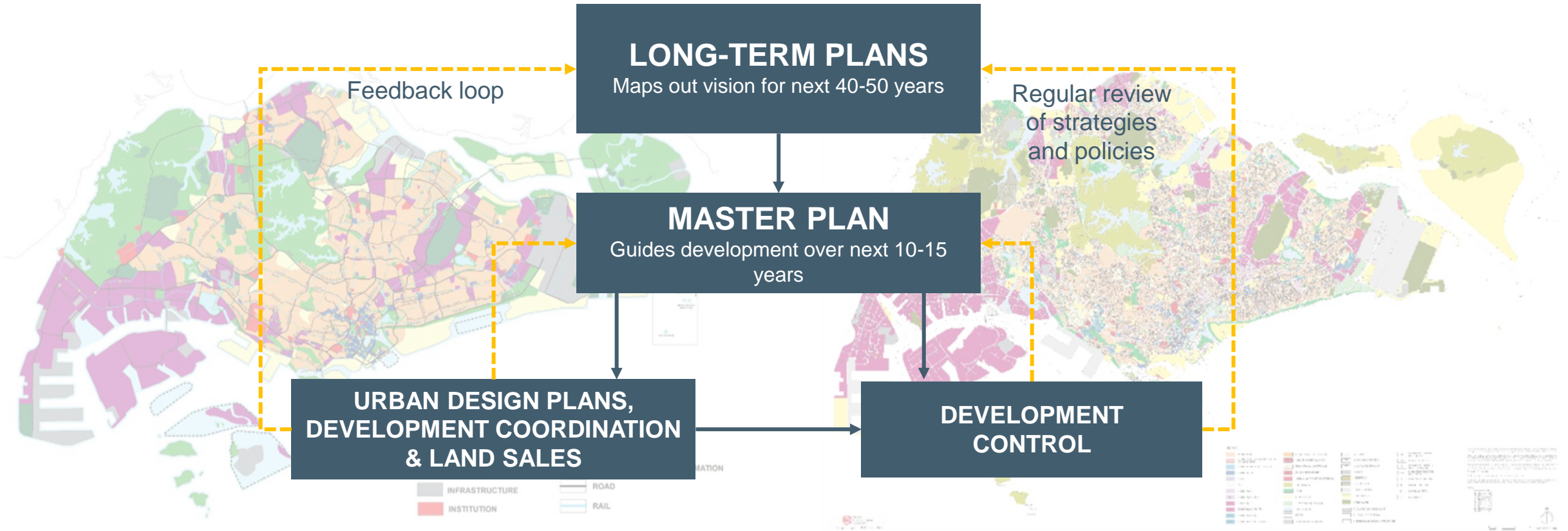**MISSION:** To make Singapore a Great City to Live, Work & Play

small island
CITY-STATE

Land Area: 728 km²
Population: 5.69 million
Density: 7,810 persons/km²

LAND NEEDS

Housing

Commerce

Industry

Port

Defence

Airport

Water Catchment

Culture & Heritage

Greenery and Parks

SEA NEEDS

Anchorage \ Fairways

Aquaculture

Landfill

LONG-TERM PLANS
Maps out vision for next 40-50 years

MASTER PLAN
Guides development over next 10-15 years

URBAN DESIGN PLANS, DEVELOPMENT COORDINATION & LAND SALES

DEVELOPMENT CONTROL

Feedback loop

Regular review of strategies and policies

ECONOMIC
Sustain a robust and vibrant economy

SOCIAL
Provide a good quality of living and a sense of well-being for all

ENVIRONMENT
Develop in an environmentally responsible manner

LAND & SEA
Optimise our limited land and sea space

+ FLEXIBILITY RESILIENCE
Need to consider the rise of disruptive technology, unanticipated uncertainties, and the effects of climate change
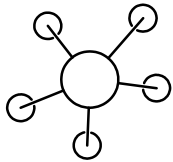
Policy = Implementation

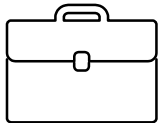# Data → Insights → Action

KEY THRUSTS OF DIGITALISATION

OBJECTIVES

1. **URA to be more data-informed & productive**
   - Access and analyse data, and build internal analytics capabilities

2. **Whole-of-Government planning**
   - Collaborate and level up capabilities of agency partners

3. **Support industry productivity gain & value creation**
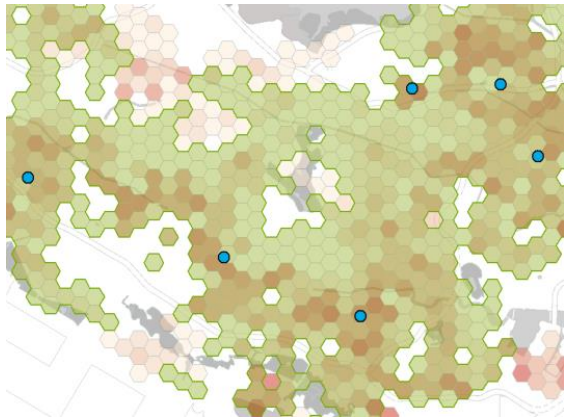   - Provide industry with better services and shared insights
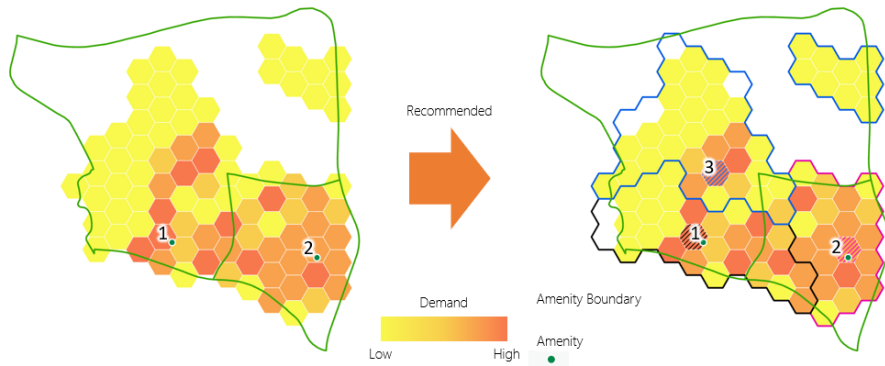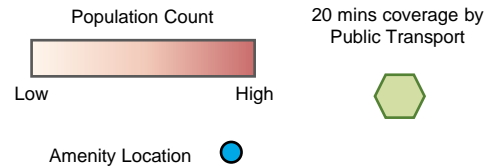
Enabled by Digital Technologies

Think Big, Start Small, Act Fast

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Informed Local Amenities & Infrastructure Planning

AMENITIES PLANNING

Use of spatial analysis to identify gaps in accessibility to amenities

Population Count

Low — High

20 mins coverage by Public Transport

Amenity Location

Recommended

Demand

Low — High

Amenity Boundary

Amenity

Coupled with optimization modelling to identify new potential sites and prevent under-provisioning

INFRASTRUCTURE PLANNING

Origin-Destination Count
Low — High
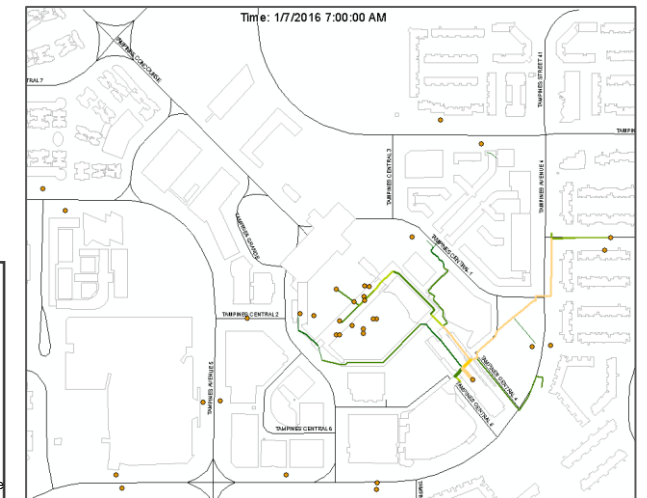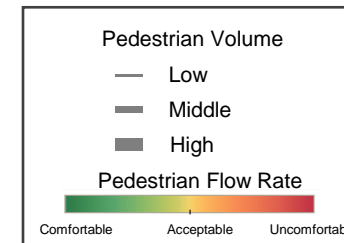Train Station

Estimated Cycling Demand
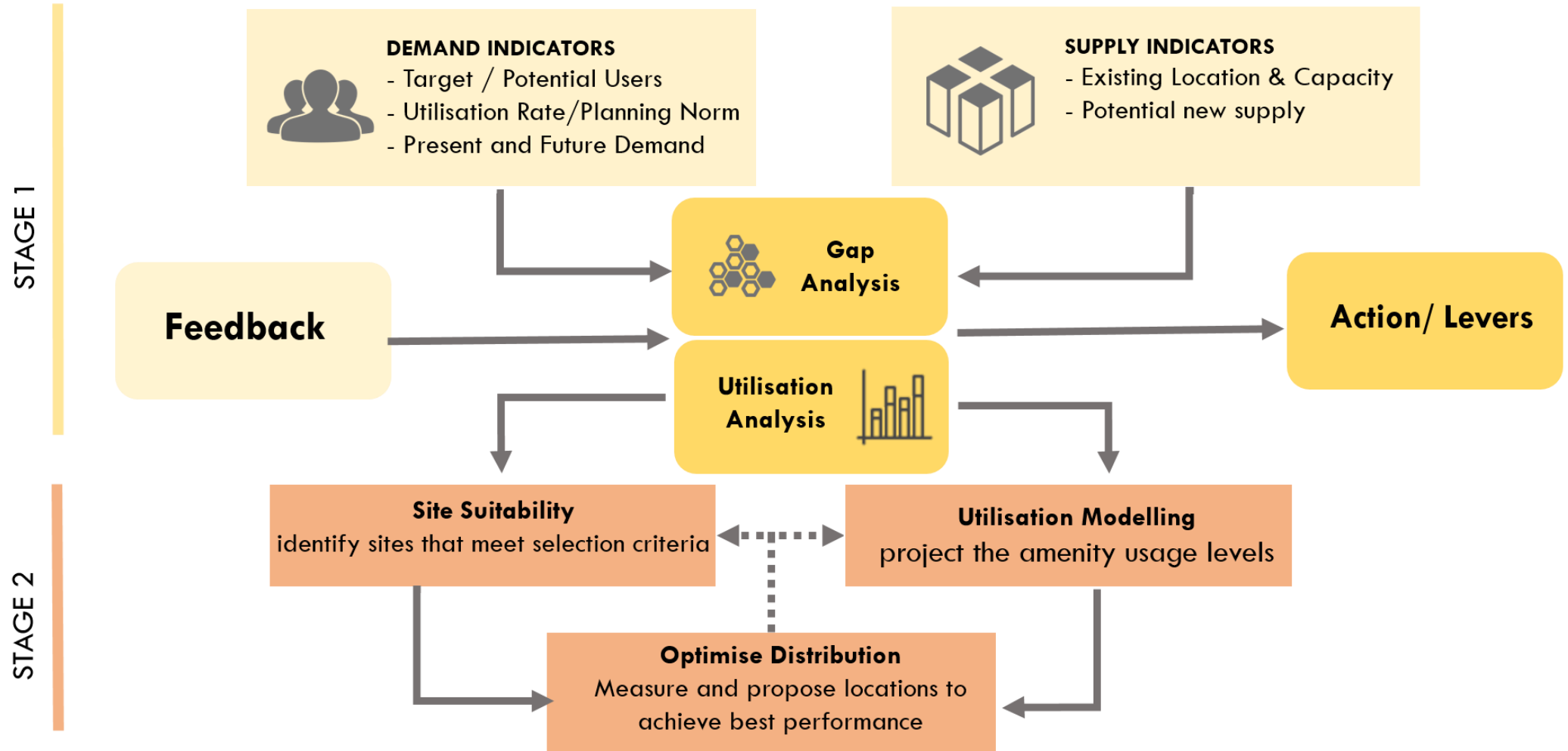Low — High
Train Station
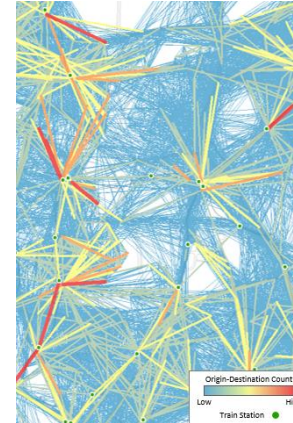
Demand
Low — High

Applying network analysis on origin-destination data such as EZ-link to derive potential demand for cycling paths

Estimating pedestrian flow density to improve pedestrian comfort

Time: 1/7/2016 7:00:00 AM

Pedestrian Volume
— Low
— Middle
— High

Pedestrian Flow Rate
Comfortable — Acceptable — Uncomfortable

Enhanced Facilities Planning Analysis Framework

Enable life-cycle planning of towns

- Harness data analytics to size up future demand and examine changing demographic trends, usage patterns and profiles to:

  o Inform right-siting of new facilities

  o Repurpose facilities (e.g. childcare vs. senior care centres) to cater for changing needs
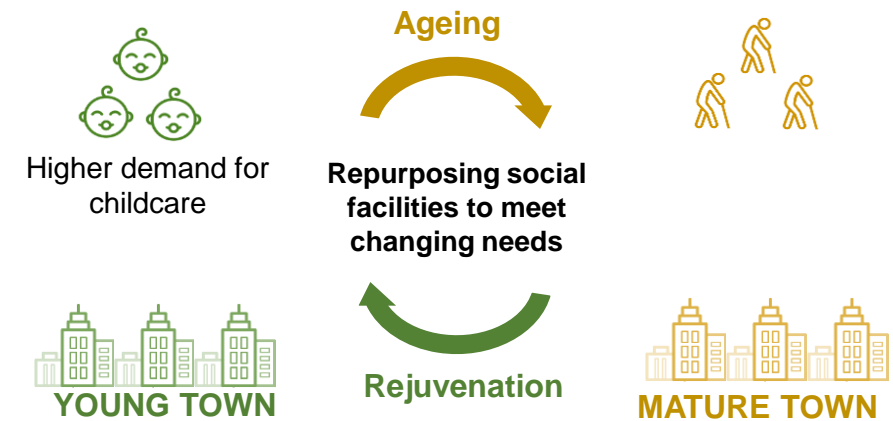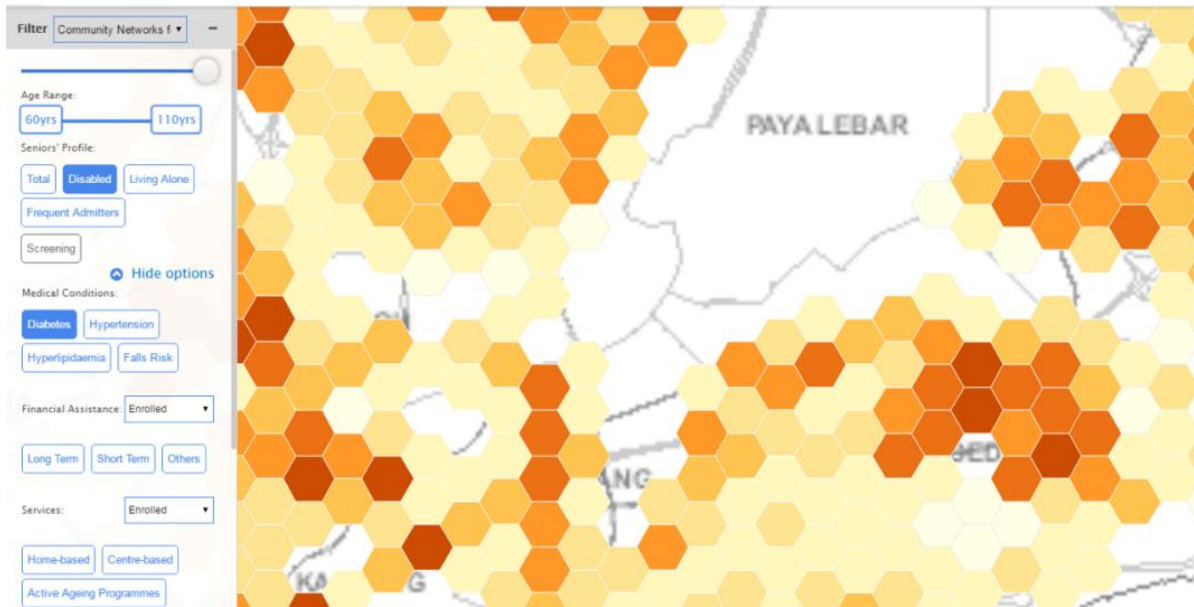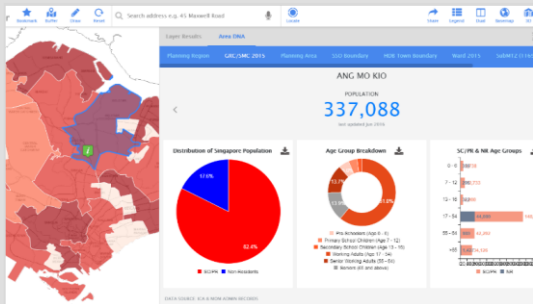

Meeting changing needs across a town's lifecycle

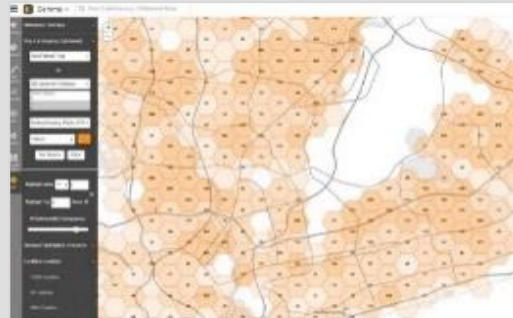# Use in-house digital planning tools to transform processes

ePlanner
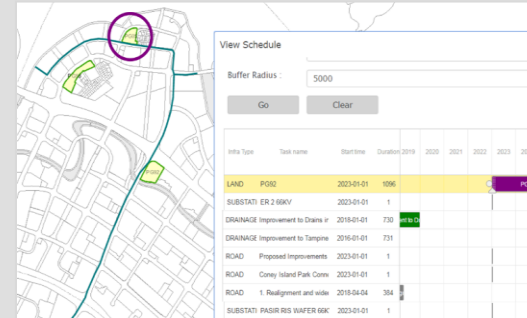Provides planners with rich planning data for quick visualisation and analyses

GEMMA
Brings planners from across agencies on a common platform to study land use scenarios together

Urban Systems Dashboard
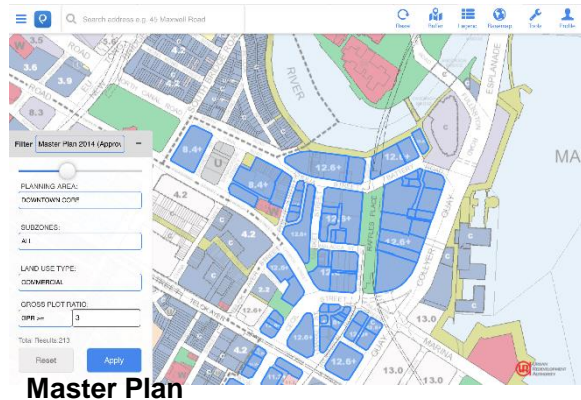Allows planners to track the implementation progress of development and infrastructure

OneTool
To streamline GEMMA and USys into a user-centric platform to facilitate long to mid-term planning workflows at less operating costs
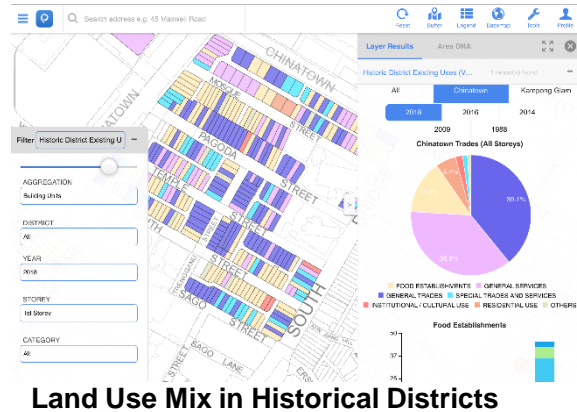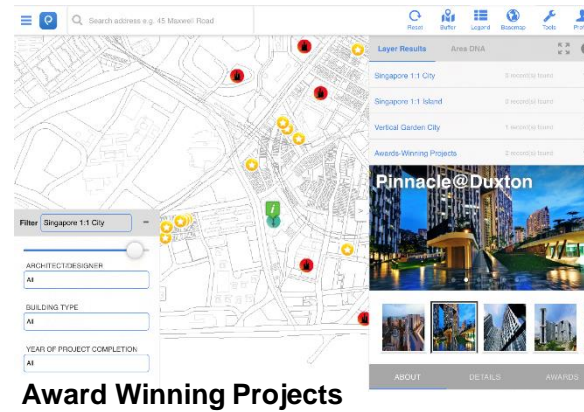
URBAN REDEVELOPMENT AUTHORITY

ePlanner

One-stop geospatial tool to simplify GIS and data analytics for planners

Easy, multi-scale insights for each area and various key domains
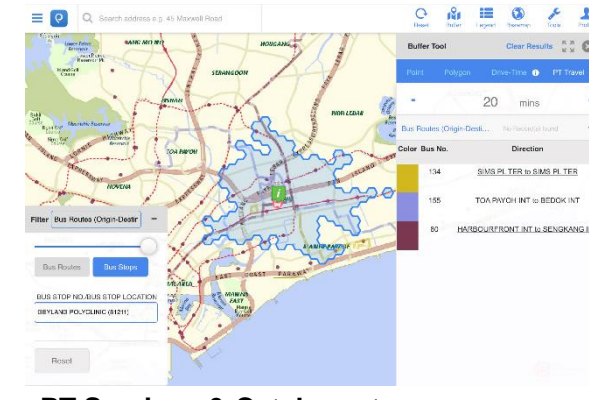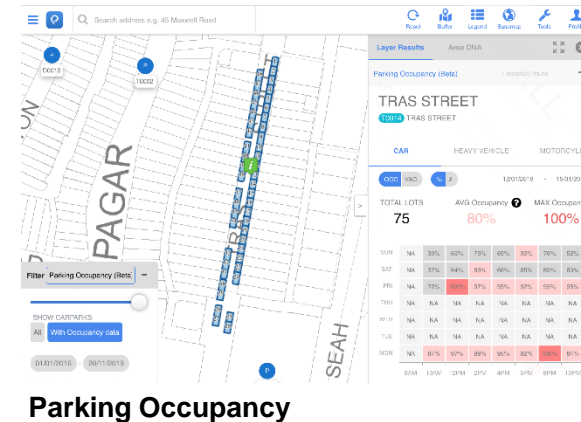

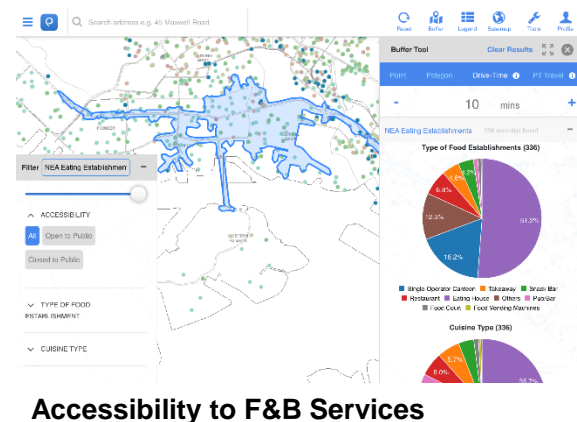**Master Plan**

Land Use Mix in Historical Districts
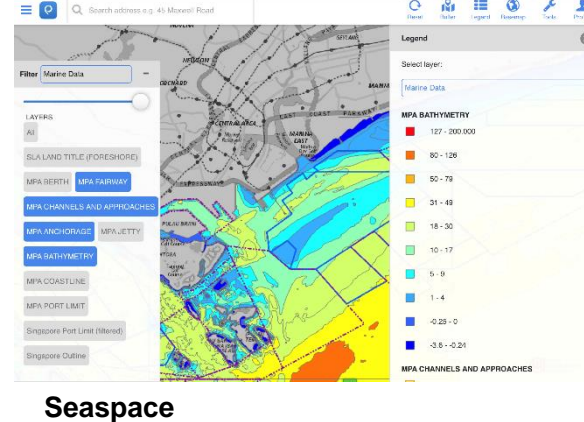

Award Winning Projects

PT Services & Catchment
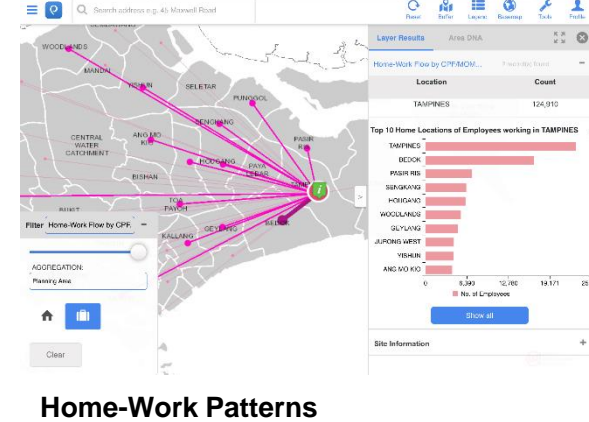
Parking Occupancy

Accessibility to F&B Services

Seaspace

Home-Work Patterns

An inter-agency multi-user platform encourages collaboration, information sharing and reduces individual development effort

COLLABORATION AND INTEGRATION

USER-CENTRICITY

Stakeholders drive the development of individual modules, with a core team coordinating resources, guiding and setting up supporting structures

Design components are modular, consistent, and reusable across workflows ensure that the development process is replicable and scalable

MASS CUSTOMISATION

AGILE DEVELOPMENT

An iterative approach that adopts rapid prototyping and continuous user testing, feedback that guide the development trajectory

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UXpress Apprenticeship Programme

We empower staff to Reimagine service journeys, Co-design solutions and Upskill themselves in User Experience Design
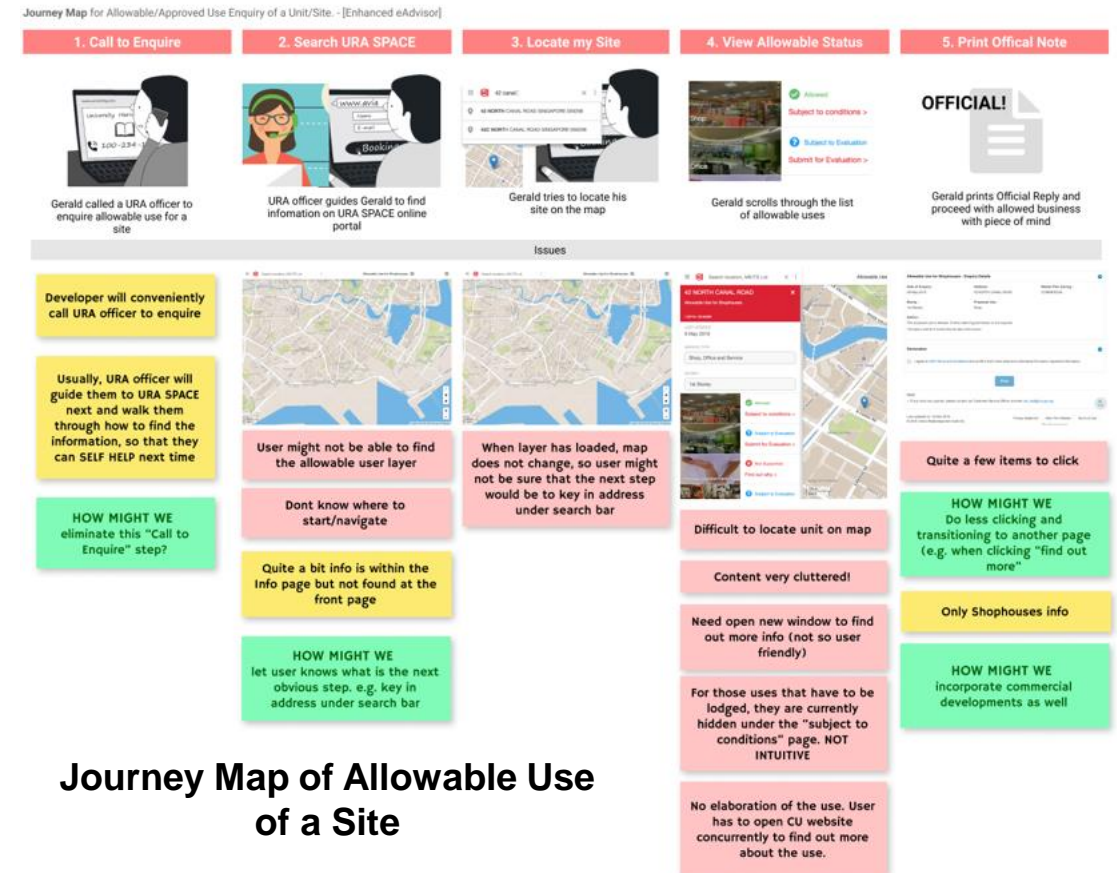
Journey Map of Allowable Use of a Site

SPACE OUT

Stay informed of crowd levels in Singapore

www.spaceout.gov.sg

SpaceOut helps you find out **Crowd Levels** in malls, supermarkets, post offices and markets across Singapore

PUBLIC FEEDBACK

PARTNERS:

Build up capabilities of our people and with partners

KNOWLEDGE EXCHANGE

Communities of Practices (CoP)

ANALYTICS IMMERSION PROGRAMME #AIM

EXECUTIVE ANALYTICS PROGRAMME

TRAINING

Collaboration with Grab researchers on travel demand analytics

RESEARCH AND STUDIES

Maritime Industry Firm Clustering Patterns with NTU

DPXΔ (DP Exchange)

Machine Learning with Textual Information Profiling Engine (TIPE)

Evaluating Transport Network Resilience with ETH researchers

Poster 1

#PLANTECH

TRANSFORMING THE DIGITAL ARCHITECTURE OF PLANNING

A Learning Circle and DPXΔ collaboration

11 JUNE (THUR) | SG 3-4.30PM

We have invited **Connected Places Catapult (UK)** to share on their recent White Paper "Transforming the Digital Architecture of Planning"

Synopsis:
In this Webinar CPC will introduce the Plantech work they have been nurturing across the UK over the last 4 years. They will showcase the work they recently undertook exploring and envisaging the digital architecture of planning software in England. This project is rooted in deep user research and is the result of close collaboration between their in-house urban planning and design experts and their data scientists and engineers. Through this project CPC reviews the planning software market currently in use in England, explores new emerging Plantech products – and presents the principles which they recommend could be the backbone for the delivery of a new software landscape for a truly digital planning future.

SPEAKERS

Kate Taylor
Team Lead Digital Planning

Justin Kliger
Senior Architectural Urbanist

Yusuf Sohoye
Data Engineer

Issac Squires
Data Scientist

REGISTER HERE: **GO.GOV.SG/CPC-URA**
redirect to an eventbrite webpage

Jointly organised by
British High Commission Singapore | SGUK PARTNERSHIP FOR THE FUTURE | CATAPULT Connected Places | Digital Planning Lab @ URA | URA ACADEMY

Poster 2

URA's Design and Planning Lab
presents DPXΔ

Planning Built Environments for Change: Concepts, Approaches, and Digital Tools

While change is a key driver of urban development, our built environments are not purposefully designed to support it. The idea that buildings should be designed for change is gaining ground, implemented in various ways, such as circular economy in construction, multi-use community spaces, or adaptable building projects.

However, in order to integrate Design for Change at the urban planning scale, we need to understand how to plan and distribute adaptable capacity throughout our built environments. In this session, Dr Pieter Herthogs will illustrate concepts, approaches, and digital tools that help build this understanding.

Dr Pieter Herthogs,
Senior Researcher and Investigator,
Singapore-ETH Centre

26 MARCH 2021, FRI
11 - 12PM

ZOOM WEBINAR

SCAN THE QR CODE OR SIGN UP HERE:
HTTPS://GO.GOV.SG/DPX-MARCH21

URBAN REDEVELOPMENT AUTHORITY | Design & Planning Lab

Poster 3

URA Design and Planning Lab presents DPXΔ

Mapping and Modelling Cities with AI

Making sense of big, open geospatial data

An increasing amount of geospatial data is becoming available openly, presenting further opportunities to spearhead new applications.

This talk will overview research at the NUS Urban Analytics Lab, a multidisciplinary research group focusing on urban data analysis, geographic data science, and 3D city modelling. The group is developing new instruments to assess and support urban sustainability, such as the first open registry of sustainable rooftops around the world and a global dataset on urban building morphology.

11 June 2021, Friday
11 – 12PM
Zoom Webinar

DR FILIP BILJECKI
PRESIDENTIAL YOUNG PROFESSOR
SCHOOL OF DESIGN AND ENVIRONMENT
NATIONAL UNIVERSITY OF SINGAPORE

SCAN THE QR CODE OR SIGN UP HERE:
HTTPS://GO.GOV.SG/DPX-JUN21

Design and Planning Lab | URBAN REDEVELOPMENT AUTHORITY

# Joint Analysis of Maritime Industry Clustering – NTU collaboration

Understand the characteristics and spatial relationships between sub-sectors of the Maritime industry. Findings can inform the planning of upcoming employment centres in proximity to Tuas.

Identify Sub-Sectors that are Spatially Clustered

Measure Firm Agglomeration as Distance (d) Increase
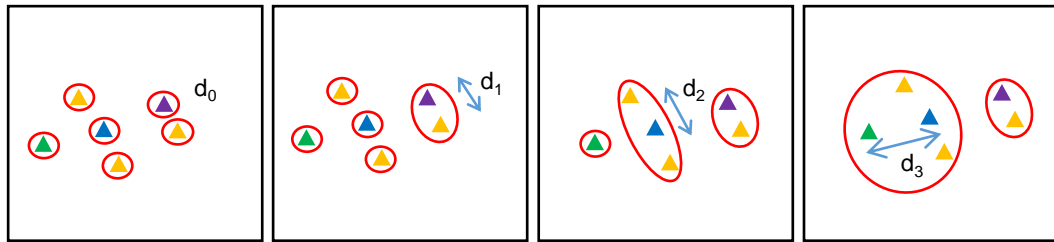
Evaluate the Rate of Change in Agglomeration as Distance (d) Varies
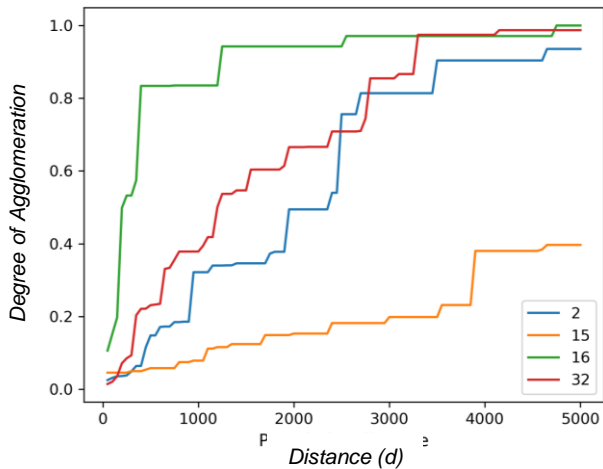
**Insurance** is agglomerated at very small scale *(e.g. clustered at CBD)*

Ship Agencies agglomeration increases with distance

Bunker Supplier no agglomeration at small scale, but agglomerated if a larger scale is considered *(e.g. clustered in the west)*
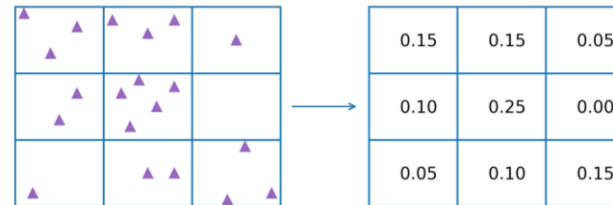
Inspection Services no agglomeration at any scale

Identify Inter-Dependant Sub-Sectors Likely to Relocate in Order for Business Viability

Compute the Probabilities of Firms Occurring in Each Zone Per Sub-Sector
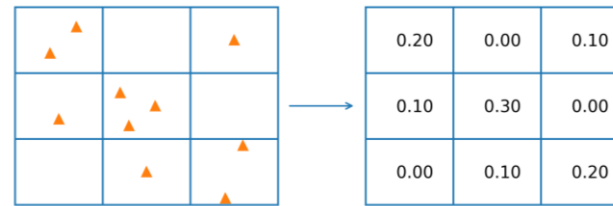
$P_A = [0.20, 0.00, 0.10, 0.10, 0.30, 0.00, 0.00, 0.10, 0.20]$
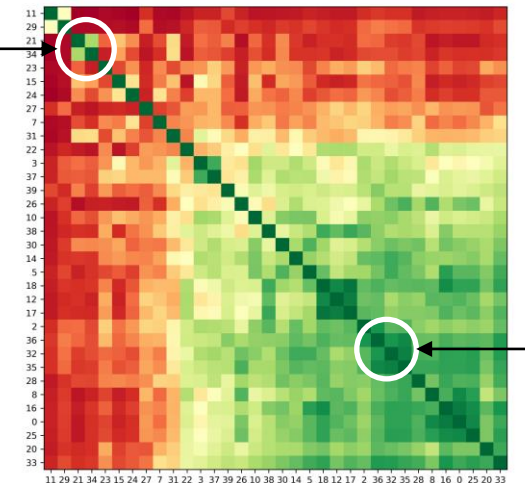

$P_B = [0.15, 0.15, 0.05, 0.10, 0.25, 0.00, 0.05, 0.10, 0.15]$

Compute the Similarity Between Sub-Sectors

$$\text{Co-occurence} = corr(P_A, P_B)$$
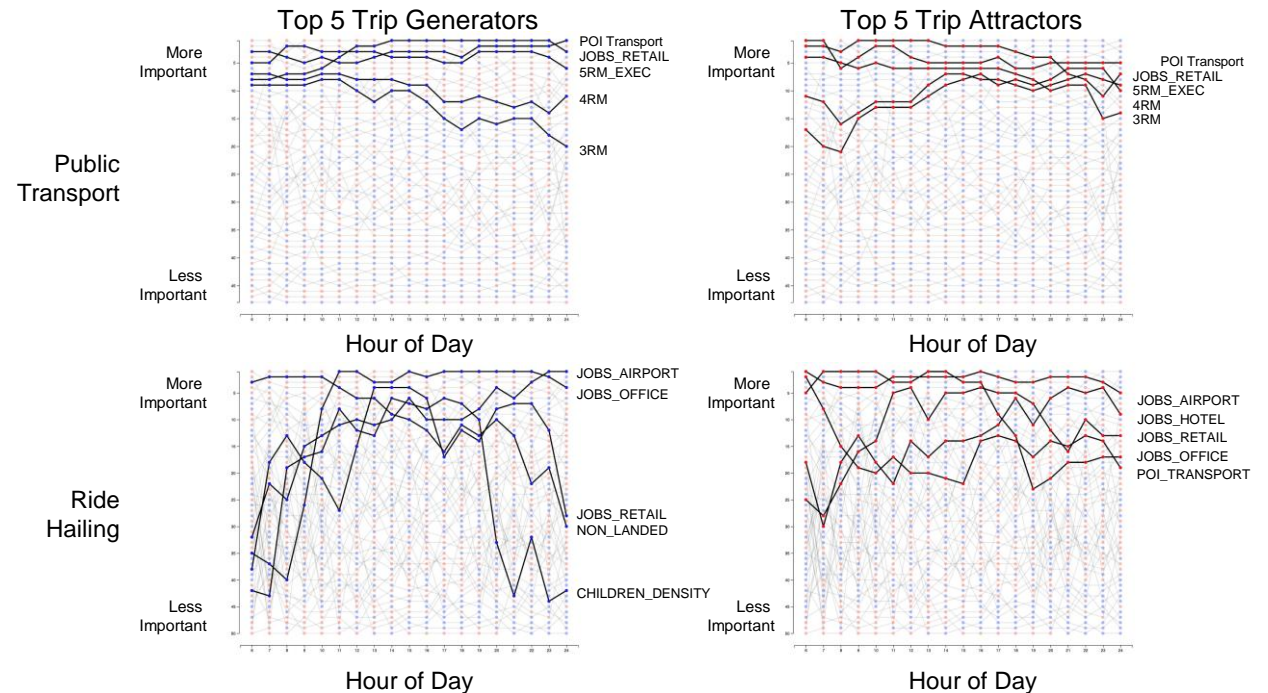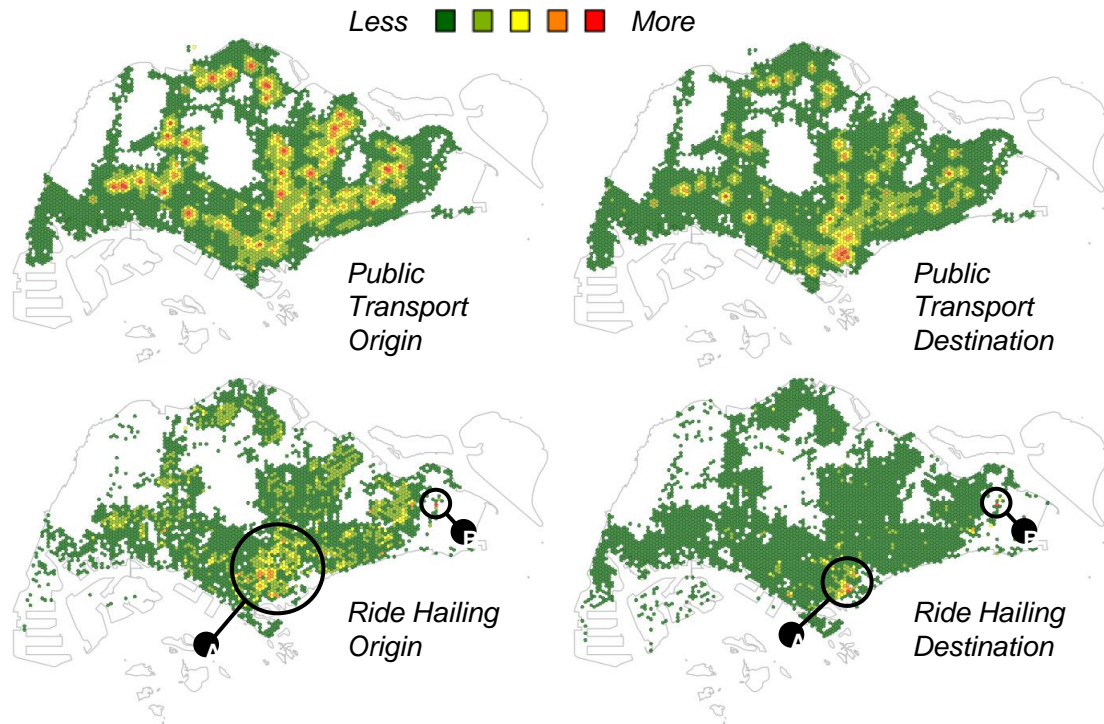
Less Likely ⟶ More Likely

Ship owners & operators, *Ship agencies*, & *Ship management* co-occur (0.9, 0.93, 0.95)

Marine & offshore engineering co-occur with *Ship builder & repairer* (0.68)

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Collaborations between businesses and planners to jointly study consumption patterns for new services – Grab Collaboration

Help city planners obtain a better understanding of the ground in a more timely way, and be more responsive to changing needs and concerns through reviews in plans and policies.

Less ▉ ▉ ▉ ▉ ▉ More

Public Transport Origin

Public Transport Destination

Ride Hailing Origin

Ride Hailing Destination

Public Transport

Top 5 Trip Generators

More Important

Less Important

Hour of Day

POI Transport
JOBS_RETAIL
5RM_EXEC

4RM

3RM

Ride Hailing

More Important

Less Important

Hour of Day

JOBS_AIRPORT
JOBS_OFFICE

JOBS_RETAIL
NON_LANDED

CHILDREN_DENSITY

Top 5 Trip Attractors

More Important

Less Important

Hour of Day

POI Transport
JOBS_RETAIL
5RM_EXEC
4RM
3RM

More Important

Less Important

Hour of Day

JOBS_AIRPORT
JOBS_HOTEL
JOBS_RETAIL
JOBS_OFFICE
POI_TRANSPORT

Contribute to our schools and IHLs through partnerships for youth to apply data analytics and digital technology

NUS MUP & SUTD MUSPP

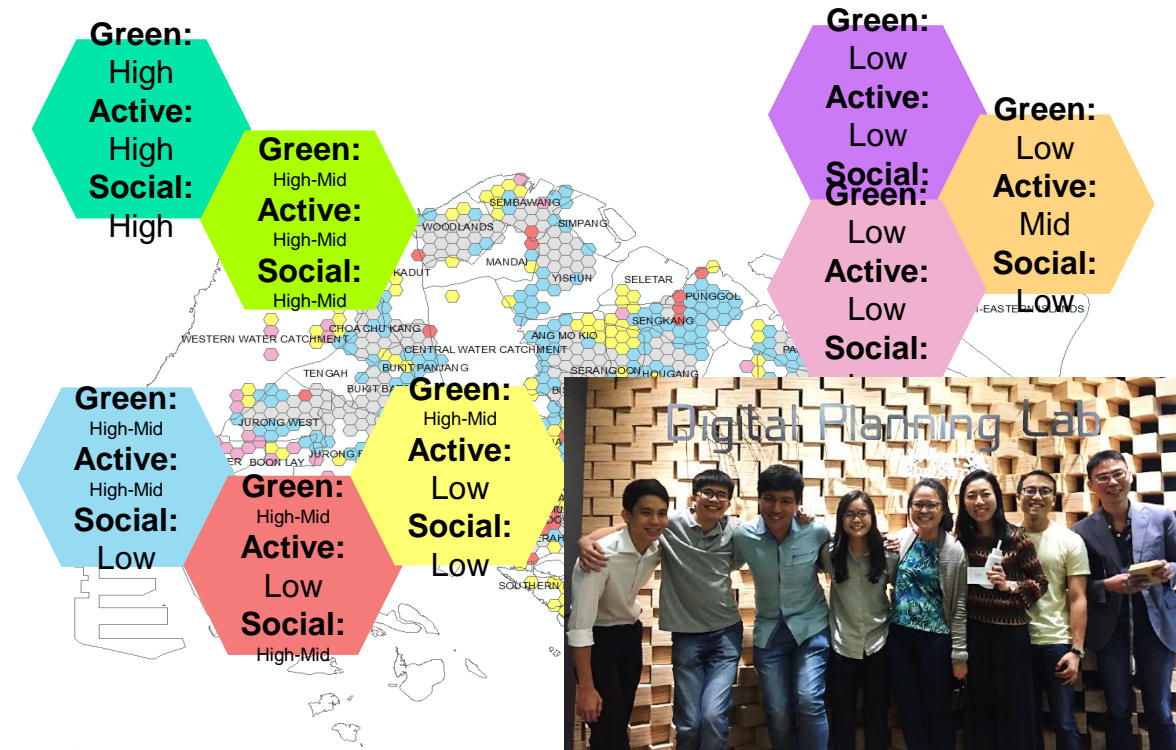

02.562:
Research Studio
Research Final Report – URA Team

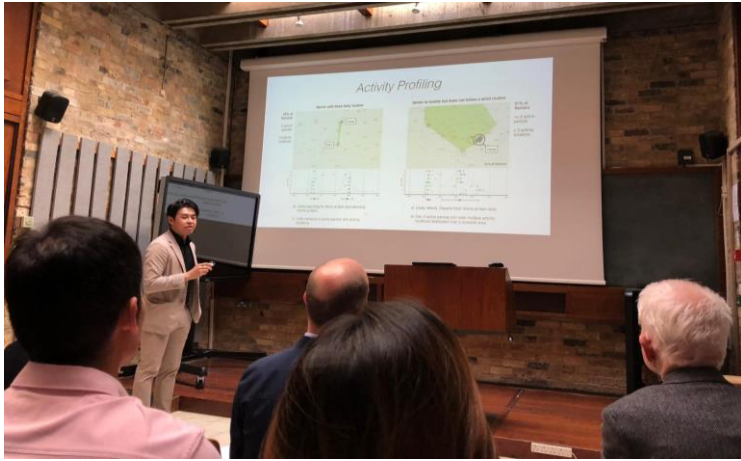Building an Inclusive Development at the Greater Southern Waterfront

Ho Jiahan, Jonathan — Irwan Soetikno — Ma Ka Kui
Muhammad Badrul Hisham Bin Ismail — Norio Sim Zuo Min

MOE Geography Talent Development Programme (TDP) students

URBAN
REDEVELOPMENT
AUTHORITY

Connect with experts worldwide

(top) Applied Urban Modelling Workshop, Cambridge University, Sep 2019

(bottom) MacArthur Workshop on Urban Modelling & Complexity Science, UCL, Sep 2019

(top) Visit by HK Institute of Planning, Nov 2019

(bottom) Digital Planning Workshop with Tianjin Eco-City Planning Committee, July 2019
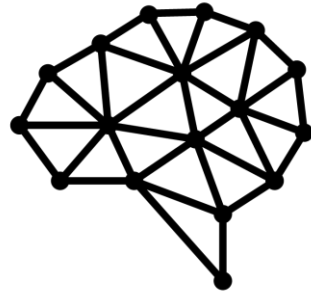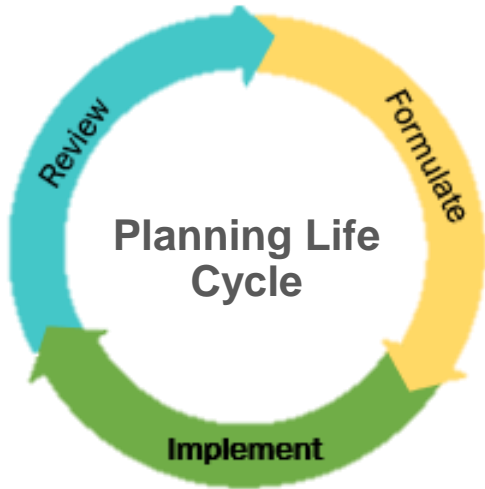

DPLab participated in HKTDC Belt & Road Summit with InfraAsia, Hong Kong, Sep 2019

URA will harness AI to transform Singapore's urban planning system and process for better outcomes

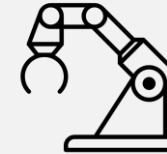**Planning Cycle   +   Artificial Intelligence   =   Outcomes**

Planning Life Cycle
- Review
- Formulate
- Implement

Data Strategy

System Design
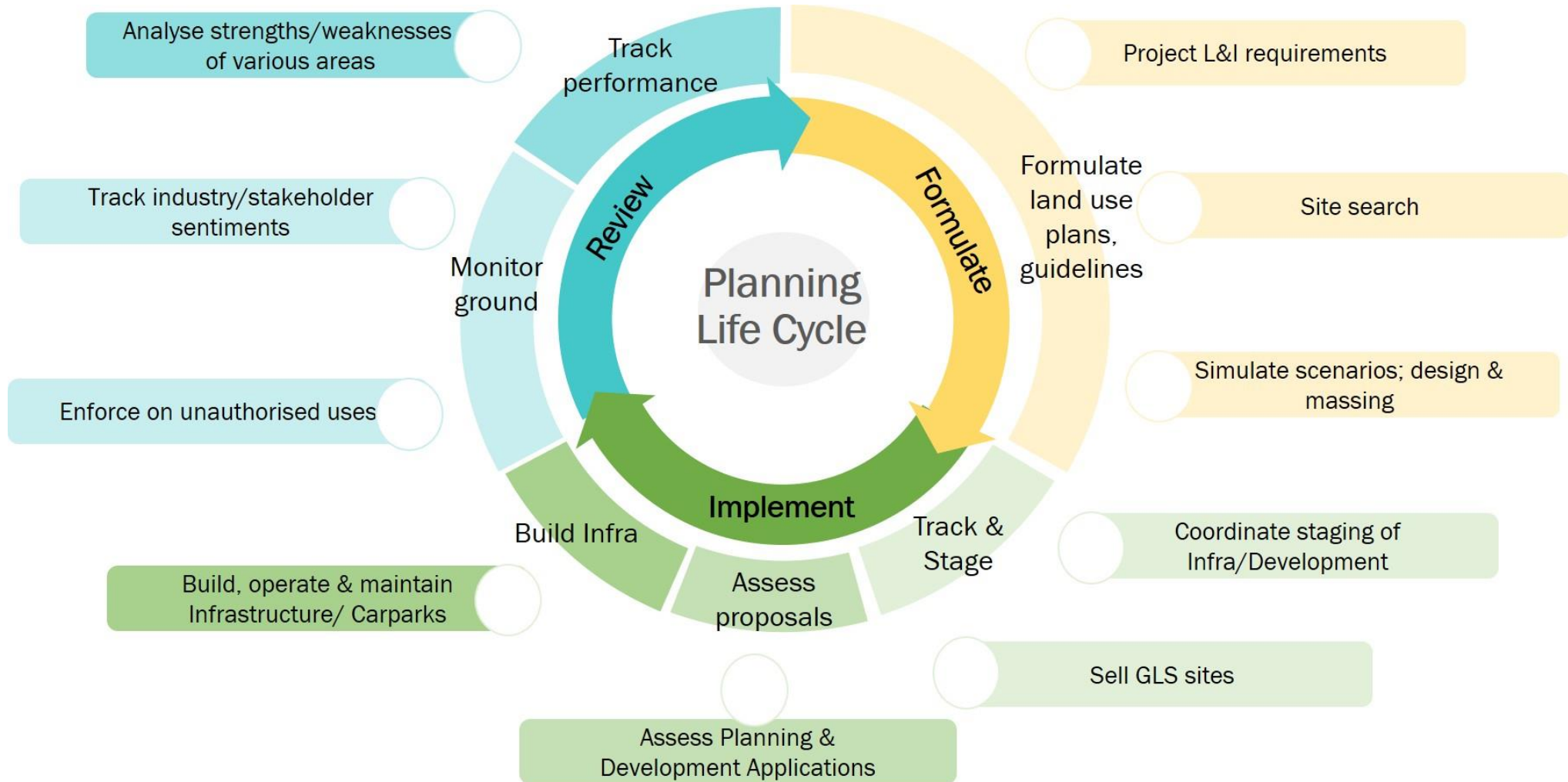
People Upskill

Do Less
Cut down time spent on routine tasks
Targeted stakeholder communications

Do Better
Generate options to support decision making
Enable pattern detection of big data

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PLAN AI : Urban Planning in the age of AI

Adopt a systems approach to build the capabilities required

Data Strategy

to enable the use of data as a strategic asset to inform planning, operations and service delivery

System Redesign

to enable an agile planning process that can be quickly adjusted to accommodate new planning workflows, regulations and innovations

People Upskill

to foster a culture where planners not only use digital tools for daily work, but also become active in building their own toolsets and solutions

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Agile ○ Collaborative ○ Smart

Dare to try
Innovate fast
Drive adoption

Work together
Re-design the way we work
Improve common picture

Keep learning
Share experiences
Find better ways we do things

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