Module 4

Unit 2. Implementing e-bus operation

E-bus network design and adaptation, a look into eBRT

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Key elements for a successful e-bus planning and operation

- Customer-oriented bus service
- IT management and optimization tools
- Smart use of energy
- Fleet renewal plans
- Staff support
- Know-how exchange

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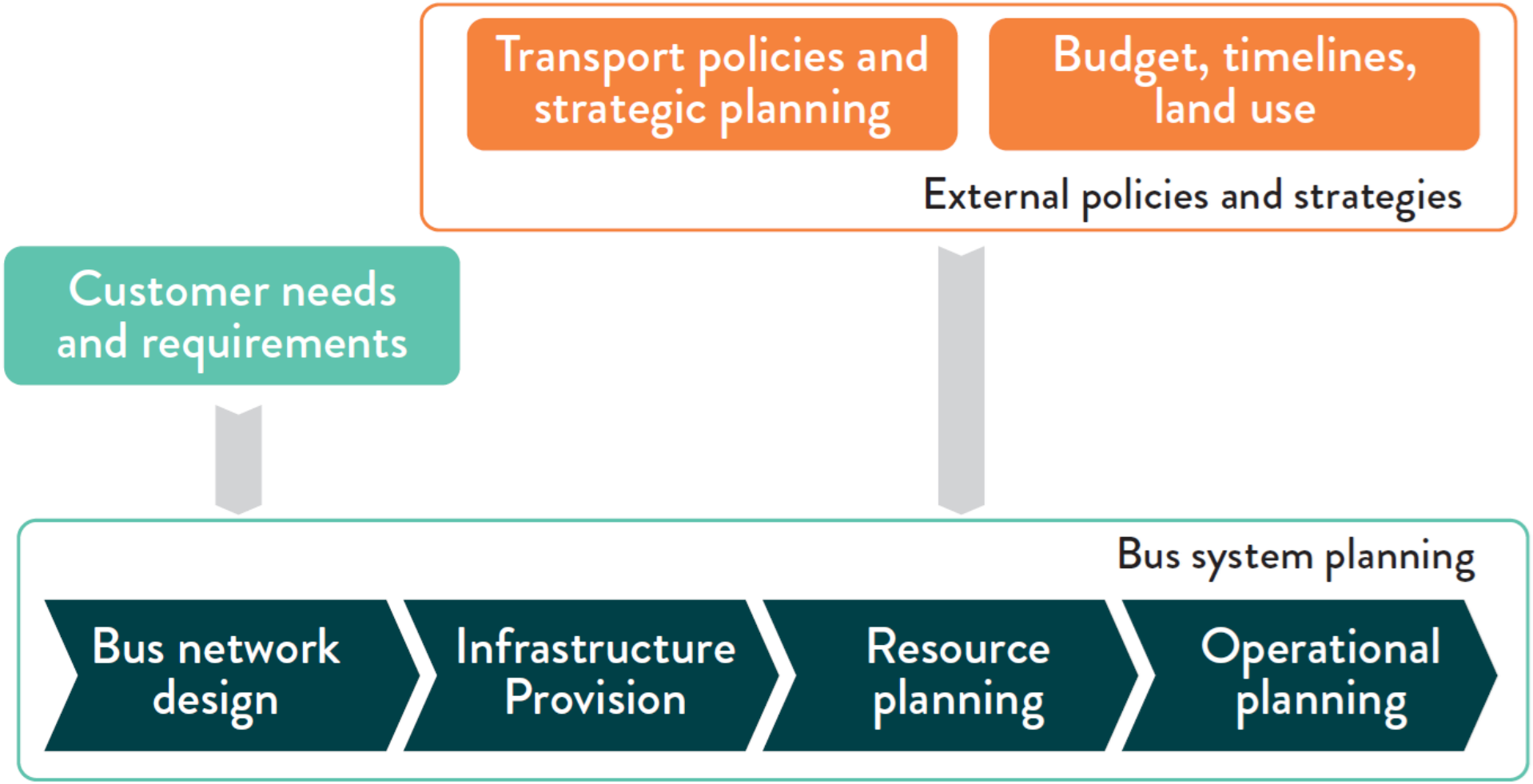
UITP Report

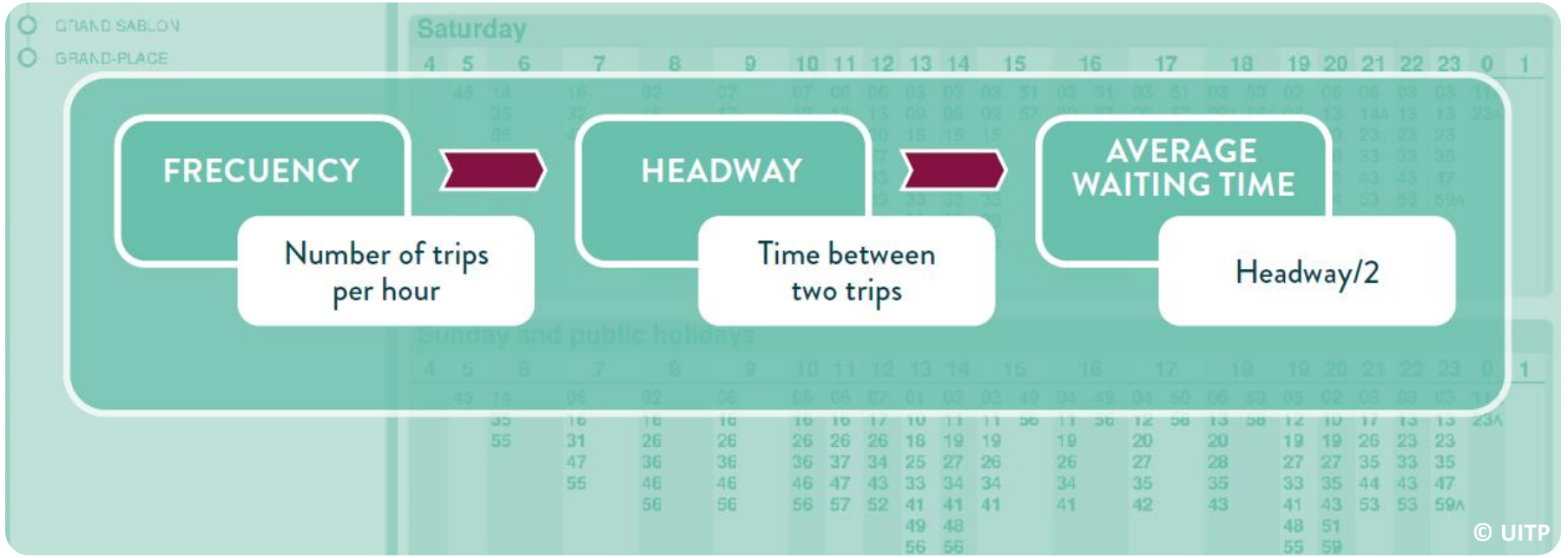
Bus Network Planning from the operators' perspective
October 2022

https://www.uitp.org/news/clearer-streets-smoother-journeys-paving-the-road-with-bus-network-planning/

Bus system planning



Planning basics



$$\boldsymbol{Average\ Waiting\ Time} = \frac{\mathbf{H}}{2} \times \left(1 + \boldsymbol{C}_{v,h}^{2}\right)$$

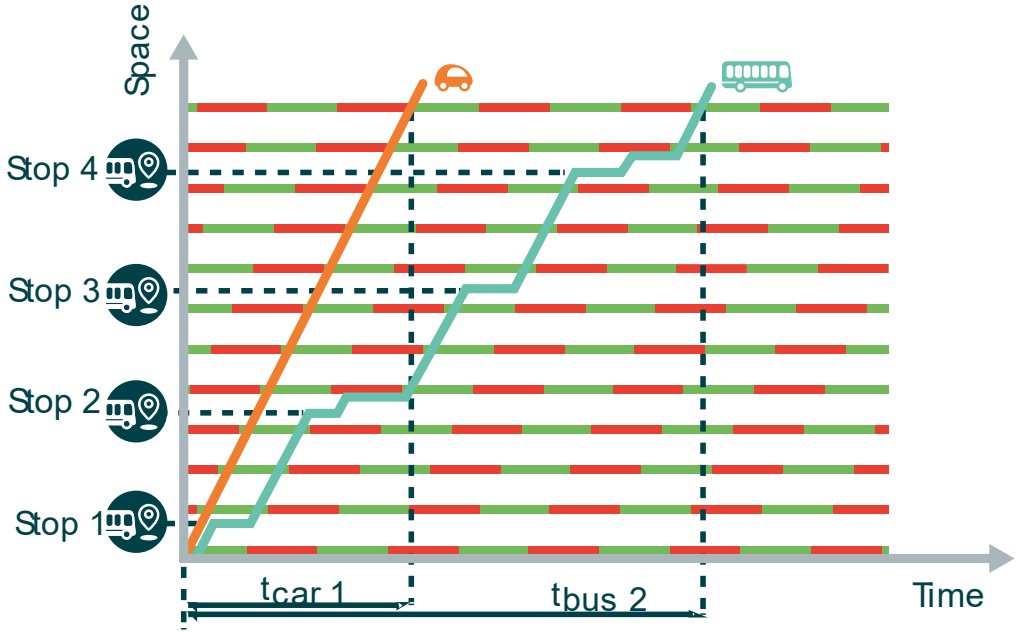
Pave the road for e-buses

- Bus lanes
- Traffic signal priority
- Passenger-oriented bus stops. Bus-stop balancing.
- Multiple-bus stops
- All-doors boarding
- Guideline documents

Speed-up buses!

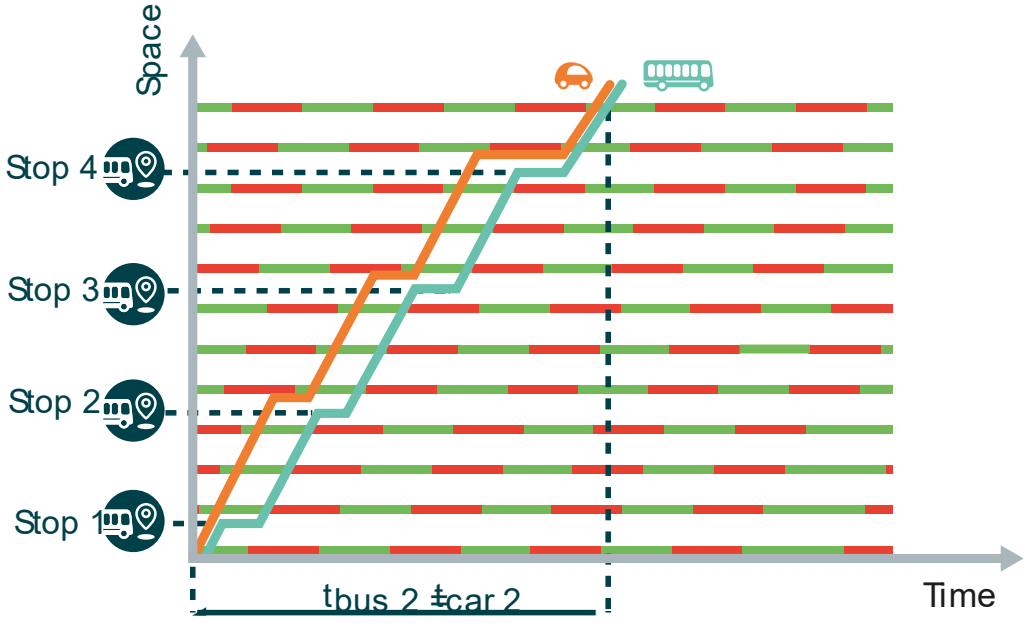
Higher speed for buses

Scenario 1: Green wave for private vehicles
Traffic signal programming favors private vehicle flow



$t_{bus2} < t_{bus1}$

Scenario 2: Green wave for public transport
Traffic signal programming favors bus flow



In scenario 2, the bus spends less time travelling the same distance as it does in scenario 1 because it does not stop at traffic lights

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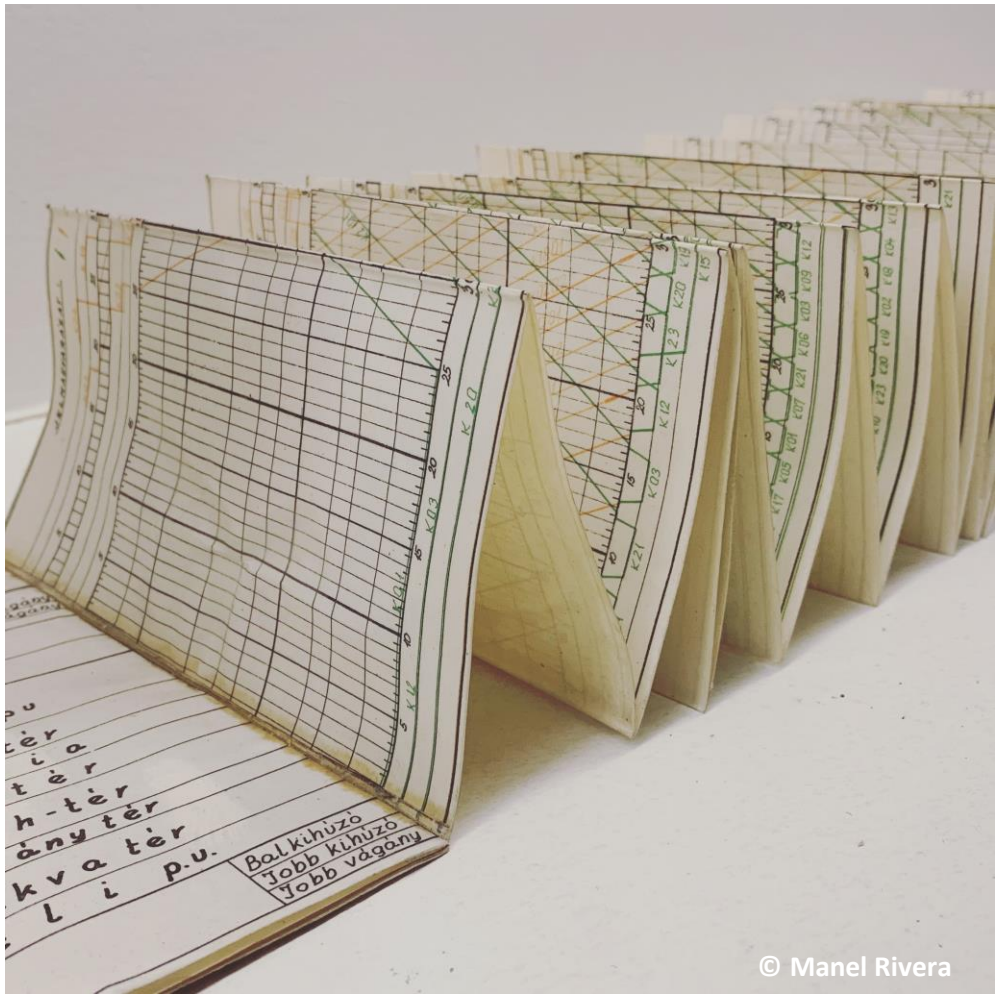
E-buses main impact on planning



- Route selection/route design
  - **Routes must fit a purpose, not a technology**
  - Lenght, topography, load...
  - Charging strategy
  - Access to the grid

- Vehicle blocks
  - Define the needed vehicle type to absorb the demand
  - For a given battery pack, do the buses have enough autonomy?

Data is key

Operators need today
the data from yesterday
to plan the service for tomorrow

IT tools for scheduling, rostering and dispatching

Use advanced IT tools for bus scheduling and dispatching, considering e-bus specifications.

- the battery characteristics of the vehicles
- the state of health of the battery
- the availability of charging infrastructure defined in strategic and system deployment plans
- charging strategies
- passenger loads and line profile.

Integrate and monitor key e-bus telemetries along with AV

Monitor the service in a command-and-control center with a centralized and data-oriented decision process.

Smart charging strategies & energy storage systems

Depot upgrade and adapted to electrical energy supply (access to the grid, charging infrastructure...)

The use of smart charging strategies allows for reducing energy cost and maximum power need, and privileges renewable sources consumption

In-depot energy storage systems also allow shaving the energy demand peak

Bus planners

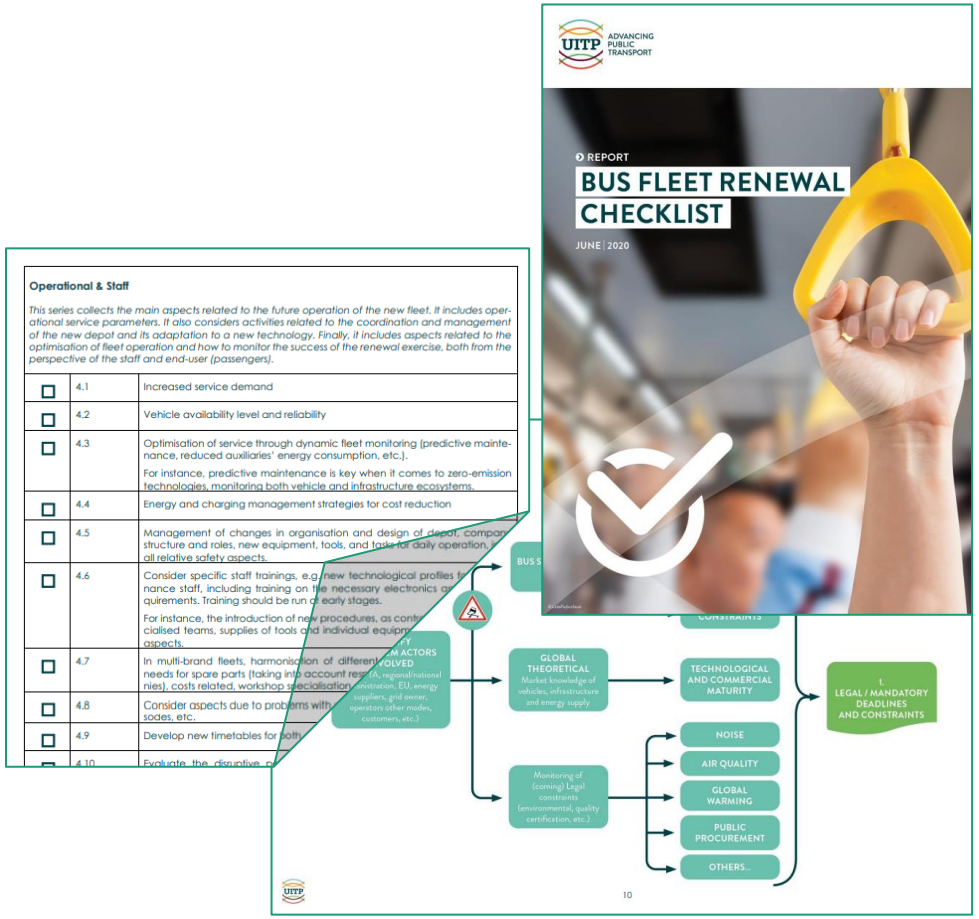
Don´t forget the people!

Specific training on e-bus characteristics at all levels of the company:

- Bus drivers
- Customer support staff
- **Planners and dispatchers**
- Fleet management staff

Key elements for a successful e-bus operation

Integrated planning in higher order plans



- It is all about planning!
- Integrate the fleet renewal plans in Urban Mobility Plans and Energy Plans at a city or regional level ensure the right framework to help all the stakeholders to meet the overall goals

Full document available here:
https://mylibrary.uitp.org/GED_V14/179857999703/Bus_Fleet_Renewal_Checklist_UITP_2020-2.pdf

Key elements for a successful e-bus planning and operation

Know-how & best practice exchange with peer cities

- Interdepartmental Knowledge-exchange
- Knowledge sharing activities with peer cities and regions.
- Enlarge your global networks and engage in capacity building and know-how activities in your regions and across the world.

eBRT2030

ELECTRIC BUS RAPID TRANSIT 2030 IN EUROPE

eBRT2030

- Project overall duration: 48 months
- Start date: 1/1/2023
- Total Budget: € 23 026 221 €
- Management:
  - Strategic and overall operational Coordinator: **UITP**
  - Technical Manager: VUB (MOBI LAB)
  - Financial and admin Manager: RINA Consulting

Objectives of eBRT2030

Create a New Generation of advanced full electric, urban and peri-urban European BRT enhanced with novel automation and connectivity functionalities.

The eBRT2030 project is developed through three main lines:

1) EBRT2030 project is developed around operations-focused demos: 6+1 demos of BRT system innovative solutions in real-operation, both city-&operator-led and BRT system-focused, or focused on specific tech developments at system or subsystem level that are ready for BRT operations, in Europe and outside Europe (in Latin America and East-Africa), and fully integrated in the whole urban mobility scenario
2) The development of **technology-focused key innovative solutions** for BRT, both at system and subsystem level, at level of vehicle, infrastructure, operation, and IoT connectivity
3) the definition a **new European concept of BRT** for year 2030, benefitting of evaluation, multiplication and replication of the real-operation test of innovations, that improve the performance of the whole European urban bus system. All cities in eBRT2030 have BRT lines already in operation or launched within 2023, and strongly committed to innovate with electrification, automation, connectivity technology tailored to the characteristics of European bus operations.

¡Gracias!

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