



competence centre
sustainable mobility and railways
innovation

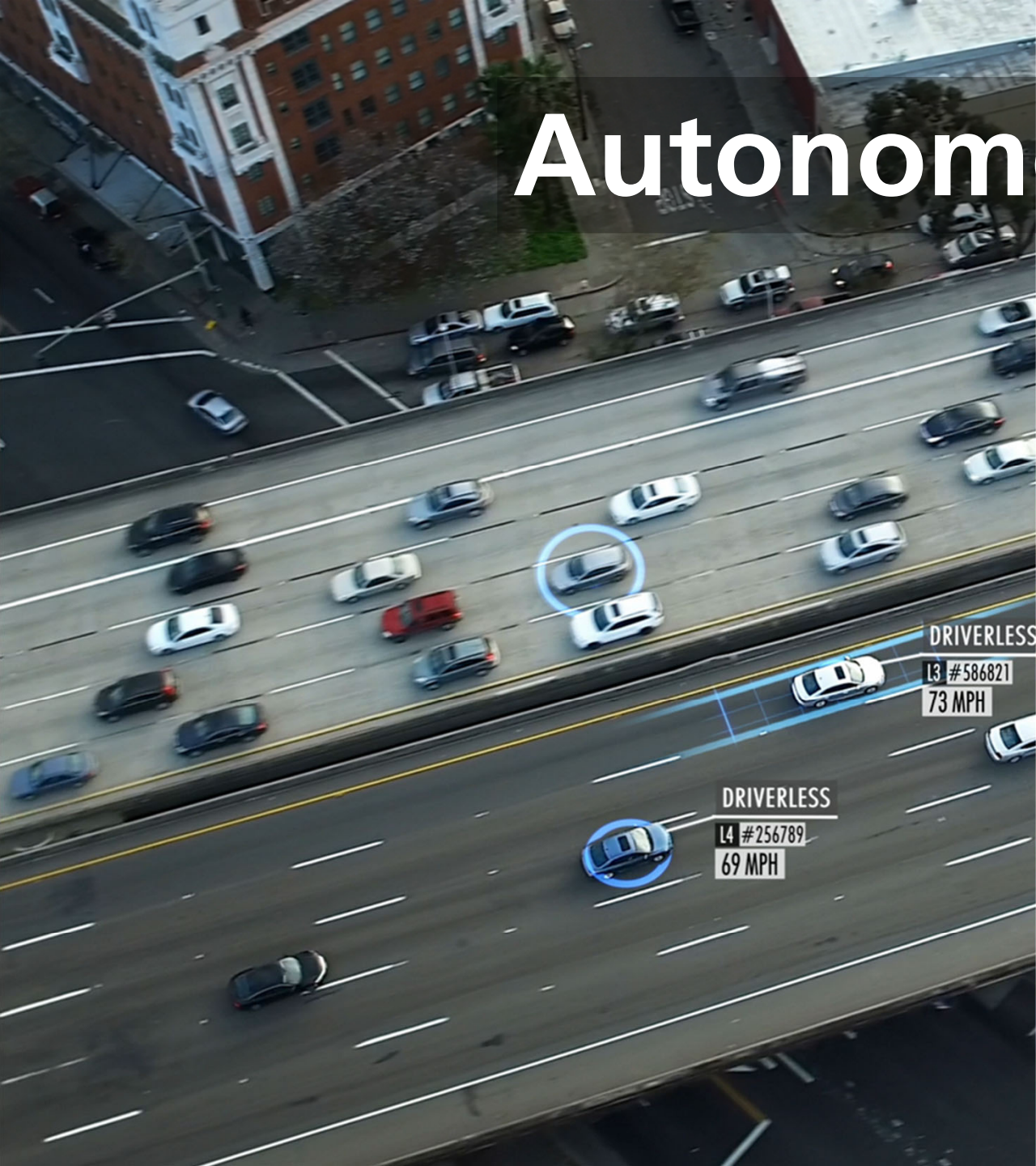
Implication of new technologies on transportation



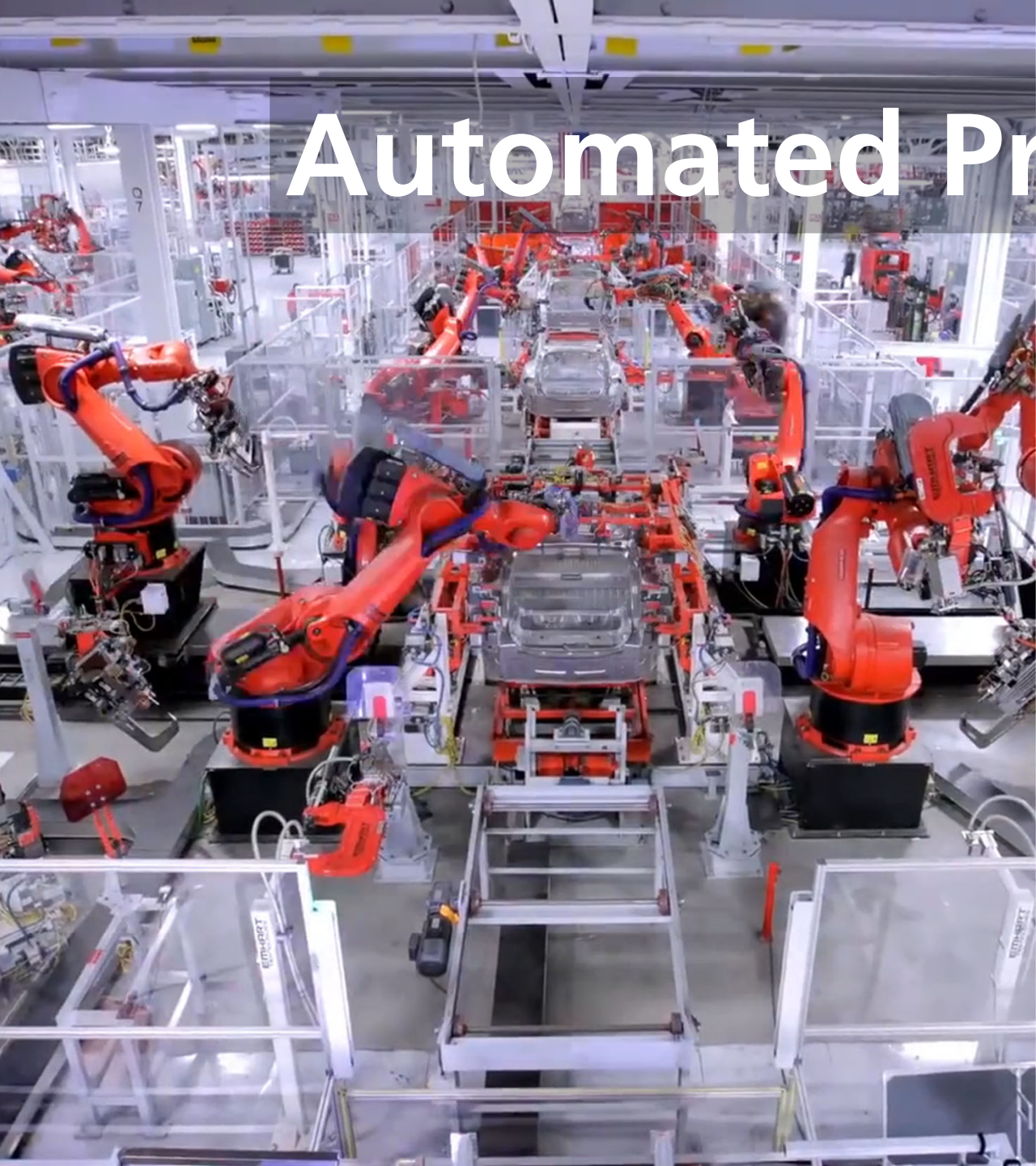
New Train Concept



Autonomous Drive



Automated Production Line



New Technologies

Mobility

Transportation is more and more digital!

Mobility services are accessible anywhere!



Topics



**Economics /
Efficiency**



Ethics / Legal



Society / People



Environment

**Privatization /
Nationalization**
Financing / Funding
Economic Impact
Public Service
Processes
Speed / Performance
Precision

Privacy
Security
Human Dignity
Balance of Power
Legal aspects
Regulations / Policies

Society / People

Social Exclusion
Safety
Humans interaction
Democracy
Demography
Education

Energy Sources
CO2 Emission
Other Emissions
Use of Resources
Use of Land

Environment

Maintainability
Impact on Operations
System Safety
Staff Skills & Competencies

Topics



**Economics /
Efficiency**



Ethics / Legal

Society / People



Environment



Topics



Topics & Elements

Economics / Efficiency

Ethics / Legal



Privatization / Nationalization
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Social Exclusion
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Energy Sources
CO2 Emission
Other Emissions
Use of Resources
Use of Land

Society / People

Environment

Mobility Model

Transportation Model

TRAFFIC

Freight

Persons

MODE

Road
(Non-Motorized)

Road
(Motorized)

Rail

Water

Air

SYSTEM

Infrastructure

Vehicle manufacture

Vehicle travel

Vehicle maintenance

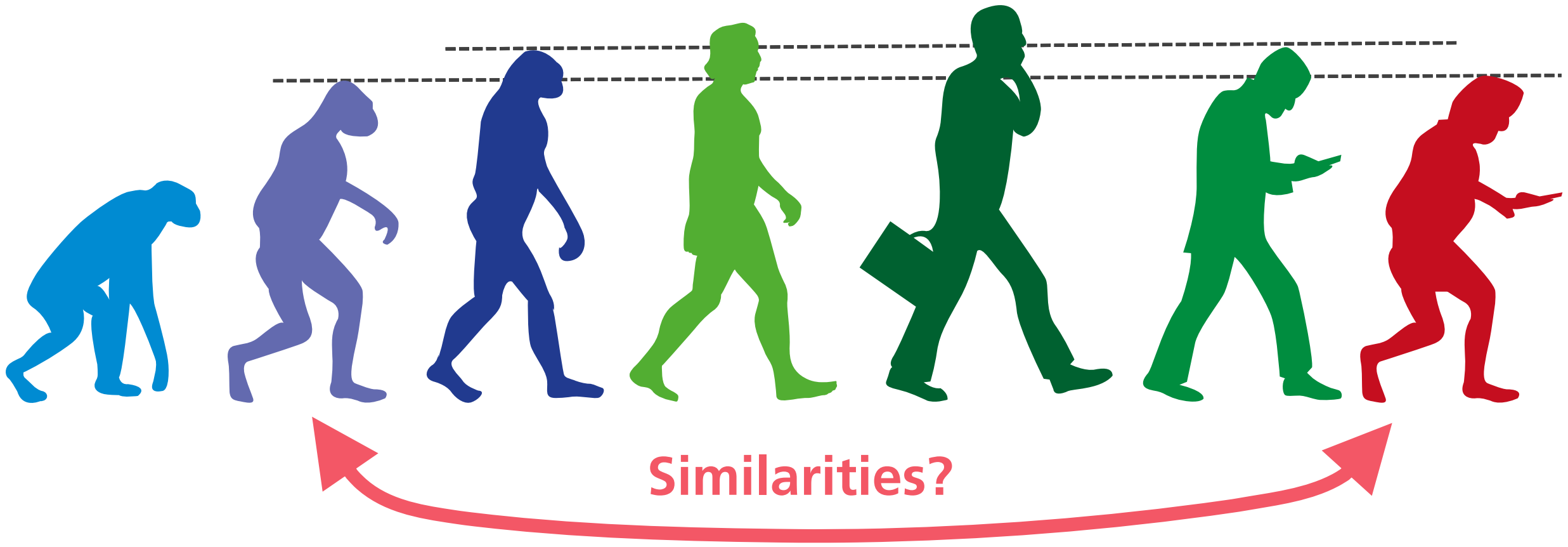
Vehicle disposal

The Technologies

Cybersecurity Wireless Power Automation Drones
Mobile & Social Internet Quantum Computing
Big Data Analytics Advanced Materials Bio-Tech
Autonomous Mobility New Screens Energy Tech
Artificial Intelligence Nanotechnology Robotics
Geo-spatial Tech Health Tech Blockchain
Internet of Things Cloud Computing
Mobile Technologies 3D Printing Voice Assistants
Clean Tech Collaborative Tech Immersive Media
Human-Computer Interaction Smart Cities
New Touch Interface Proximity Tech Exoskeletons

Excursus: (Re-)Evolution?

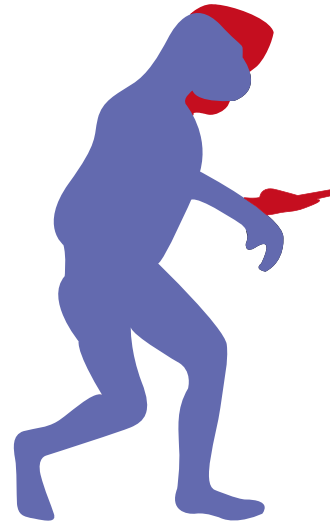
(Re-)Evolution?



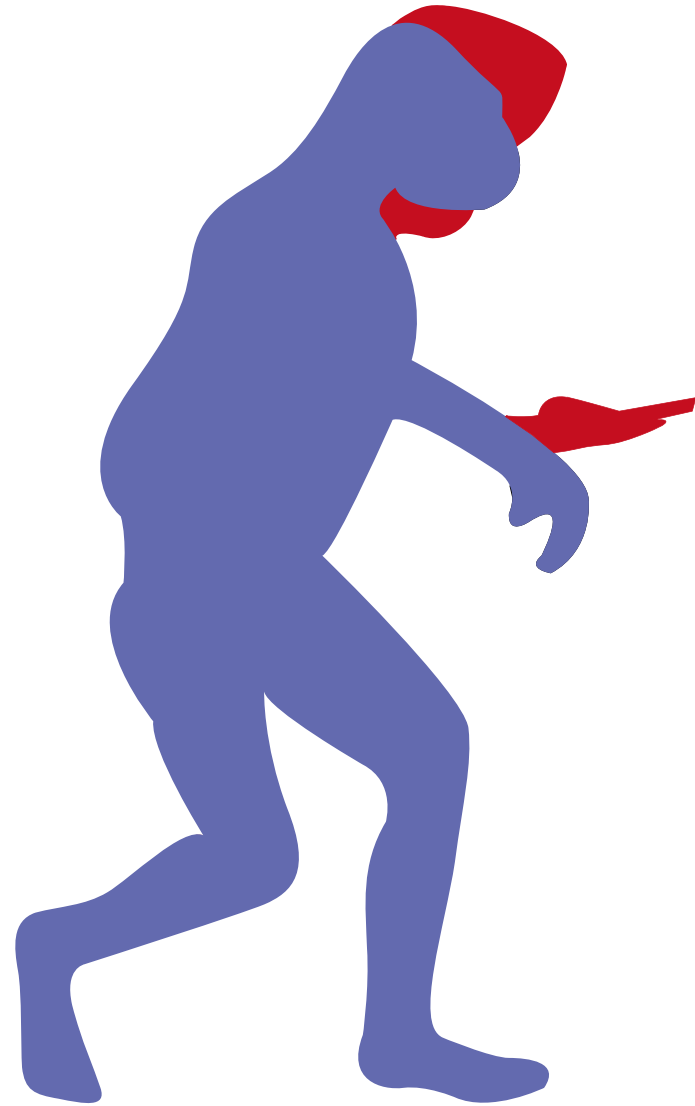
Evolution?



Evolution?



In(e)volution?



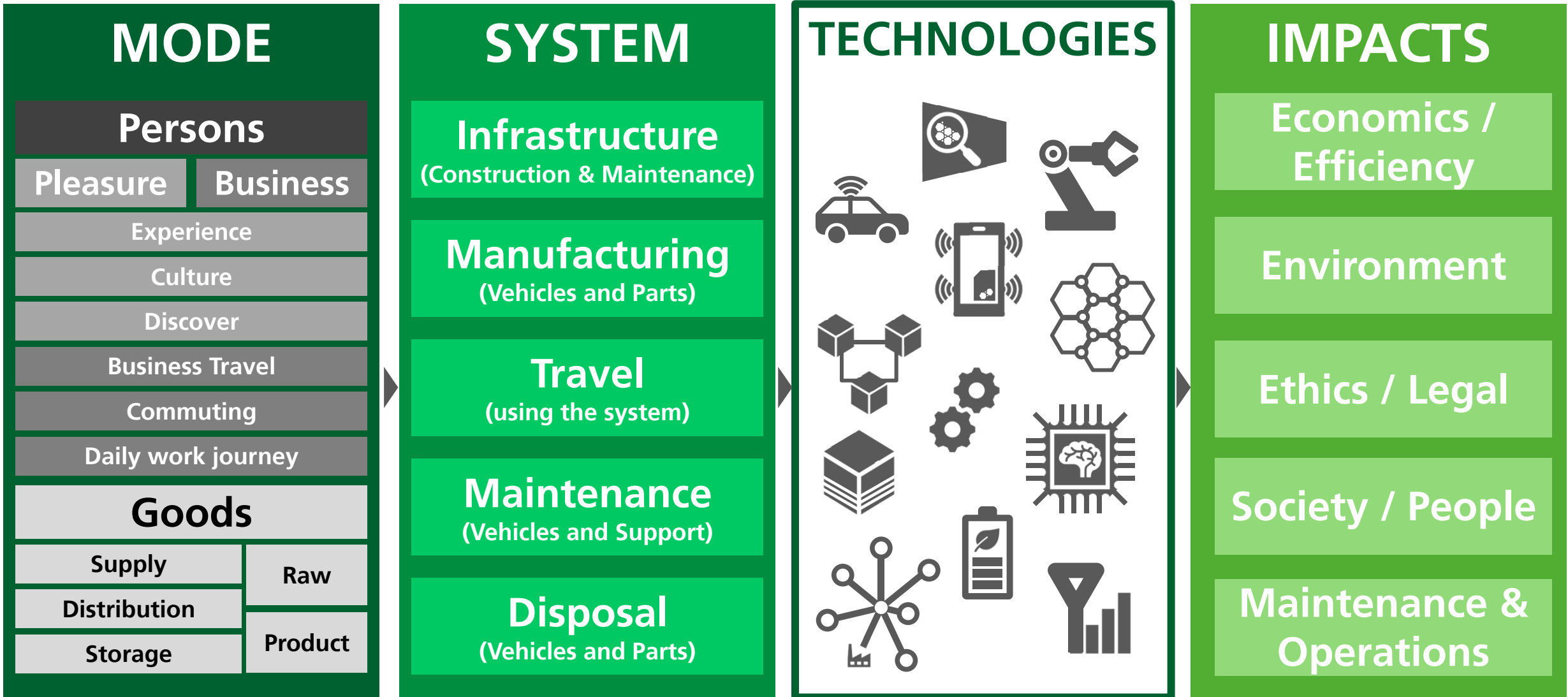
Transportation System

Journeys Story... my last Friday...

Bellinzona, Switzerland – Cairo, Egypt



New Technologies Impacts



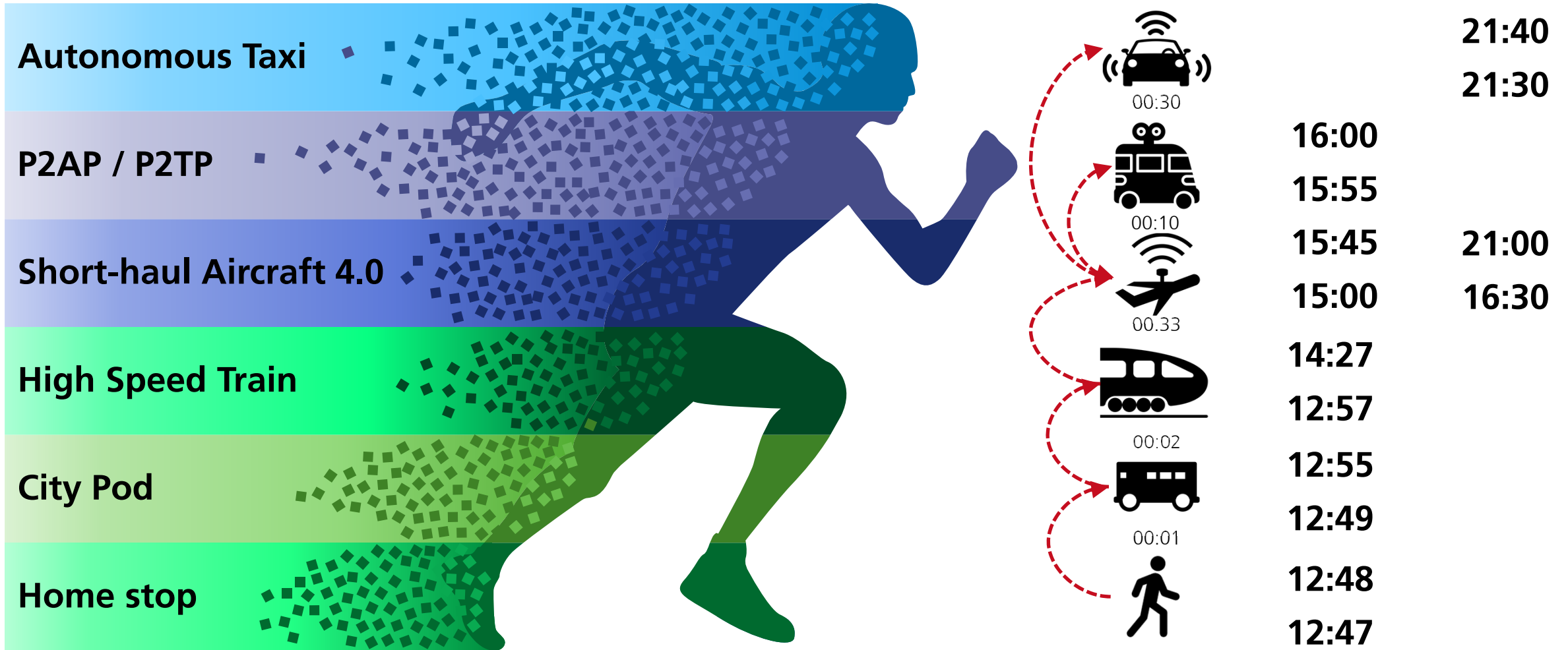
Journeys Story... future reality?

Bellinzona, Switzerland – Cairo, Egypt



Journeys Story... future reality?

Bellinzona, Switzerland – Cairo, Egypt



Examples

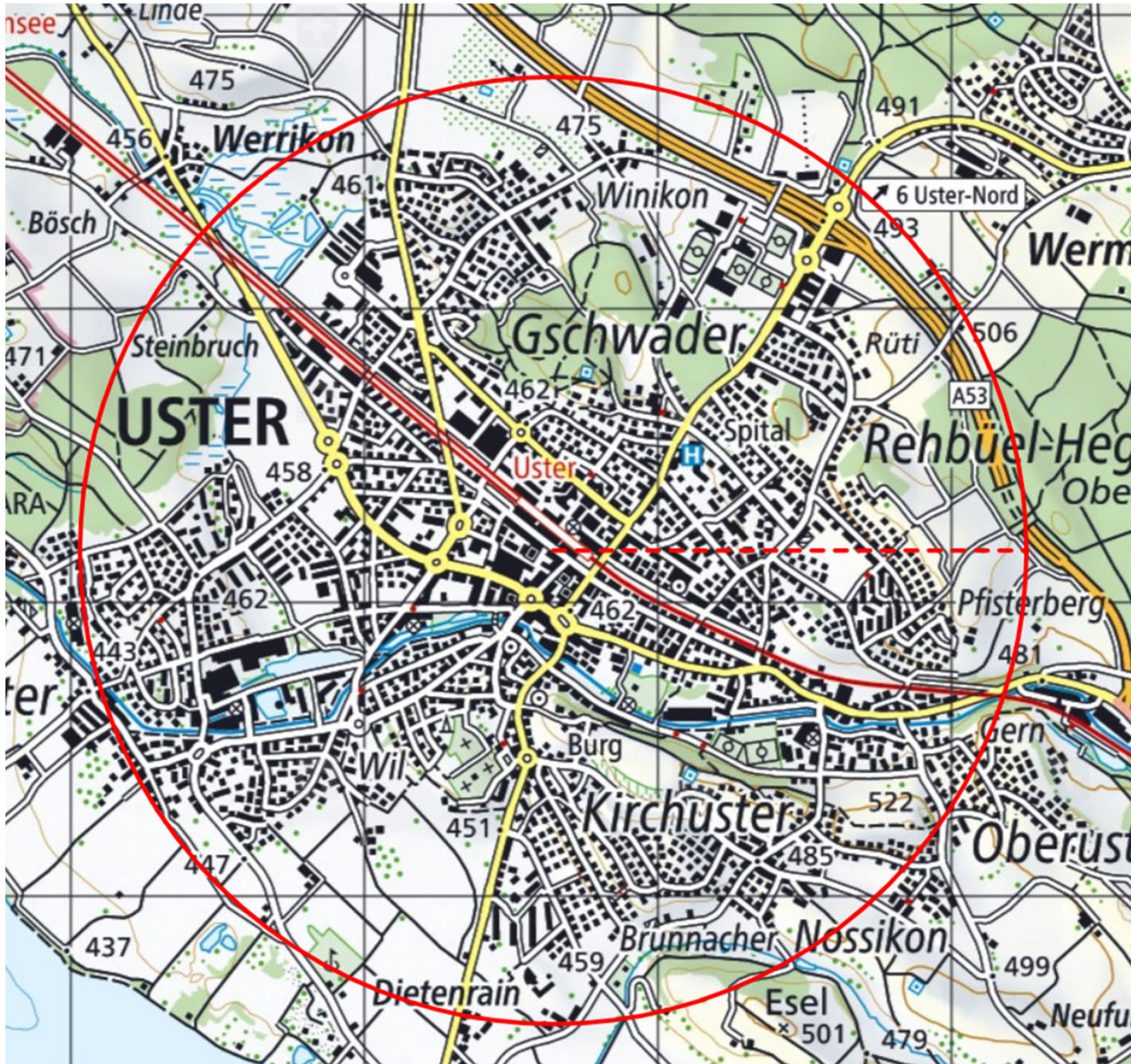
First/Last mile



First/Last mile



First/Last mile



Uster, Zurich

3rd biggest city of the Canton Zurich

Mainly flat Landscape

City is served by a local Bus Network

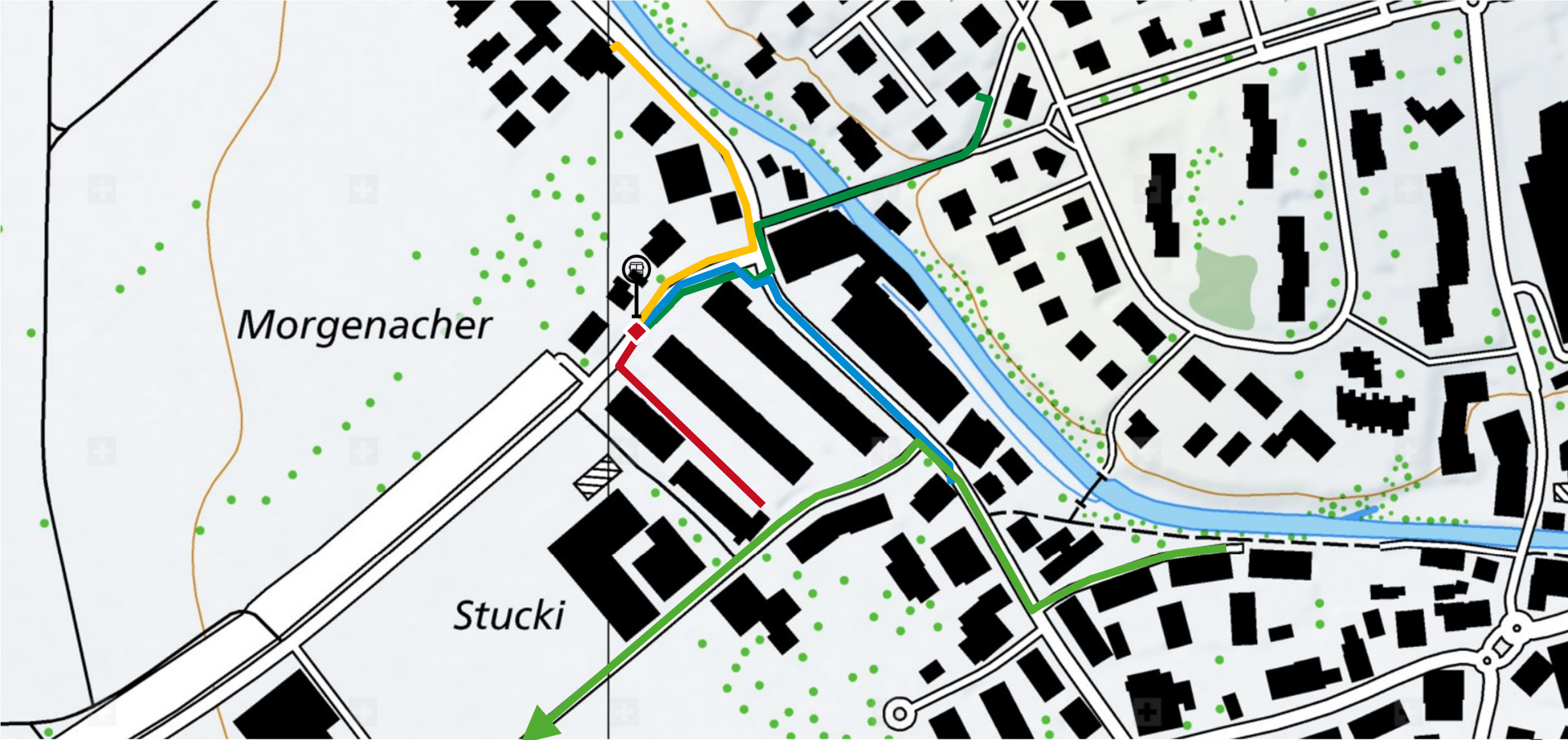
8 hourly S-Bahn train to Zürich HB

Very good infrastructure (streets, walk paths, bike paths, bus lanes)

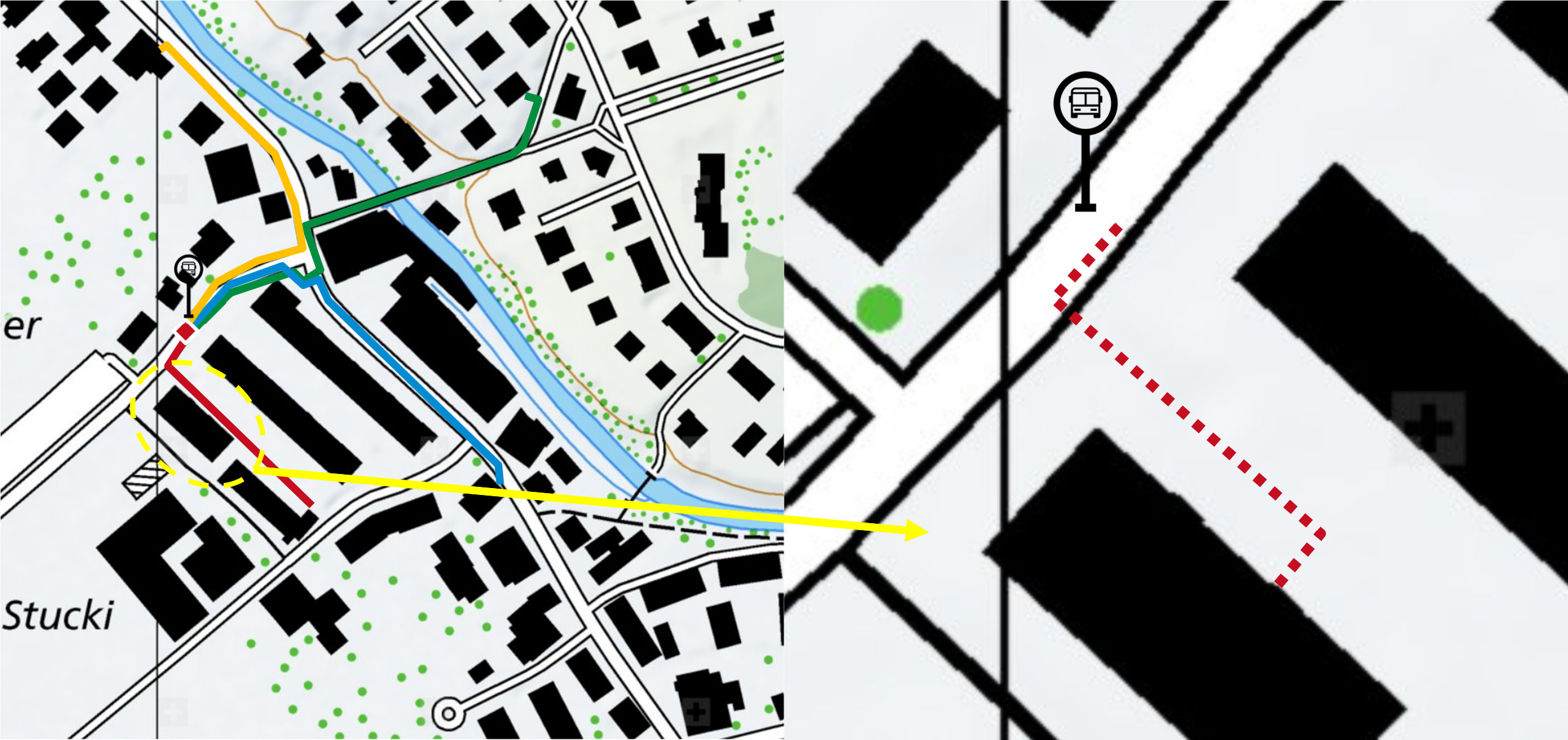
Aprox. 95% of Uster lies within 1 mile

Optimal condition for "last mile" mobility

First/Last mile 100 feet



First/Last 100-feet



Technologies

(most relevant, not exhaustive)



Blockchain



**Artificial
Intelligence**



Automation



3D-Printing



Energy Tech



IoT / IIoT



**Advanced
Material**



**Mobile
Technologies**



**Proximity
Tech**

First/Last mile

Economics / Efficiency



New market
Faster connections
Being in reach of more stations

Ethics / Legal



New Regulations are required
Exclusion of age groups
Data driven product? GAFAM?

Need for it? Customer base?

Healthy?

**Trend creating social
exclusion / groupies?**



Less human interaction?

Society / People

**New Product,
new production cycle**
City planning differentiation



Environment

First/Last mile

M & O

Maintenance

New opportunities for business & production

Digital driven activities

No or limited preventive / predictive maintenance, only maintenance on-condition

Operations

Infrastructure is shared between different users types

Conflicts with other users (shall be regulated)

Personal use: no need for an operational organization

Shared mobility: free floating requires AI

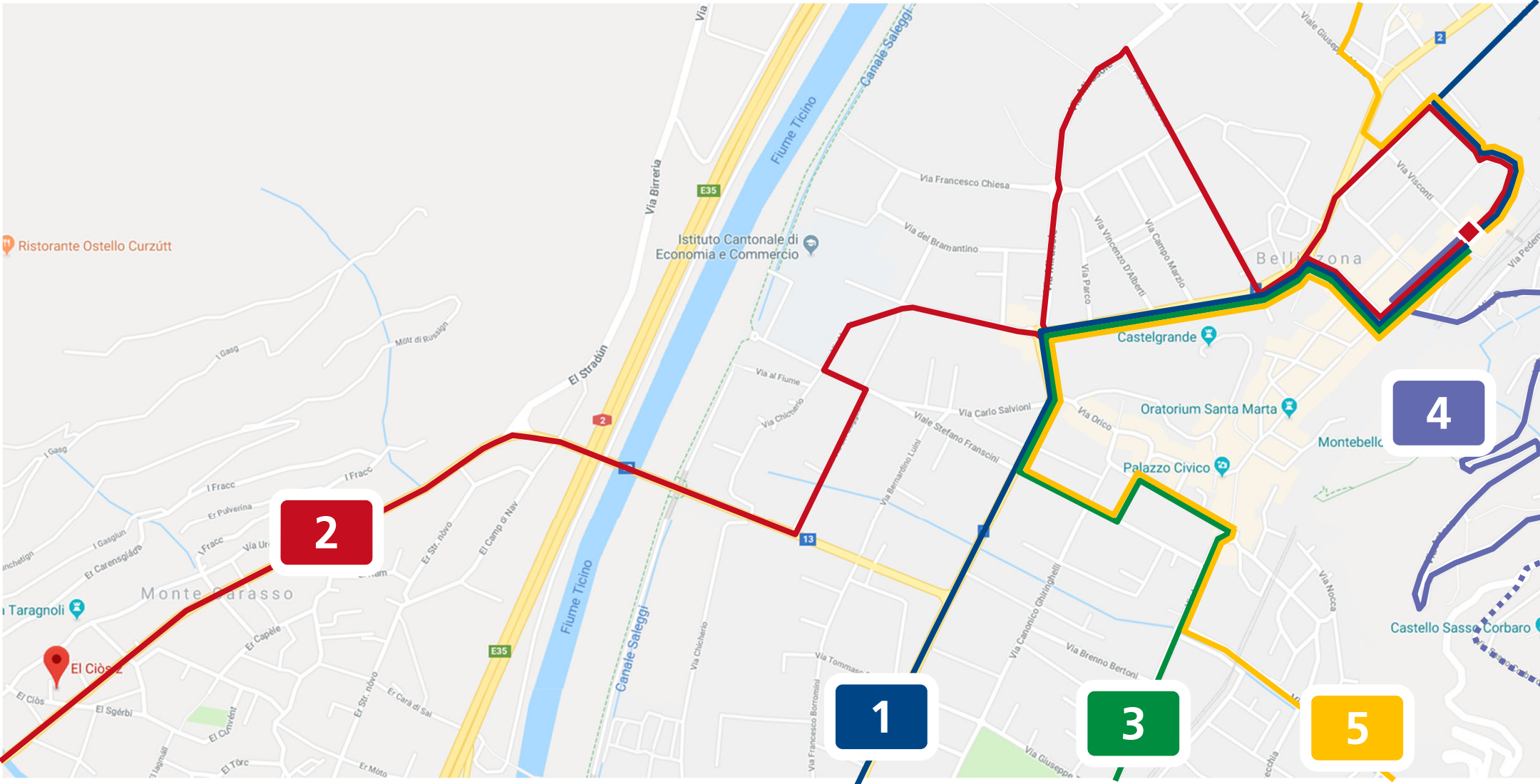
"I see little commercial potential for the internet for the next 10 years"

- Bill Gates, 1994

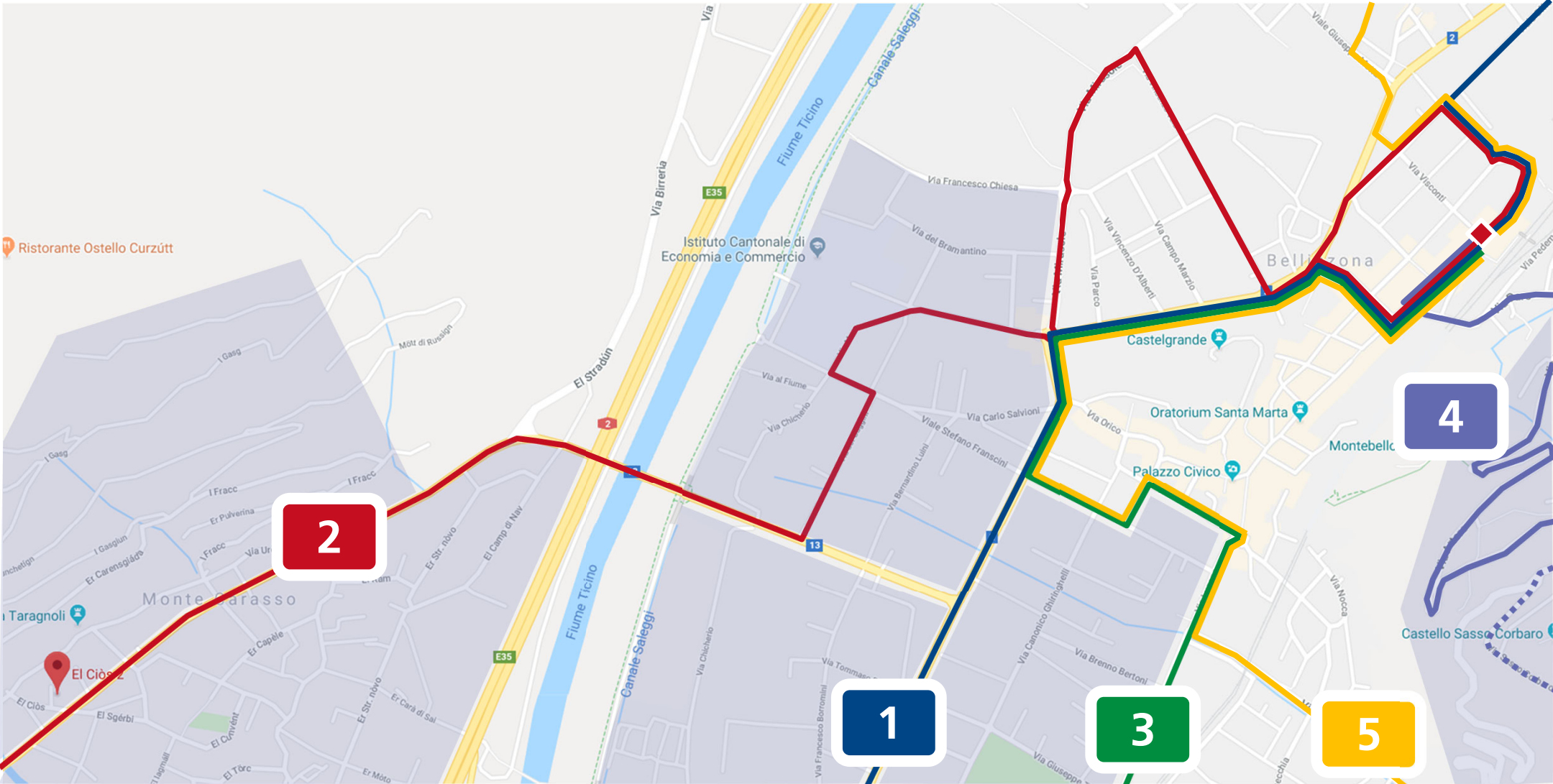
Urban Transport System



Urban Transport - Bellinzona



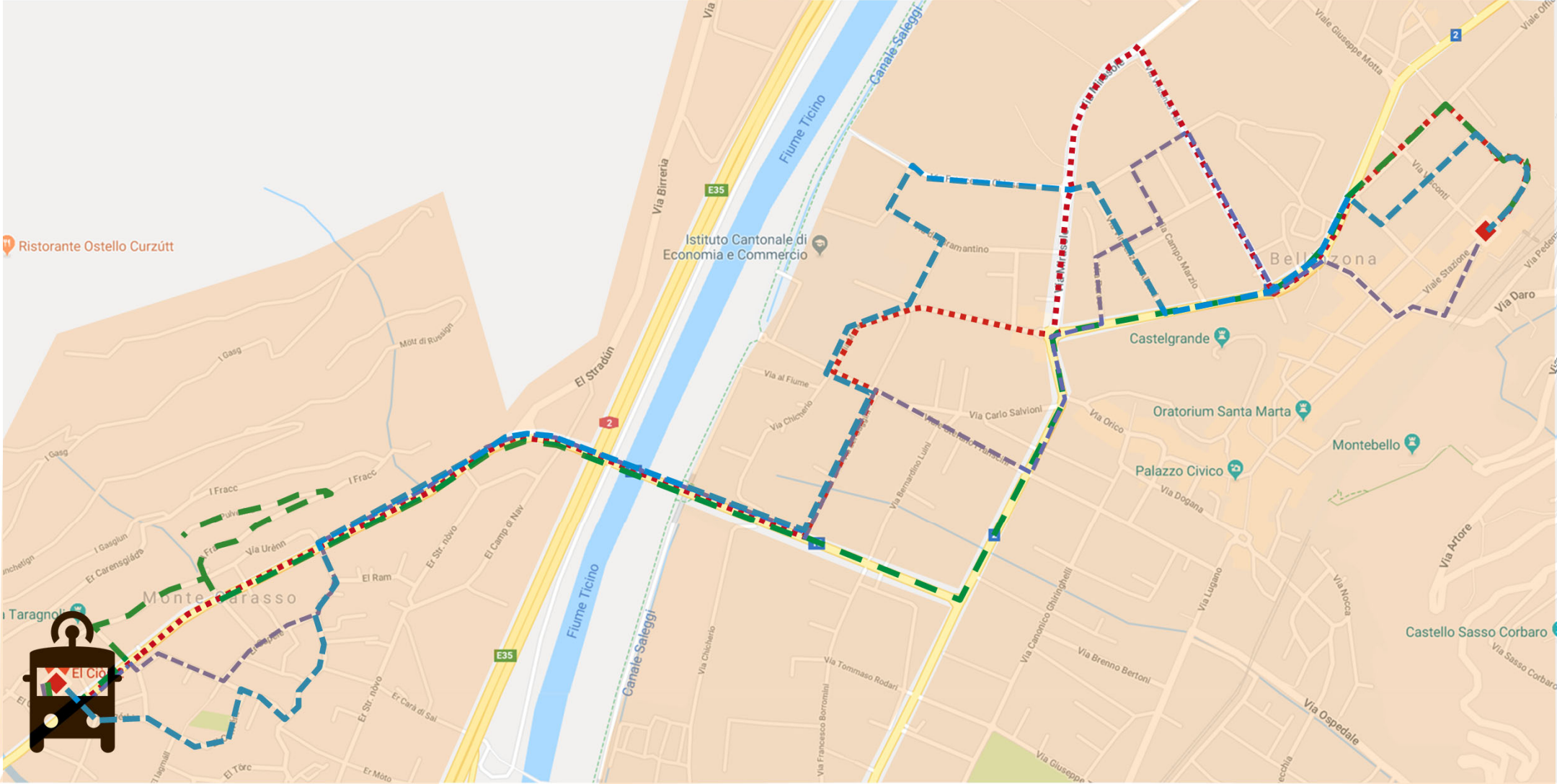
Urban Transport - Bellinzona



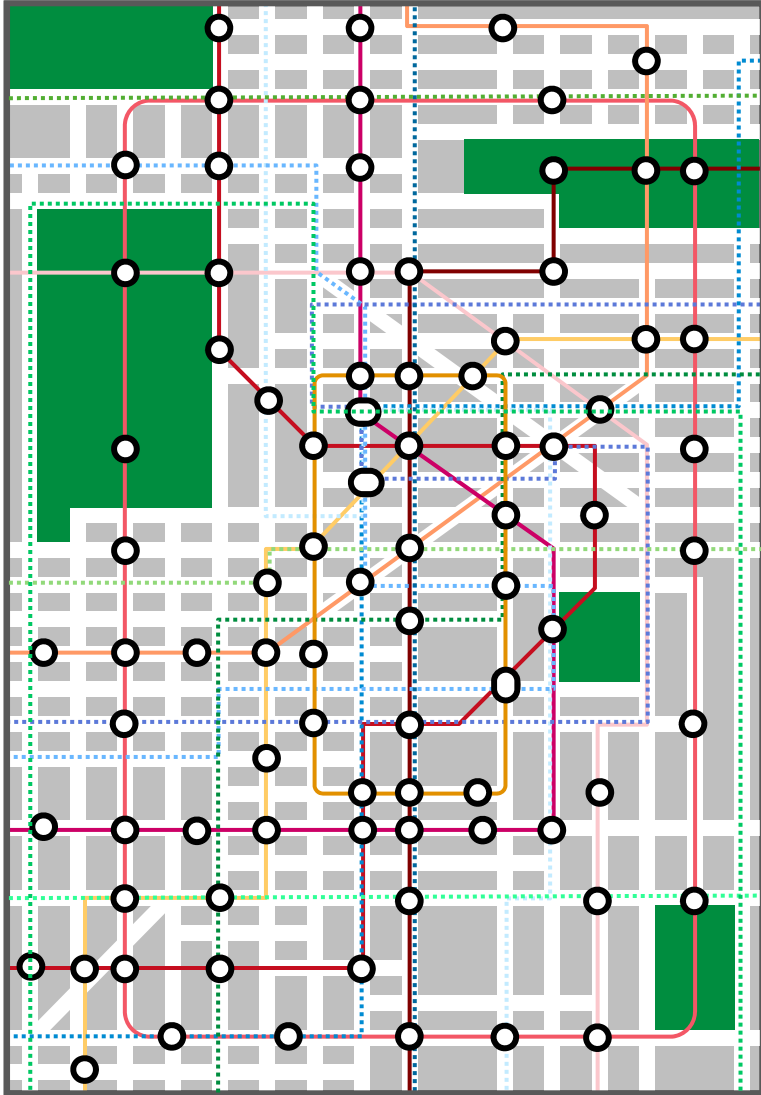
Urban Transport - Today



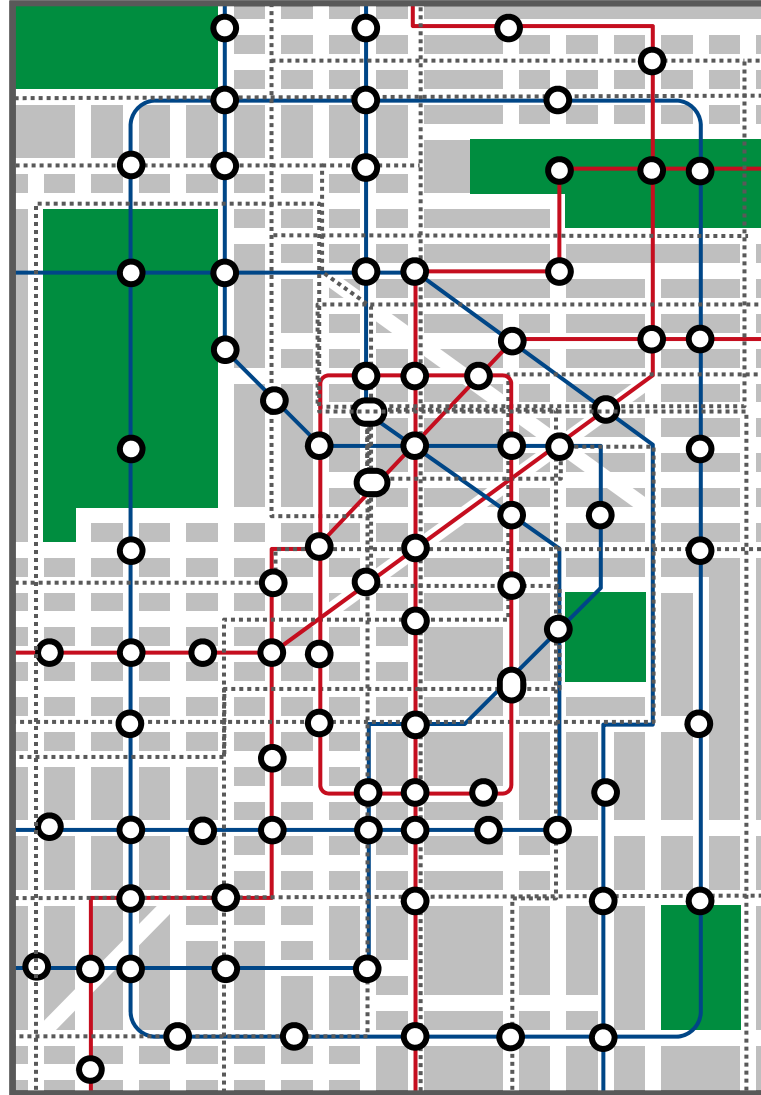
Urban Transport – Autonomous Bus



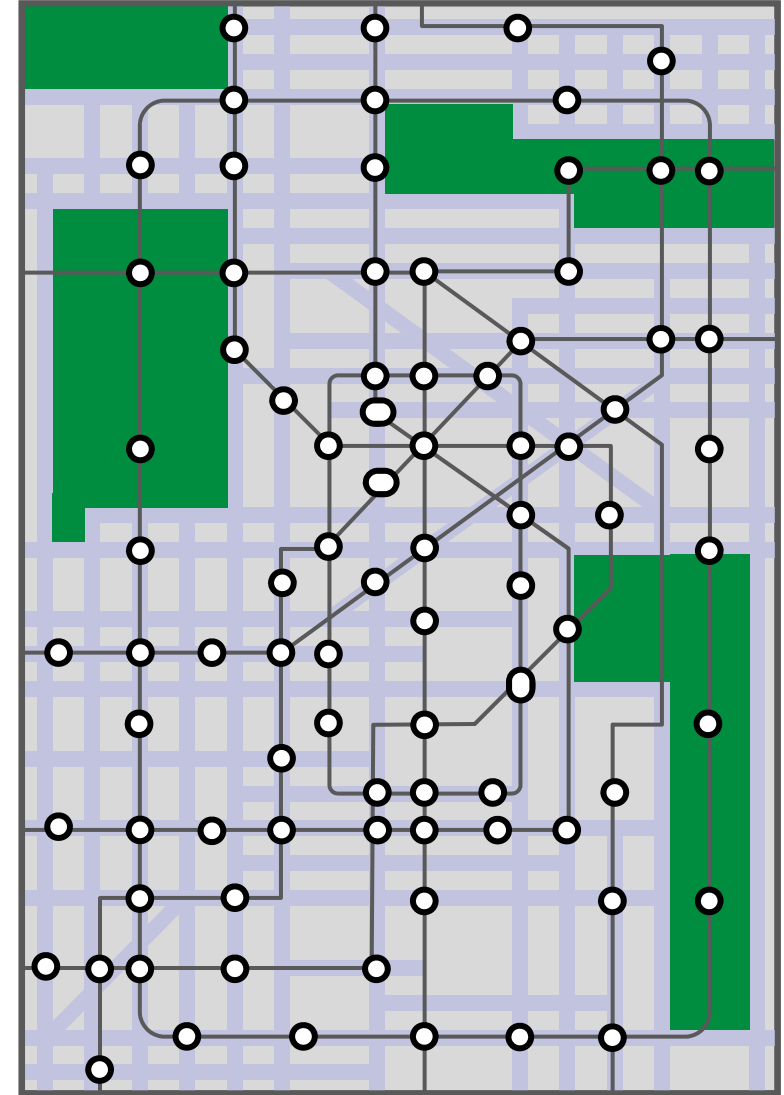
TODAY



TOMORROW



LATER



Technologies

(most relevant, not exhaustive)



Blockchain



**Artificial
Intelligence**



**Autonomous
Mobility**



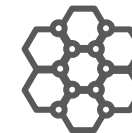
Robotics



Energy Tech



Automation



**Advanced
Material**



**Mobile
Technologies**



**Proximity
Tech**

Urban Transport – Autonomous Bus

Economics / Efficiency

Ethics / Legal



*Can cover efficiently
remote areas
Adaptable capacity
LCA / ROI
Public service: financing*



*New Regulations are required
Responsibility
Bus driver future*

*Society behaviour changes
Role of employees
Skills requirements
Accessibility*



Society / People

**Zero Emissions
Public spaces re-definition**



Environment

Urban Transport – Autonomous Bus

Maintenance

Operations

M & O

New vehicle technologies

Different maintenance programs: predictive

Employees skills and competencies

Tools and equipment

Mixed operation : autonomous & classic

Planning of routes, capacity with historical data

Speed of operation today is limited

Infrastructure adaptation: safety

New roles for employees

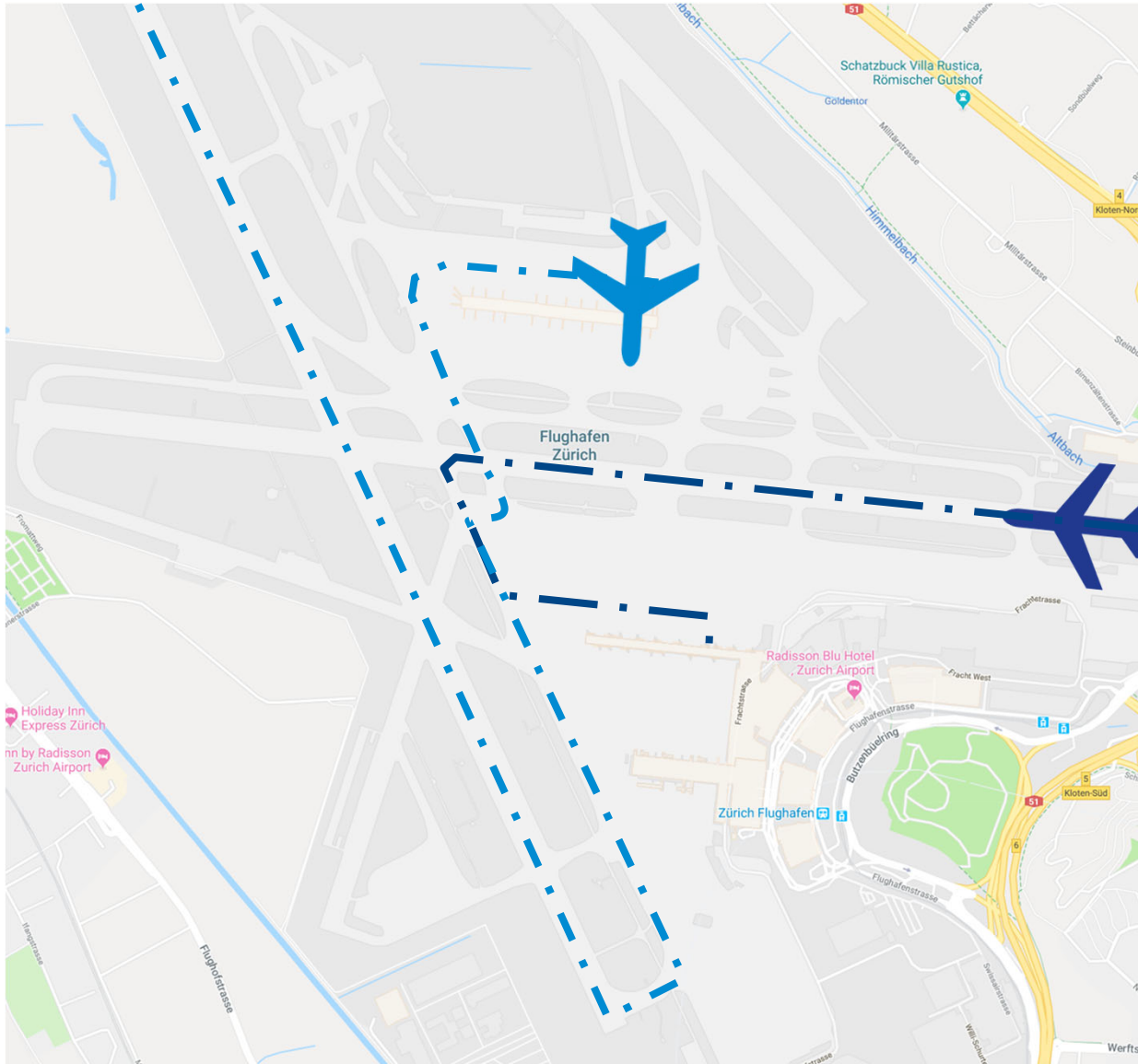
“A developed country is not a place where the poor have cars. It's where the rich use public transportation.”

- Gustavo Petro

Aircraft taxiing



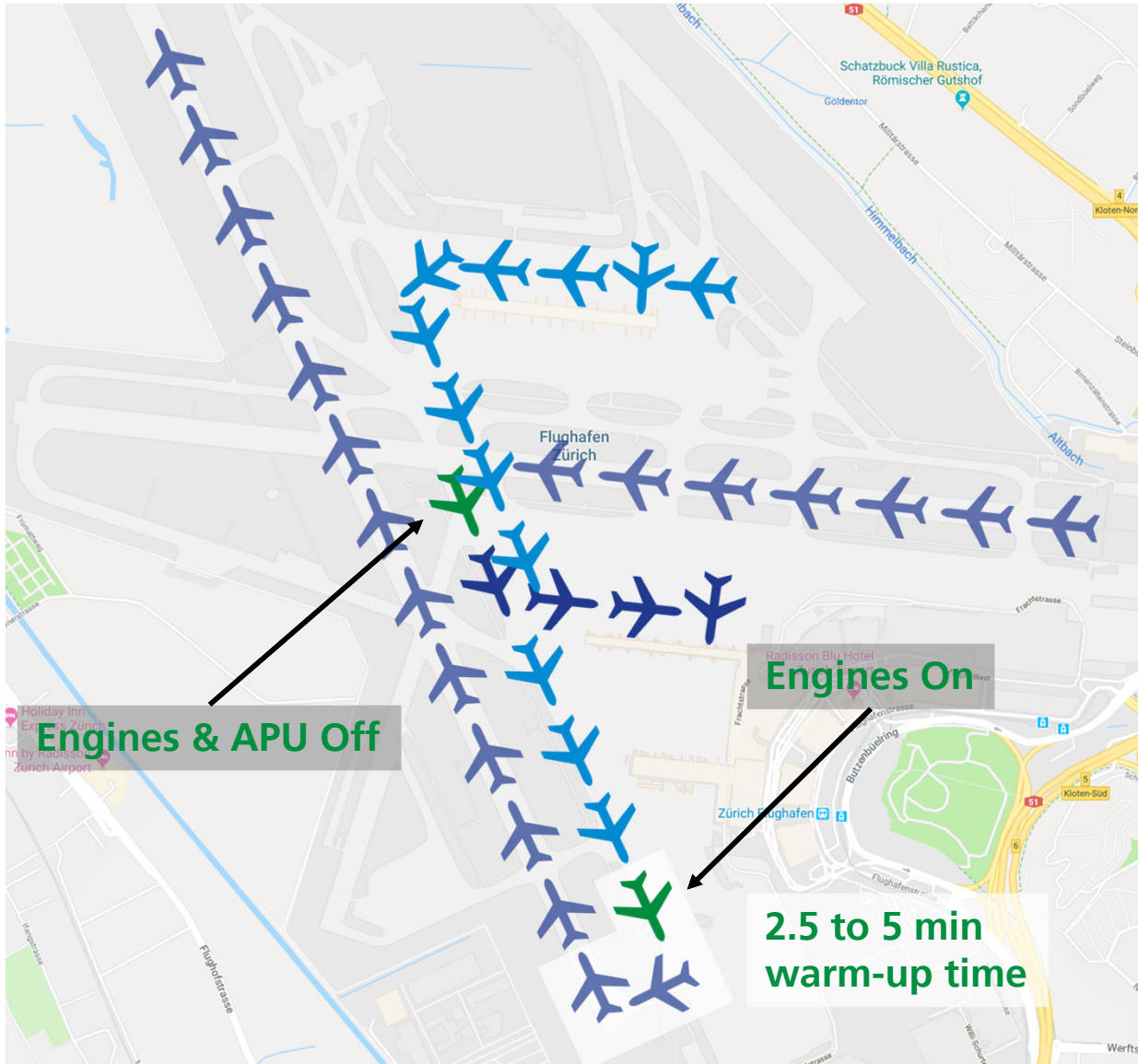
Air Transport: Aircraft Taxiing



Stakeholder

- Air Traffic Control
- Airport Tarmac
- Airport Infrastructure
- Aircraft Manufacturer
- Push-back Tug Manufacturer
- Ground Handling
- Pilots / Airline

Air Transport: Aircraft Taxiing



Activities (summary)

Landing coordination and clearance

Taxi coordination

Gate assignment

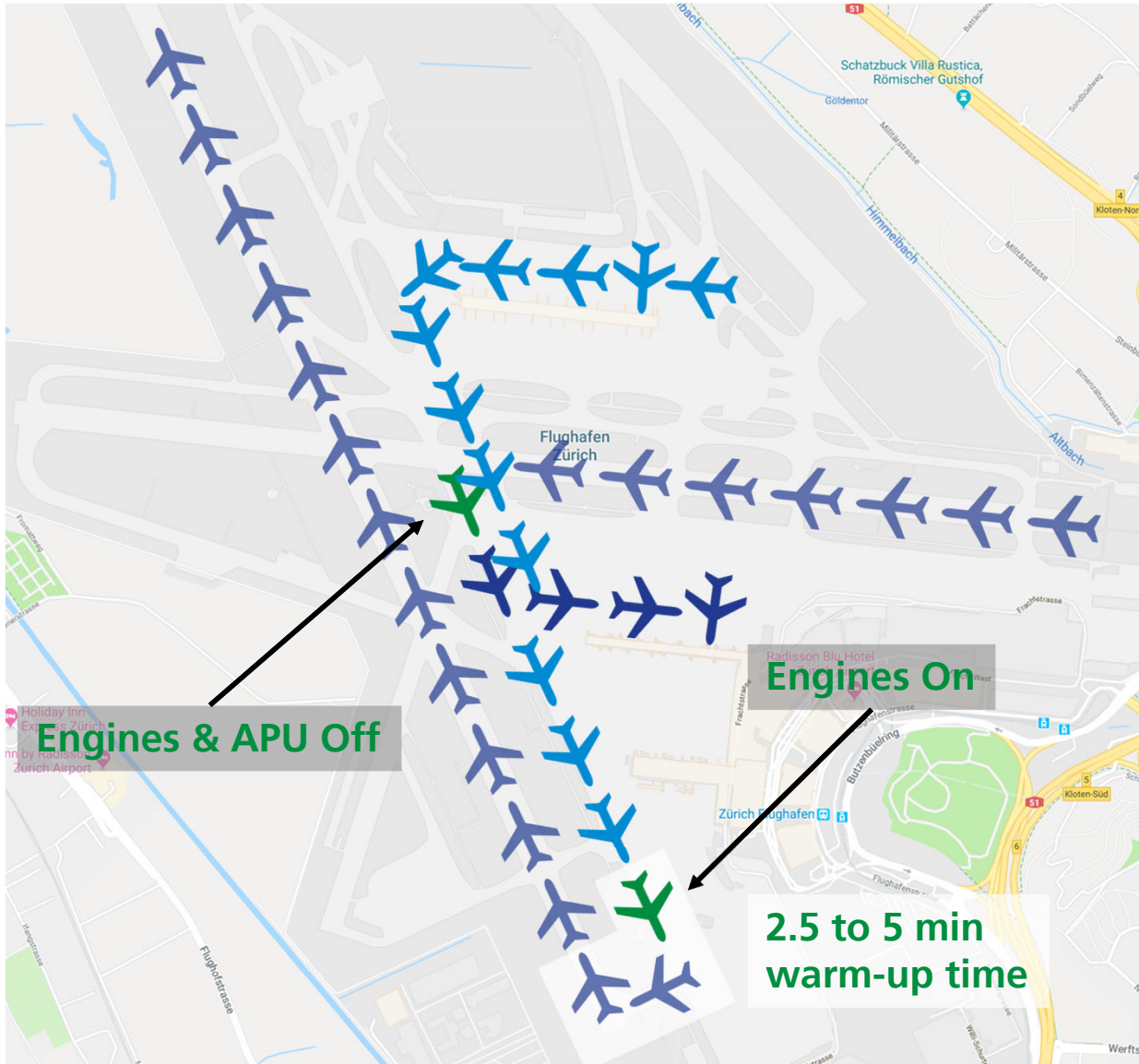
Ground staff planning

Gate assignment

Take-off Slot coordination

Ground staff planning

Air Transport: Aircraft Taxiing

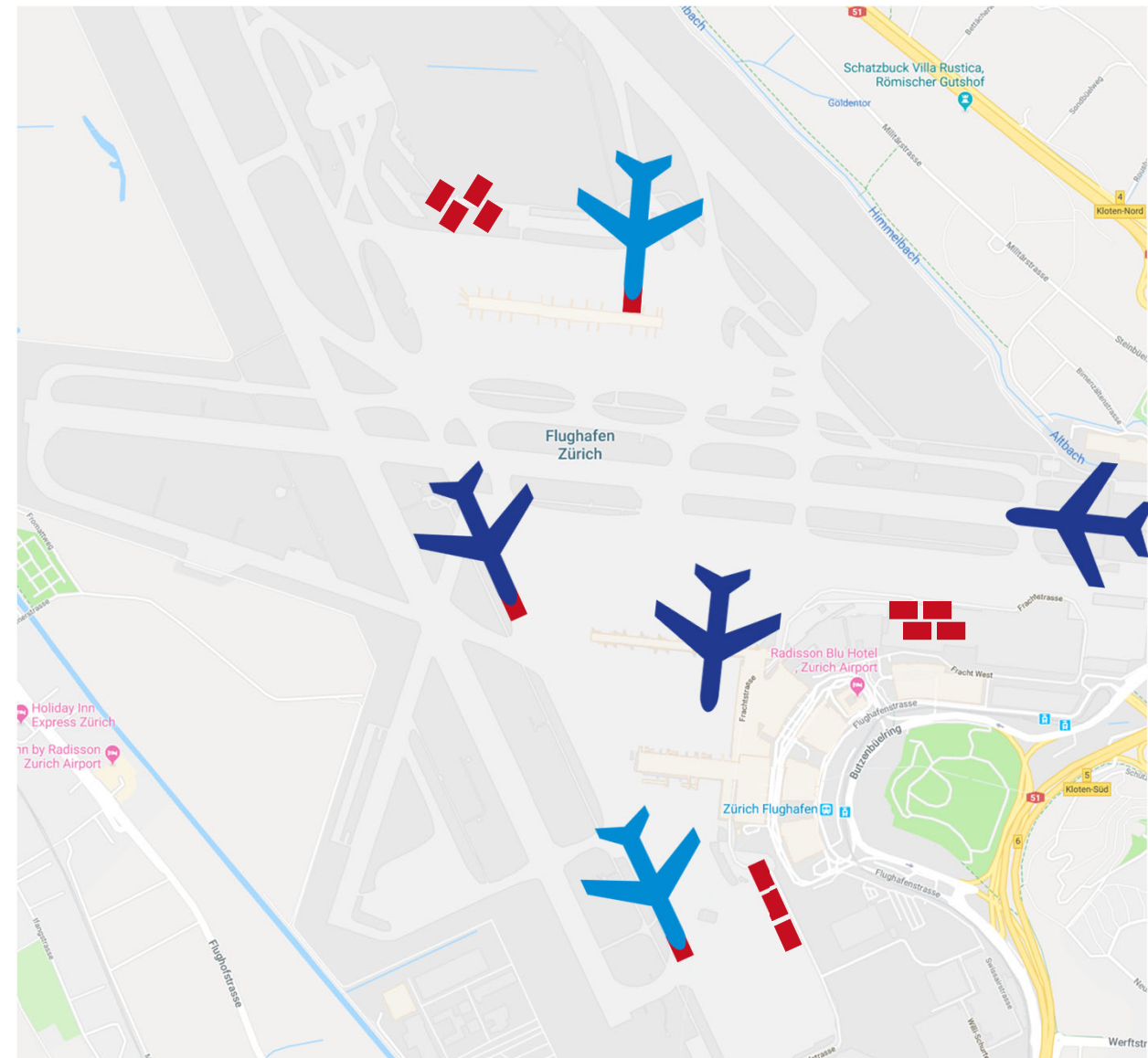
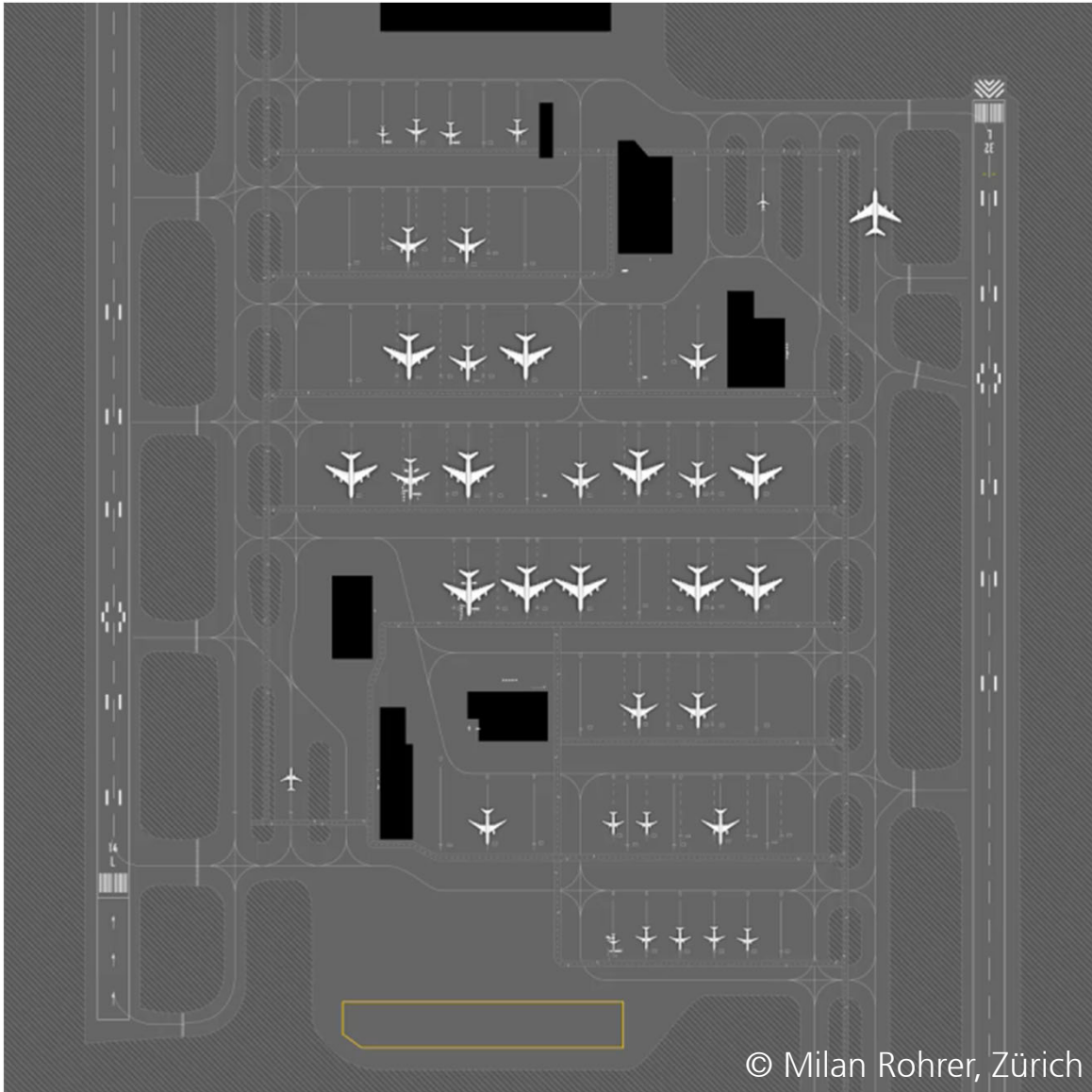


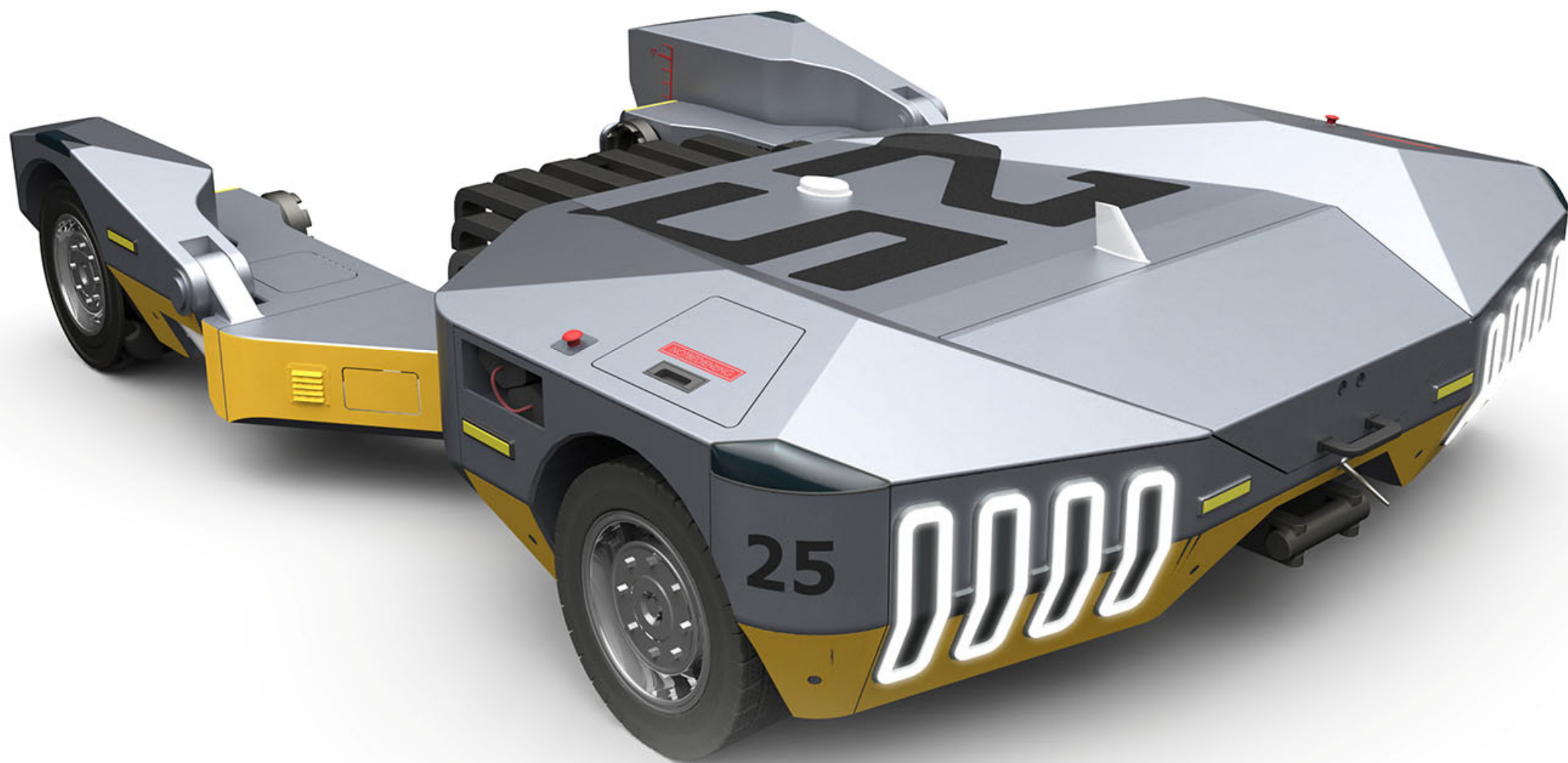
Improvements & Changes

- Reduction of Emission
- Reduction of Fuel consumption
- Increase of ground space availability
- Increased capacity handling
- Increased ground safety
- No Ground communication

- Job Profile Changes / Tug Driver
- Process Changes / Ground handling
- Flight OPS Changes / Start-up procedure
- Long-Term investment planning
- No public transport (private institution)

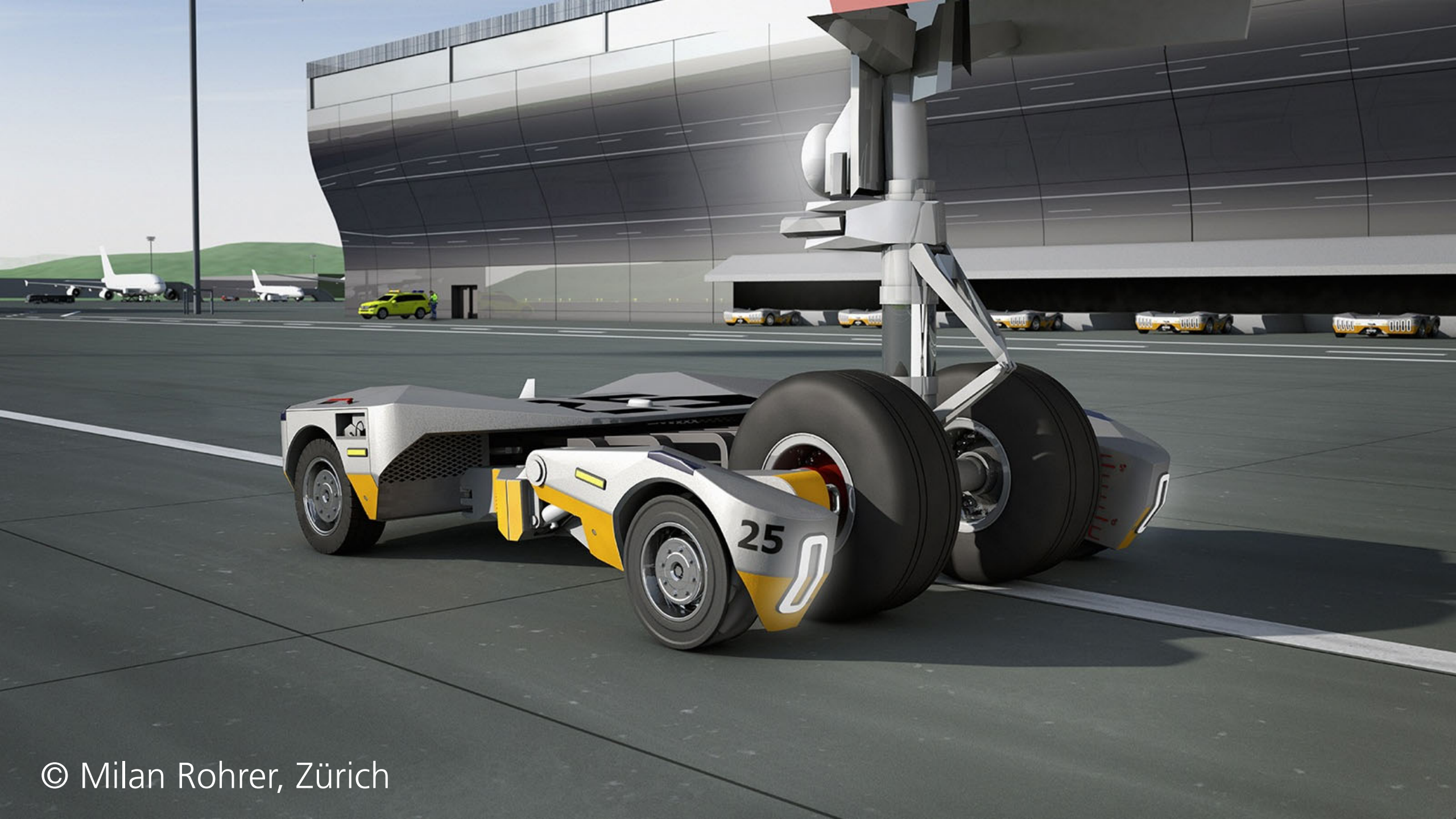
Air Transport: Aircraft Taxiing





© Milan Rohrer, Zürich



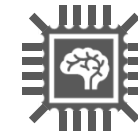


Technologies

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**Autonomous
Mobility**



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IoT / IIoT



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Technologies**



**Proximity
Tech**

Air Transport: Aircraft Taxiing

Economics / Efficiency

Ethics / Legal



LCA / ROI

Increased & adapted capacity
Speed of service



Responsibility

New Regulations are required
Tug driver future
Communication coordinator

Role of employees
Skills requirements
Accessibility
Increased Safety



Society / People

~ Zero Emissions
Airport spaces re-definition



Environment

Air Transport: Aircraft Taxiing

Maintenance

Operations

M
&
O

Different skills needed

Self-diagnostics / Managed fleet

New Tools and processes

AI managed network

Skilled supervision needed

Managed fleet

Change from Fossil to Renewable

Stakeholder responsibility and staff position changes

"I think there is a world market for maybe five computers."

- Thomas Watson, president of IBM, 1943

Summary

Economics / Efficiency



Investments required
Efficiency improvement
(& safety)
ROI

Ethics / Legal



New Regulations are required
Responsibility / Liability
Employment transfer

Society behaviour changes
New roles, new jobs
New Skills, new competencies
Education & Training



Society / People

Zero Emissions
E-energy
Landscape re-assignments



Environment

Summary

Maintenance & Operations

System will be more complex

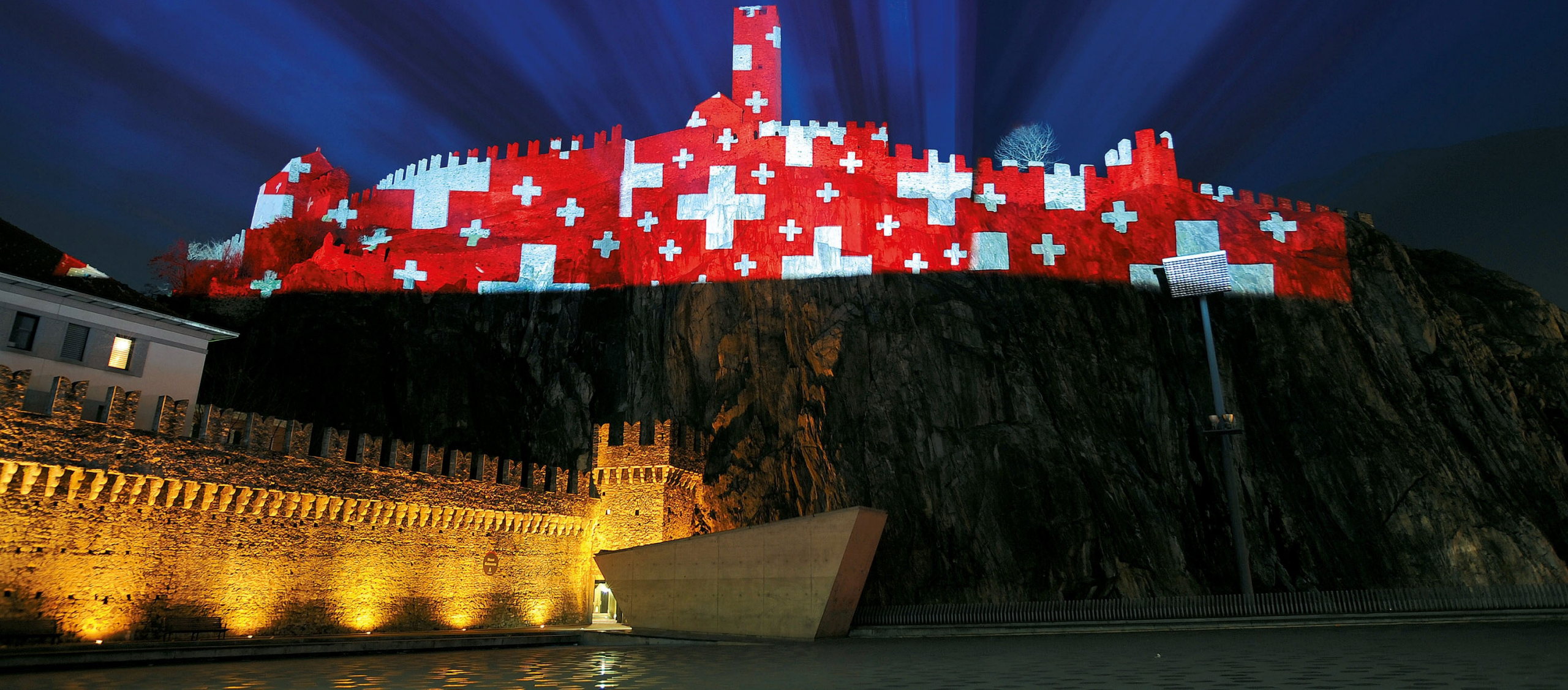
Skills and competencies of staff will be a key factor for success

Job profiles will dramatically change

New regulations will be required

**While implementing
“New Technologies” ...
Think about...**

Visit us in Bellinzona! An amazing experience with PT!





competence centre
sustainable mobility and railways
innovation

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