MPD for mobility: case studies and lessons learnt
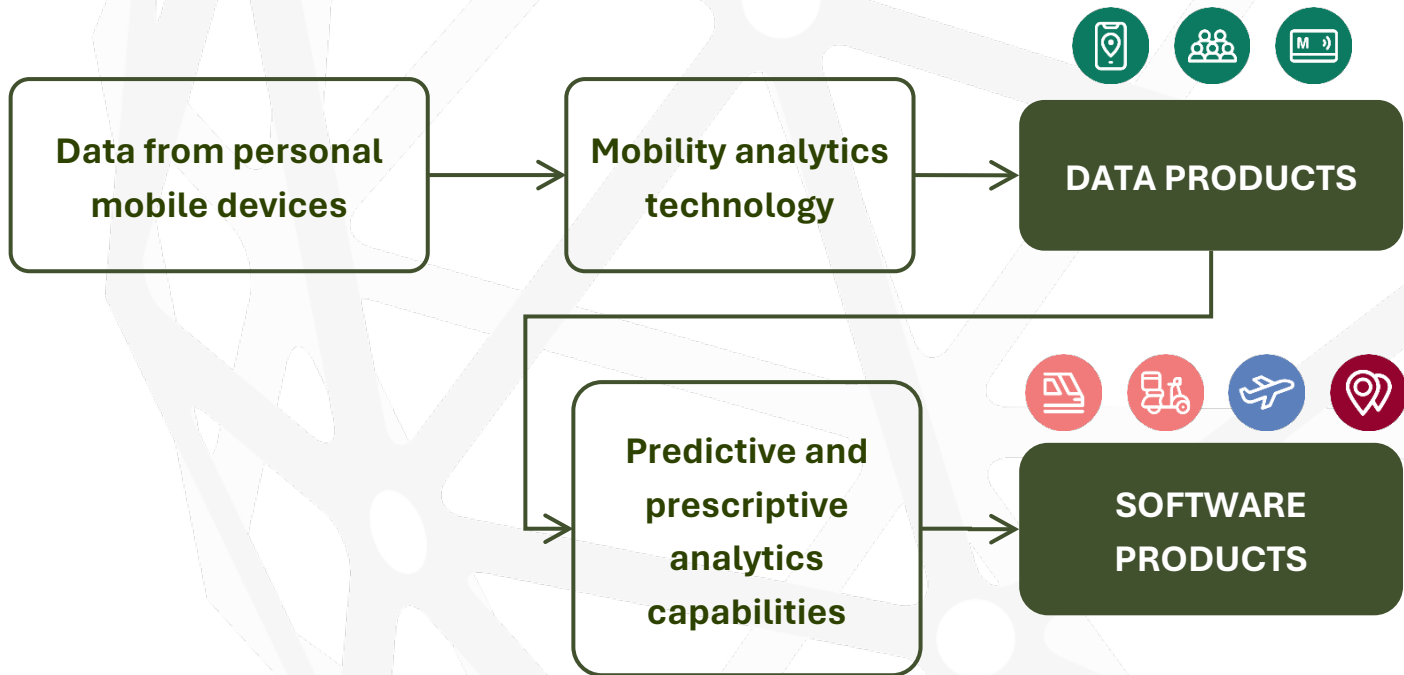
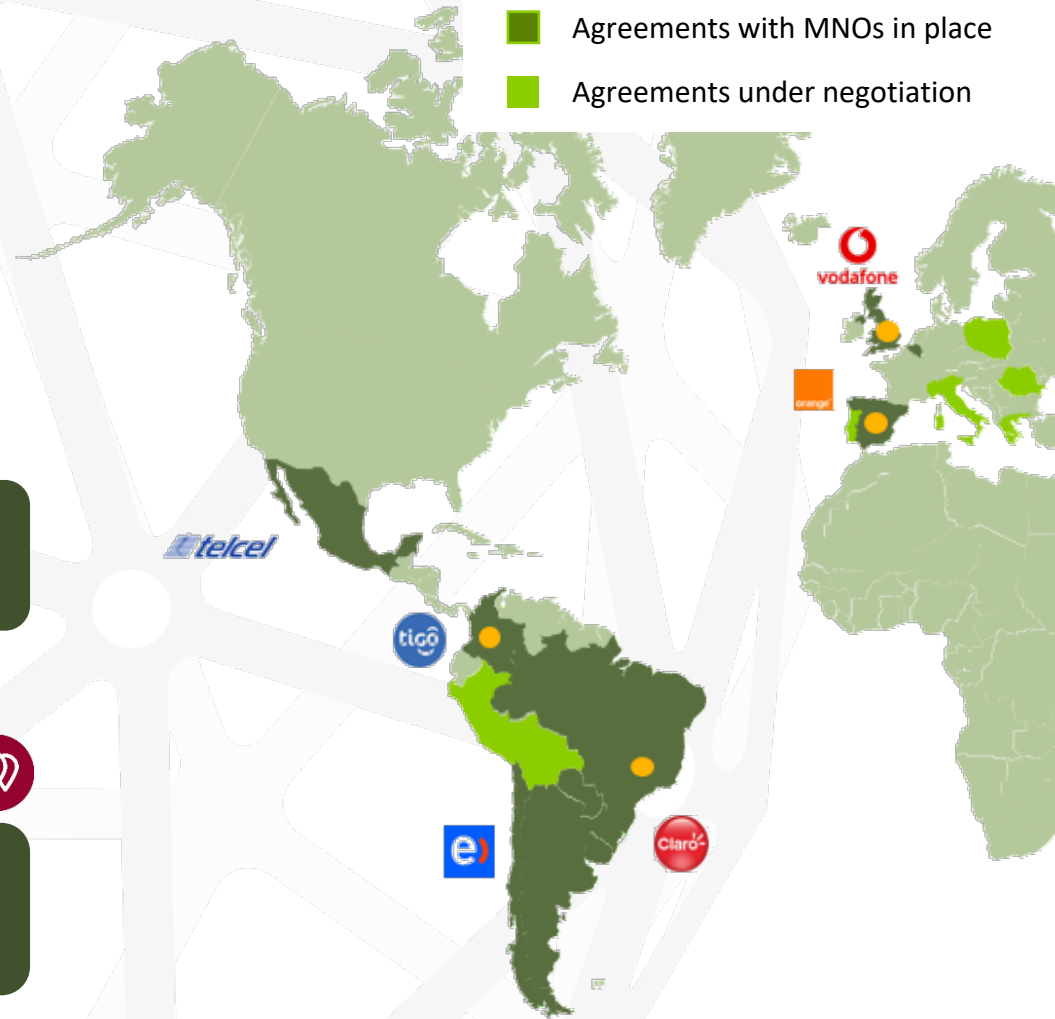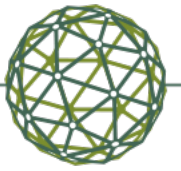**Javier Burrieza Galán**

Nommon Solutions and Technologies
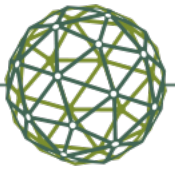
Nommon

Nommon is a research-intensive technology company that **develops decision support tools** based on **big data and artificial intelligence**, with focus on the transport & mobility sector

Data from personal mobile devices → Mobility analytics technology → **DATA PRODUCTS**

Predictive and prescriptive analytics capabilities → **SOFTWARE PRODUCTS**

- ● Permanent offices
- ■ Agreements with MNOs in place
- ■ Agreements under negotiation

MPD: an opportunity for mobility studies

Mobile network operators are **already collecting spatio-temporal registers** for billing purposes...

What if we **leverage them to understand mobility patterns**?

Mobile network events
Device-antenna communication registers

Network data
Location and characteristics of antennas

Anonymised user data
Age, gender, nationality...

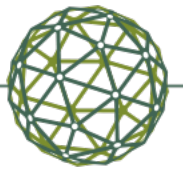| **Advantages over surveys**	**Advantages over GPS data from apps**	**Advantages over Bluetooth & WiFi sensors**
Larger samples and greater spatial coverage	Apps are not used continuously (they don't generate a continuous stream of data)	Full vs. local trajectory
Constantly updated information	Larger samples and less biases	No additional infrastructure needed
Dramatic cost reduction		Sociodemographic information available
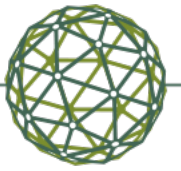
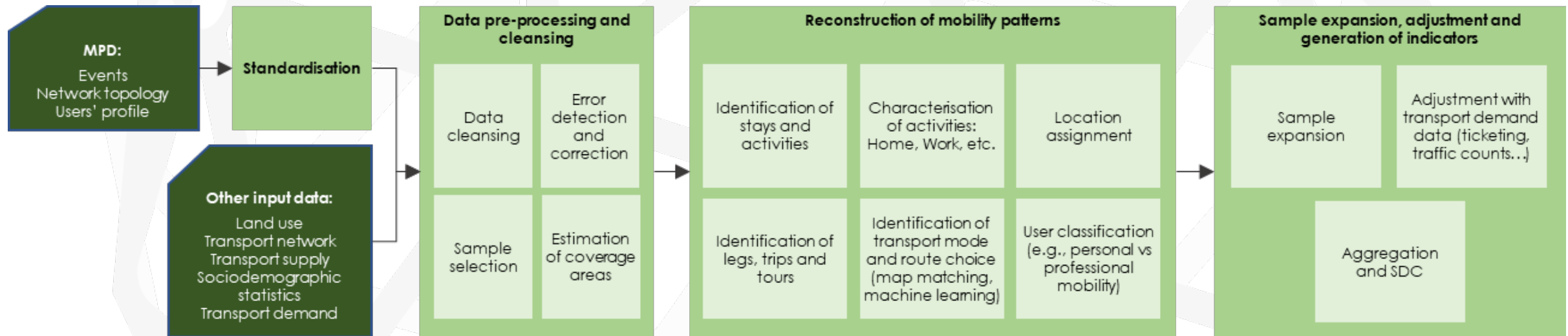## The importance of an use case-led approach

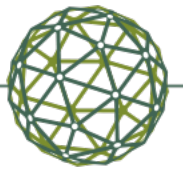MPD analytics is a very powerful technology...

...but the use case should define how we apply it

- Can MPD be combined with other data sources to get better insights?

- Should any aspect of the MPD analysis be adapted to my use case?

- Which is the sensitivity of my decision to the figures I get from MPD?
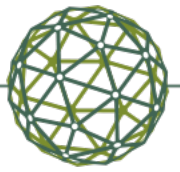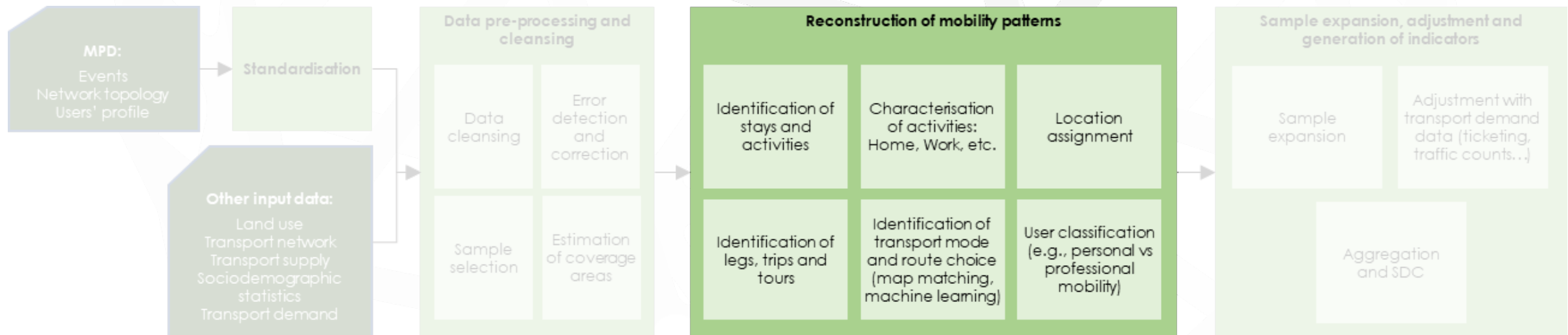
Analysing MPD for mobility studies

MPD:
Events
Network topology
Users' profile

Other input data:
Land use
Transport network
Transport supply
Sociodemographic statistics
Transport demand

Standardisation

Data pre-processing and cleansing

Data cleansing	Error detection and correction
Sample selection	Estimation of coverage areas

Reconstruction of mobility patterns

Identification of stays and activities	Characterisation of activities: Home, Work, etc.	Location assignment
Identification of legs, trips and tours	Identification of transport mode and route choice (map matching, machine learning)	User classification (e.g., personal vs professional mobility)

Sample expansion, adjustment and generation of indicators

Sample expansion	Adjustment with transport demand data (ticketing, traffic counts...)
Aggregation and SDC	

Analysing MPD for mobility studies

- **Big passive data**: MPD are composed of large databases that were not collected for mobility analytics purposes

- Be aware of errors in the raw data and the impact of certain pre-processing decisions (e.g., thresholds for sample validity)
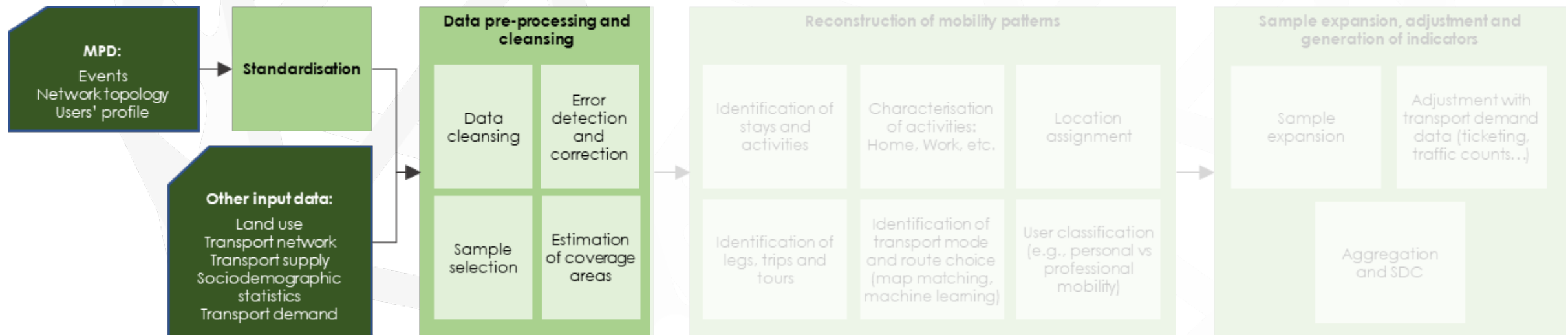
Analysing MPD for mobility studies

- **'Activity-travel diary':** a basic disaggregated unit of info behind any aggregated insight

- Be aware of mobility-specific aspects depending on your use case: distinction between trips and legs, identification of professional mobility, etc.
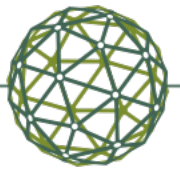
Analysing MPD for mobility studies

- **It's big data, but it's still a sample**: it requires an expansion process

- Are there any 'ground truth' data to adjust the results?
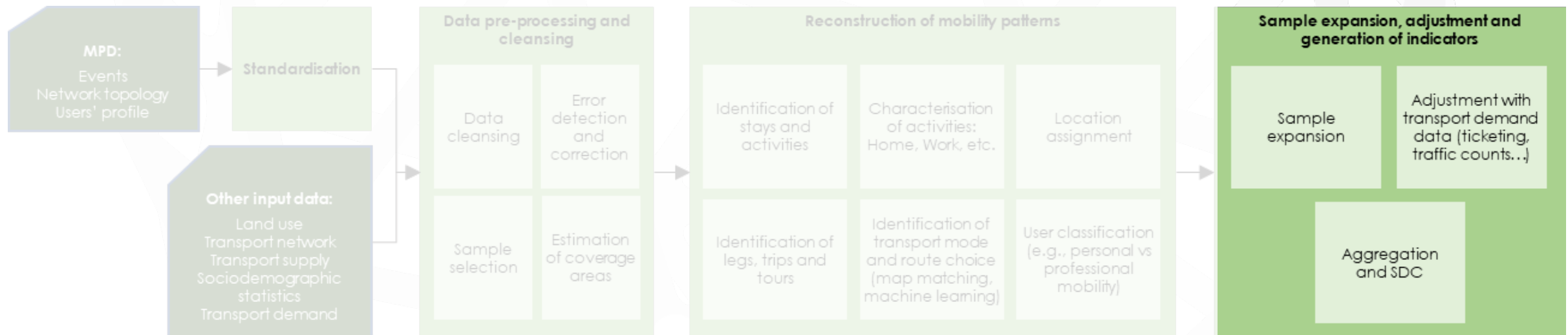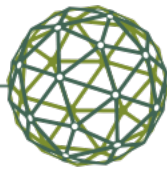
Emphasis on validation

Comparison with HTS in Valencia, Spain
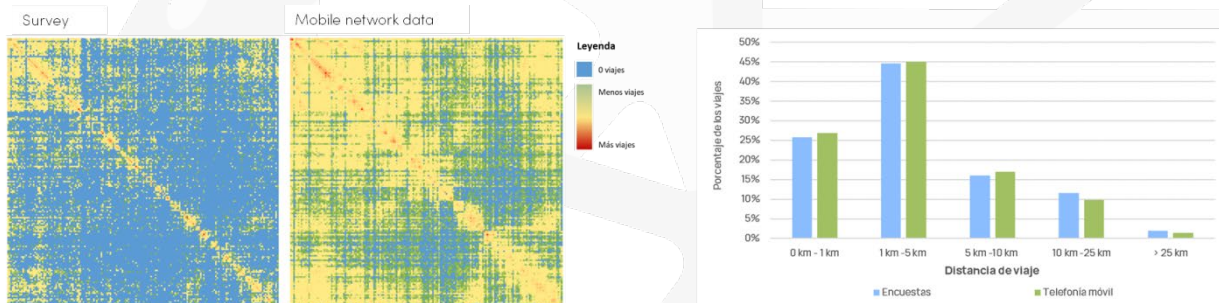
Comparison with RENFE and AENA ticketing data
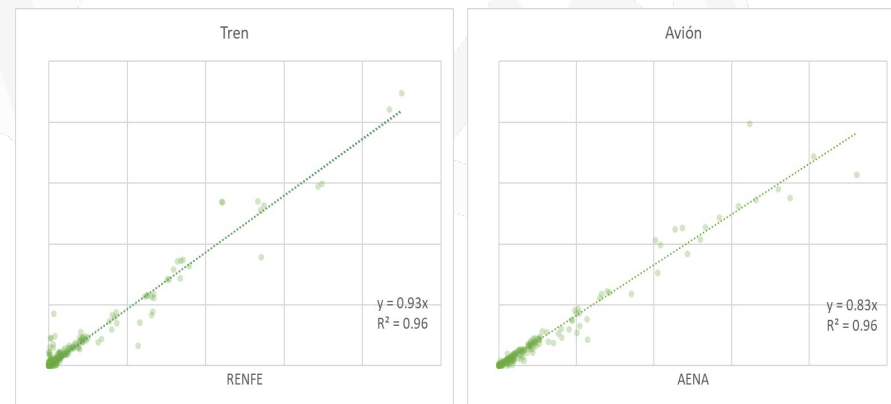
Comparison with Scotland's Transport and Travel Survey

Comparison with traffic counts
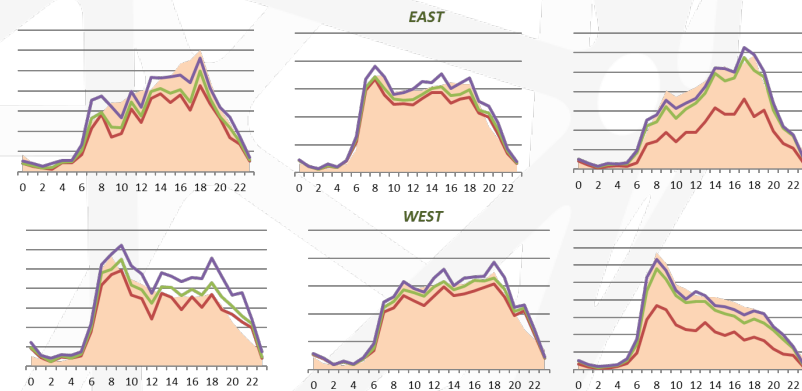
Implementation: as important as the technical solution

- The application of a cutting-edge technical solution will only be successful under a robust work plan

- Proper implementation projects can mitigate many limitations of the raw MPD and of the technical solution

    ✓ Define the specifications: which mobility insights you want to get from MPD?

    ✓ Ensure a common understanding of the specifications

    ✓ Look for complementary data sources

    ✓ Define the validation checks: what will you look at once you get the insights?

The importance of pilots

- Pilots allow MPD users to familiarize with the technology, and MPD analytics providers to understand the use cases

- Some success stories: Spanish Ministry of Transport, Madrid Regional Transport Authority
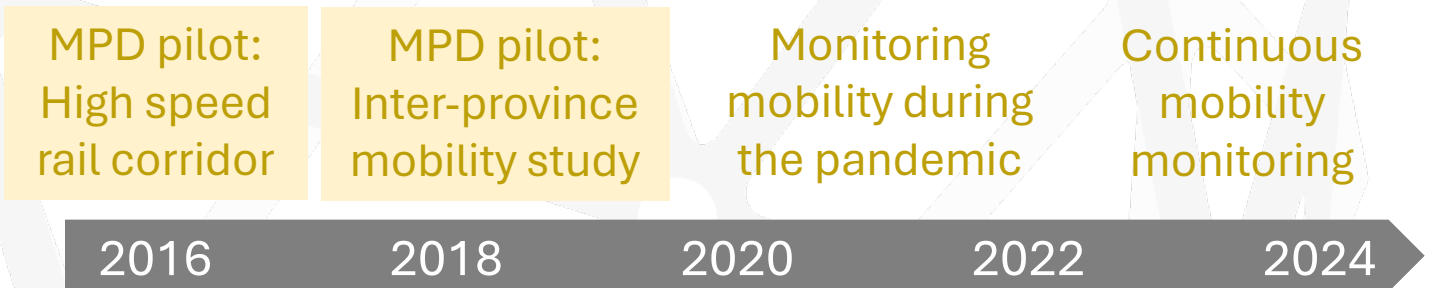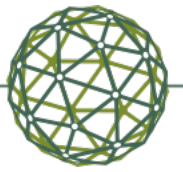
MPD pilot: High speed rail corridor

MPD pilot: Inter-province mobility study

Monitoring mobility during the pandemic

Continuous mobility monitoring

2016   2018   2020   2022   2024

MPD pilot: INVOLVE project

MPD for complementing Madrid HTS

Monitoring mobility during the pandemic

Continuous mobility monitoring

2014   2016   2018   2020   2022   2024

A variety of application examples

Urban mobility plans

Regional/national transport plans

Transport concessions

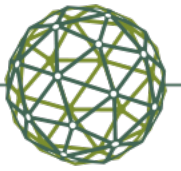New mobility services

Traffic management

Competition studies

Catchment areas of transport hubs

Continuous monitoring

A variety of application examples


Urban mobility plans

Regional/national transport plans

◎ Analyse the evolution of mobility patterns during the COVID-19 pandemic in the cities of Bogotá, Medellín & Buenos Aires

- Detailed zoning system (e.g. >2,000 zones in Buenos Aires)

- Longitudinal analysis: 2019-2020-2021

- Detection of professional trips

- Segmented by trip purpose, place of residence, age, gender and socioeconomic level

- Mode segmentation: data fusion process integrating travel surveys and ticketing data from public transport services
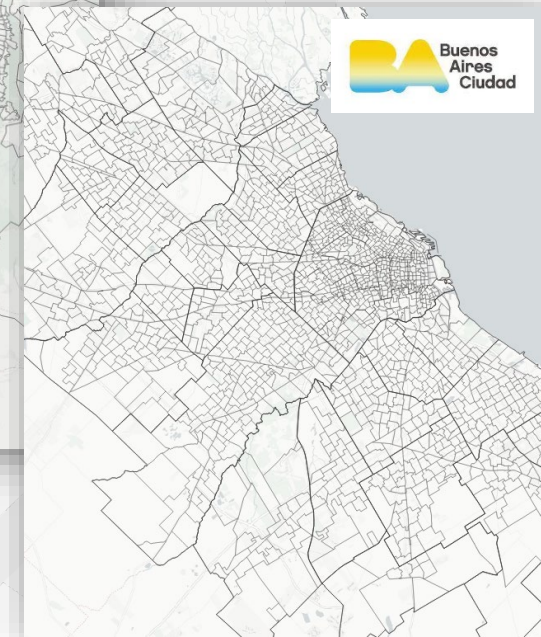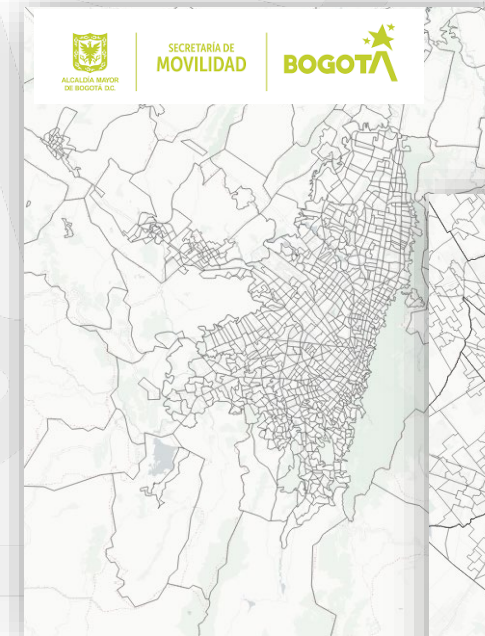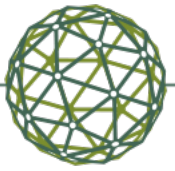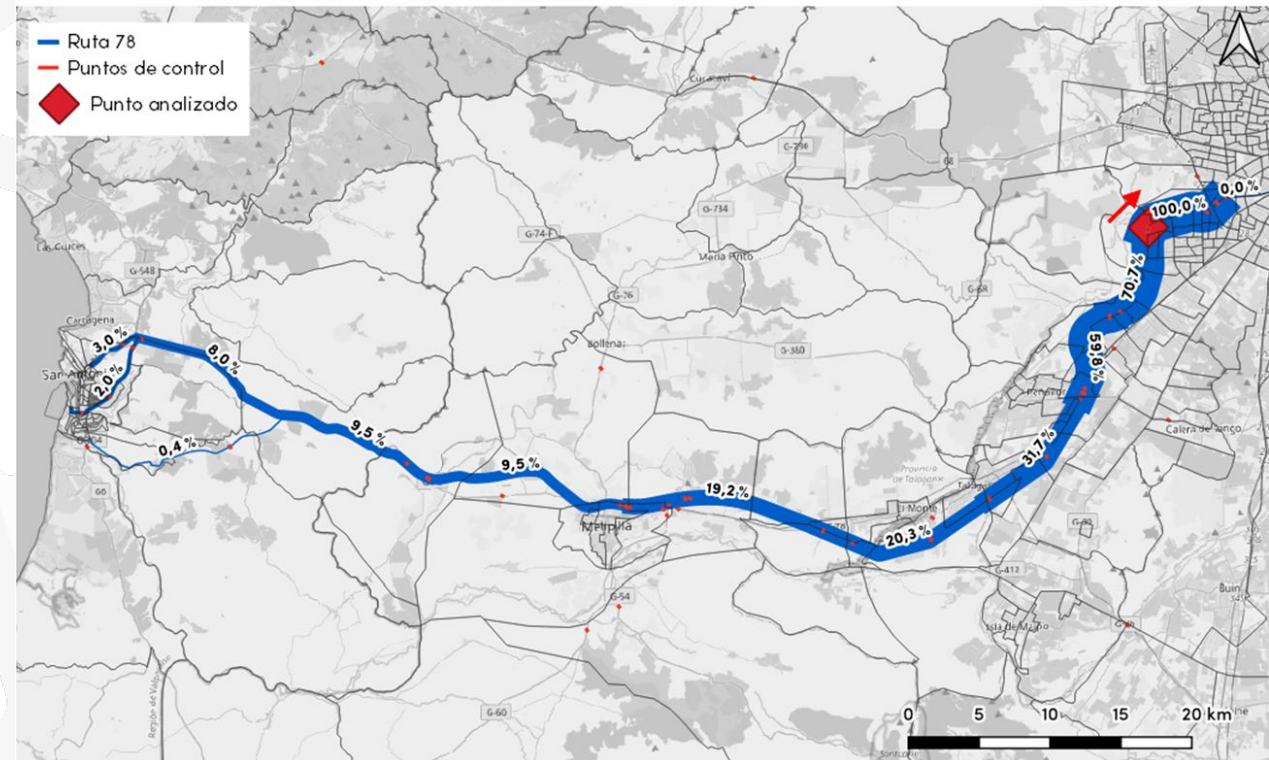
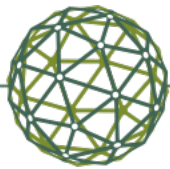# A variety of application examples

Transport concessions

Competition studies

◎ Analyse the route choice patterns of travellers that have Chilean Route 78 as an option
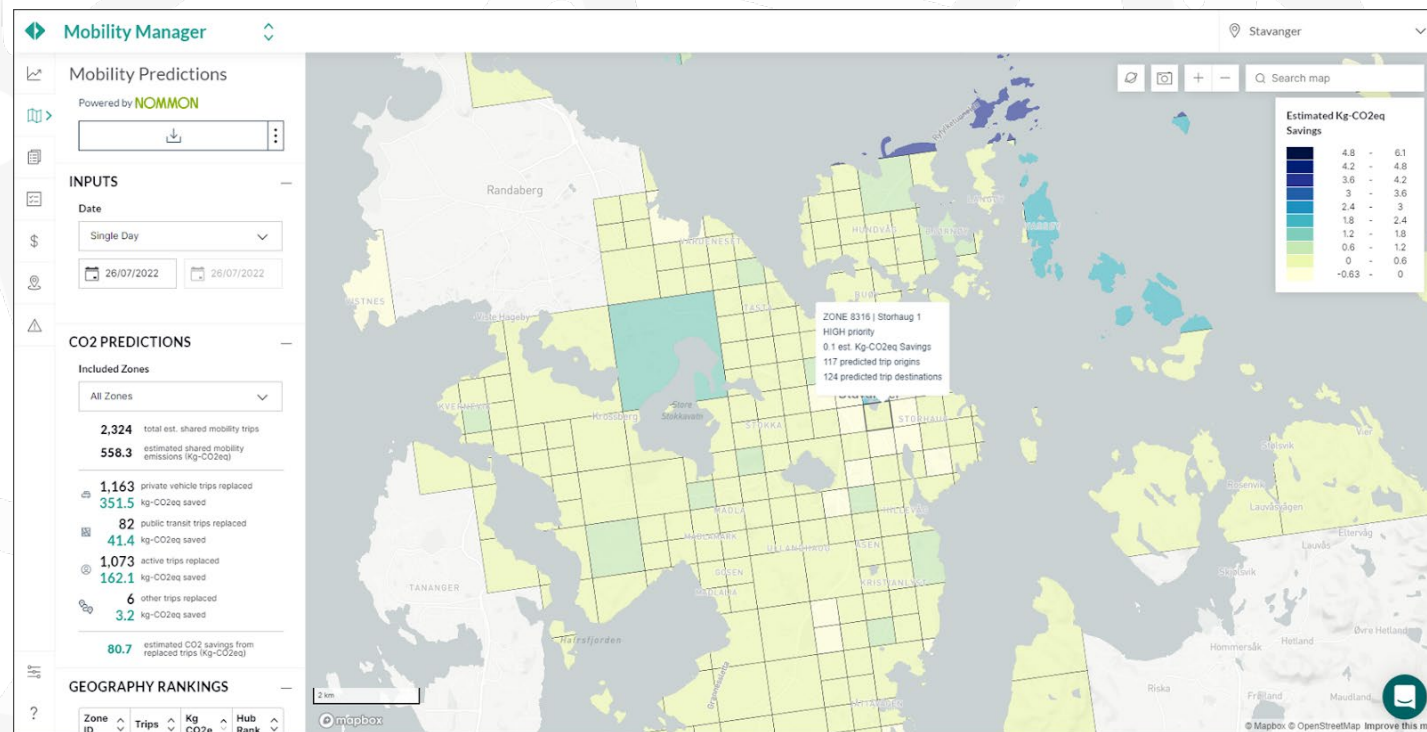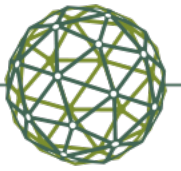
A variety of application examples

New mobility services

🎯 Estimate the CO2 savings associated with the introduction of shared mobility systems in suburban areas (Helsinki, Tallinn, Stavanger)

In collaboration with ◆ POPULUS

Key takeaways

Adjust your approach to MPD to your mobility use cases

Combine MPD with other data sources to enrich and validate your insights

Pilots train and empower the sector in the use of MPD for mobility

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