ITF Modelling Framework

ESCAP Regional Meeting

17th July 2024
Presentation outline

- General modelling framework
- ITF Freight model
- ITF Non-urban passenger model
- ITF urban passenger model
- ITF fleet model
PASTA - Modelling Framework
Policy Ambitions and Sustainable Transport Assessment

Model inputs
- **Global assumptions**: GDP, Trade, Demographics, Energy Prices, Urbanisation,
- **Scenario variables**: Exogenous Factors, Policy Measures

**Demand Models**
- **Passenger**
  - Urban Passenger model
  - Non-urban and Interurban Passenger model
- **Freight**
  - Urban Freight model
  - Domestic and International non-urban Freight model

**Fleet model**
- Fleet model (All modes)

**Output**
- Tonne-km; Vehicle km; Passenger km; Costs; Emissions (CO2eq); Connectivity
Inputs geographical resolution

Scenario policy measures (19 markets)
Scenario policy measures

**Economic**
- Carbon Pricing
- Road Pricing
- Congestion charging
- Parking pricing
- Ticket taxes

**Regulatory**
- Access restrictions
- Parking restrictions
- Short-haul flight ban
- SAF mandates
- Biofuel blending targets
- Speed limits

**Operational**
- Pick-up points (urban freight)
- Intelligent transport systems
- High Capacity Vehicles
- Smart steaming
- Asset sharing
- Real-time data

**Infrastructure**
- Land use planning
- Pedestrian and cycle facilities
- Rail investment
- PT investment, including priority measures

**Innovation**
- Electric / alternative fuel uptake
- Shared mobility policies
- Multimodal travel services (e.g. MaaS)
- Hydrogen / electric planes
- Alternative shipping fuels
ITF freight model
Framework

Model inputs
- Carbon intensity by mode
  - ITF FLEET MODEL
- Economic & Demog.
- International Trade
  - International Trade (ENV)
- Port & Airport Cap.
  - ICAO & Others
- GIS Network by mode
  - Openstreets + Projects
- Spatial Discretisation
  - Centroids
- Scenarios
  - Policy measure levers

Models
- International Freight
  - Trade OD
  - Value to weight
  - Mode Choice
- Domestic Freight
  - Trade OD
  - Value to weight
  - Mode Choice

Equilibrium Assignment

Transport demand
- Freight volume by link, node, commodity type
- (Air) port throughputs

Transport emissions
- CO₂

5 years

ITF FLEET MODEL
Freight Model Geographical resolution

International

1,164 centroids (679 in EEA+Turkiye)

Domestic

7,303 centroids (560 in EEA+Turkiye)
Model Outputs

Geographical visualisation of network results
Model Outputs

Detail analysis

Tonne kilometres by distance bin
Year=2019, All modes

Vehicle_type
- LCVs
- Lorries
- Road tractors
- Maritime
- Airplanes
- Freight Trains
- 2&3Ws
- Non Motorised
Model Outputs

Detail analysis

Freight CO2 emissions by distance bin
Year=2019, All modes
Model Outputs

- Detail analysis
ITF non-urban passenger model
Framework

Calibration data
*French Intercity Travel Survey (2014) – ICAO True OD (2017)*
*Validation: ICAO Total Traffic – International comparison*

Global Network Evolution
- Air Network Evolution
- Rail Developments (CBA)
- Travel Price Model

Intercity Travel Models
- Travel Generation
- Destination Choice
- Mode Choice
- Route Choice

Regional Travel Models
- Travel Generation
- Mode Choice

Model inputs

Socio-economic:
- Population
- GDP
- Geopolitical characteristics
- Tourism, Trade & Emigration

Transport Supply (2015):
- Flight & Seats per route
- Rail connections and quality
- Car ownership rate per country

Spatial Discretisation
- Centroids

Scenario
- Policy measure levels

Transport demand
- Passenger volume by route, centroid and mode

Transport emissions
- CO₂
Geographical resolution

- Assesses all non-urban travel activity by splitting the world in regions:
  - Within the regions (Regional travel)
  - Between the regions (Intercity travel)
- Total of 1191 regions (defined by city airports with IATA codes)
- Allows testing the impact of various policies, measures, and trends in non-urban passenger travel
Travel scope classification

Regional

Regional Travel

Intercity

International

Domestic Intercity

No border control

Short and medium haul (> 4 hours by air)

Long haul (≤ 4 hours by air)
Model Outputs

Aggregated by SCOPE of travel or REGIONS
ITF urban passenger model
Framework

**Calibration data**
*2015 Transport demand, Set of 20 cities, International comparison*

**2015 data**
*Transport supply*

**Data projections to 2050**
*Demographic, socio-economic, vehicle emissions*

**Demographic model**

**Scenario**
*Policy measure levels*

**Model inputs**
*Geographic features → Transport supply → Mode characteristics → Trip generation → Mode choice*

**Models**

**Transport demand**
*Number of Trips, Passenger-kilometres, Vehicle-kilometres*

**Transport emissions**
*CO₂, SO₄, PM2.5, NOx*

5 years
Model resolution

- 9,234 MFUAs from the OECD-EC Cities in the World project

- Accounts for 18 modes including active and shared mobility

- Includes a demographic model

- Results available by 6 trip distance, 2 gender and 18 age categories
Modal resolution: 18 modes
ITF fleet model
Historical vehicle registration data
Around 40 different data sources consolidated

ITF Demand models
- Urban passenger model
- Non-urban passenger model
- Freight model

Fleet Model
- Estimate scrappage curves based on historical data
- Estimate stocks for countries without data
  - Base Year Calibration
  - Forecast stock demographics
  - Energy efficiencies and carbon intensities

Outputs
- CO₂, Air pollutants, Energy, Vehicles
Outputs: CO\textsubscript{2}, Air pollutants, Energy, Vehicles

Around 40 different data sources consolidated

Base Year Calibration
Estimate scrappage curves based on historical data

Estimate stocks for countries without data

Forecast stock demographics

Fleet Model

Energy efficiencies and carbon intensities

Urban passenger model
Non-urban passenger model
Freight model

Outputs: CO\textsubscript{2}, Air pollutants, Energy, Vehicles
More information at...

Thank you

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