



Learning to use the tools

Insights into the ITF Models of DTEE Azerbaijan

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Getting the tools

<https://www.itf-oecd.org/dtee-azerbaijan>

Please use the below links for more information on project outputs, events and tools that were developed in the context of this project.

Read: - Decarbonising Azerbaijan's Transport System: Charting the Way Forward

- Policy Scenarios for Decarbonising Azerbaijan's Transport System

Go to: - Azerbaijan launch of decarbonisation project

- Policy Scenarios for Decarbonising Azerbaijan's Transport System event

- Decarbonising Transport in Azerbaijan Regional Dialogue Event

Tools for policymaking: - Repository of modelling tools and related documentation



Decarbonising Transport in Azerbaijan - Repository

• ITF_DTEE_AZE_NationalPassengerModel	
Filename	Description
itf_dtee_aze_nationalpassengermodel.zip	The National Passenger model for Azerbaijan (excluding the Baku urban area). This Microsoft Excel model enables testing the impact of policy measures and technology developments on passenger transport demand by mode and its related emissions.
itf_dtee_aze_nationalpassengermodel_methodologynote.pdf	Methodology Note describing the theoretical background and workings of the National Passenger model. English version.
itf_dtee_aze_nationalpassengermodel_methodologynote_aze.pdf	Methodology Note describing the theoretical background and workings of the National Passenger model. Azerbaijani version.
itf_dtee_aze_nationalpassengermodel_usermanual.pdf	User Manual illustrating the use of the National Passenger model with examples. English version.
itf_dtee_aze_nationalpassengermodel_usermanual_aze.pdf	User Manual illustrating the use of the National Passenger model with examples. Azerbaijani version.

• ITF_DTEE_AZE_BakuModel	
Filename	Description
itf_dtee_aze_bakumobilitymodel.zip	The Baku Urban Mobility model. This Microsoft Excel modelling tool enables testing the impact of transport policy measures and technology developments on passenger mobility demand and its related emission for the Baku urban area.
itf_dtee_aze_bakumobilitymodel_methodologynote.pdf	Methodology note describing the theoretical background and workings of the Baku Urban Mobility model.
itf_dtee_aze_bakumobilitymodel_usermanual.pdf	User Manual illustrating the use of the Baku Urban Mobility model with examples. English version.
itf_dtee_aze_bakumobilitymodel_usermanual_aze.pdf	User Manual illustrating the use of the Baku Urban Mobility model with examples. Azerbaijani version.

Three tools for assessing transport



- The **Baku urban Mobility model**
 - > passenger transport in Baku
- The **National passenger model**
 - > passenger transport (excl Baku)
- The **Freight visualization tool**
 - > total freight transport

Policy scenarios for CO₂ reduction



The ITF and the Azerbaijan Ministry of Digital Development and Transport worked closely to identify and design **three distinct scenarios** :

1

Baseline

No measures are implemented

-> Do nothing

2

Current policies

Azerbaijan's transport policy measures currently planned are carried out. It reflects the most likely future for Azerbaijan.

3

Climate ambition

Additional measures are introduced to better align Azerbaijan's transport CO₂ emissions with reaching the Paris Climate Agreement.

1. The Baku Urban Mobility model

Passenger transport



The Baku Mobility Model



A **strategic** model to assess CO₂ mitigation measures for urban passenger transport in the Baku urban area.

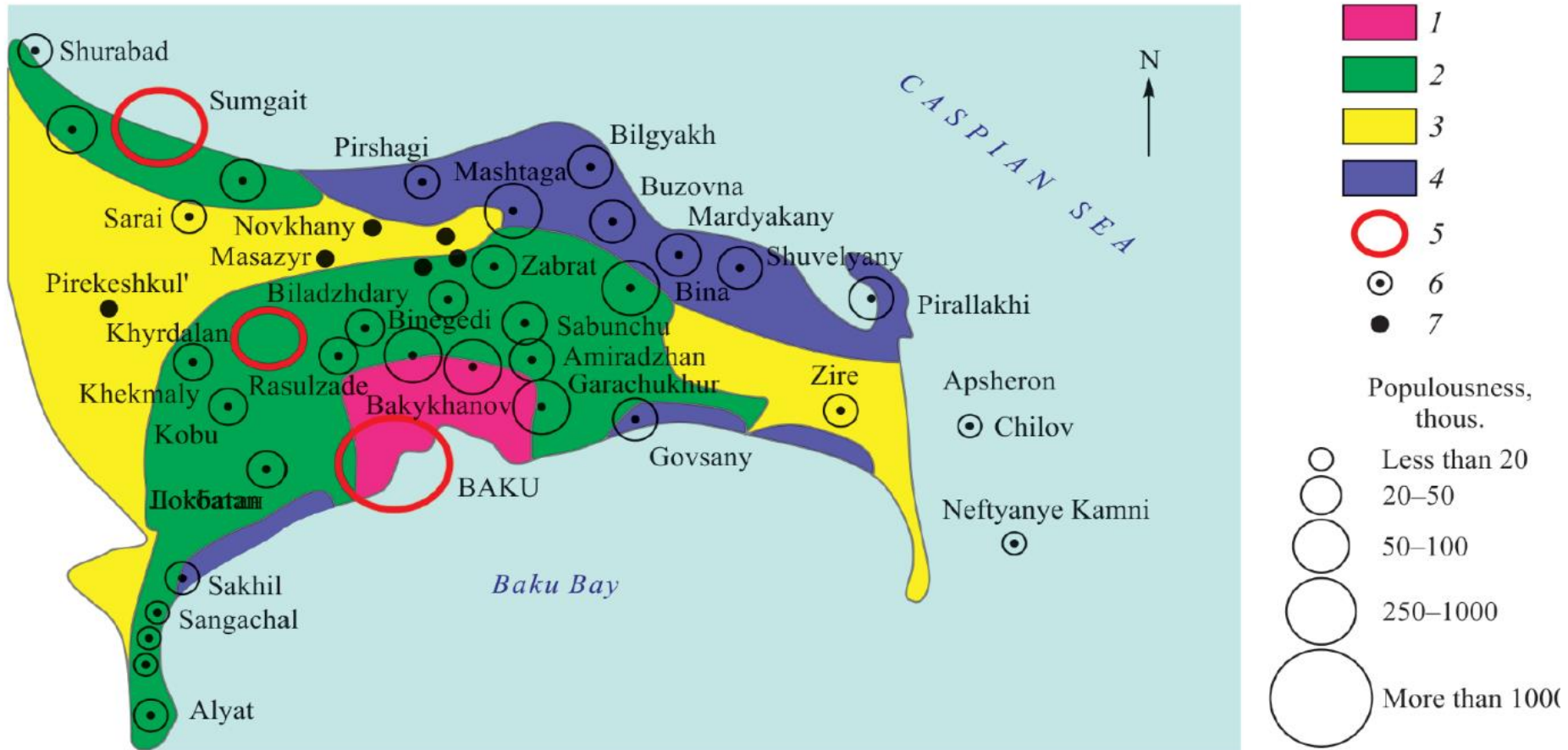
Test policy scenarios from 2015 to 2050 and estimate transport activity and related emissions

Based on the ITF Global Urban Passenger model 2020

Developed via consultations with:

- Ministry of Transport of Azerbaijan
- Baku Transport Agency

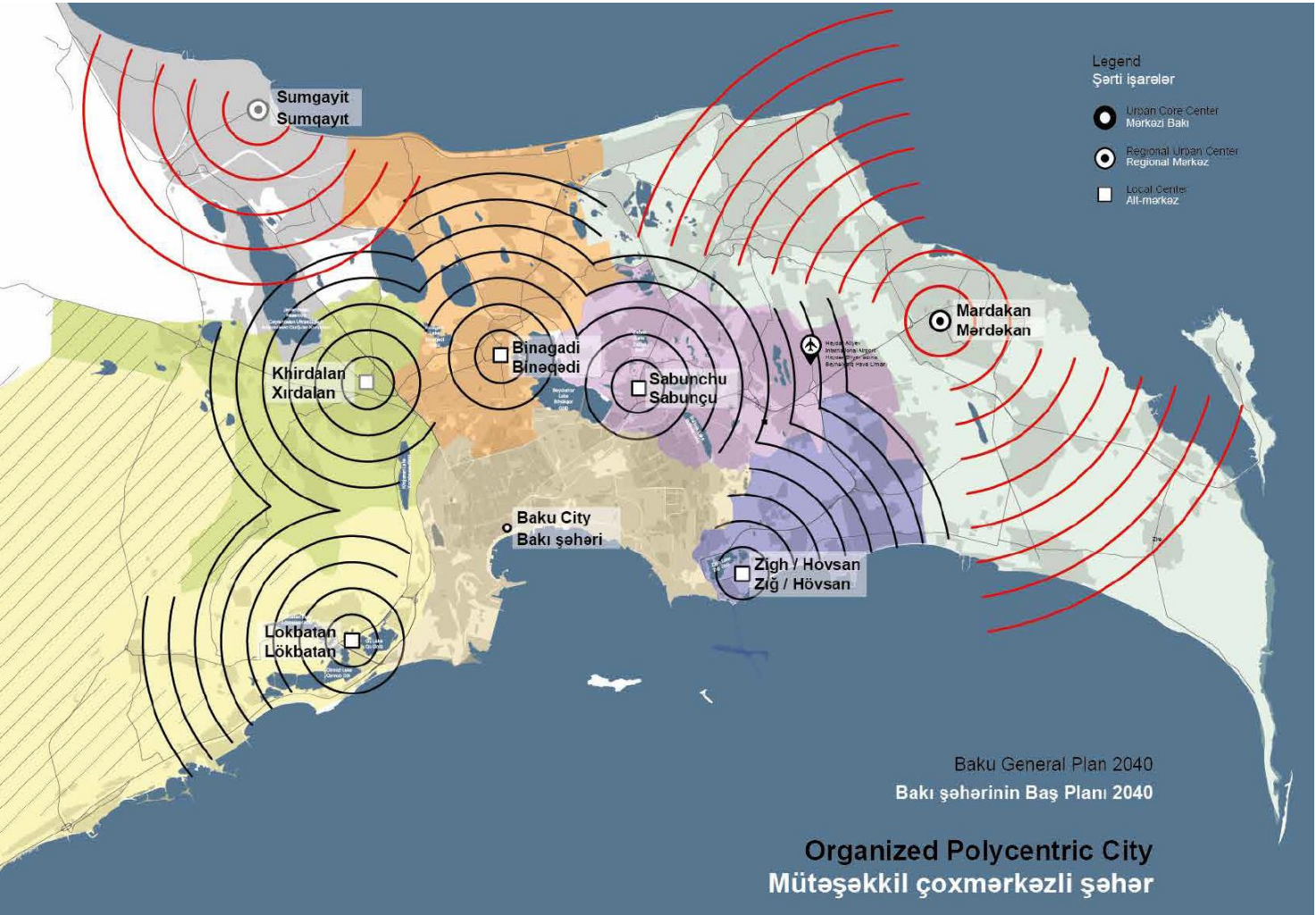
Geographical scope



Schematic map of regionalization of the Baku urban agglomeration.

Zones: 1 – core, 2 – industrial, 3 – industrial-agricultural, 4 – recreational. Settlements: 5 – cities, 6 – villages, 7 – rural settlements.

Geographical scope



Source: Baku General Plan 2040



Level of disaggregation

18 modes (current and possible future ones)

2 genders and 5 age cohorts

6 trip distance bins

5 fuel types (gasoline, diesel, electric, methane, H2)

5 years step from 2015 to 2050

Active modes

Walking
Biking
Scooter sharing
Bike sharing

Public transport modes

Light Rail
Rail
Metro
Bus
BRT

Private vehicle modes

Motorcycle
Car

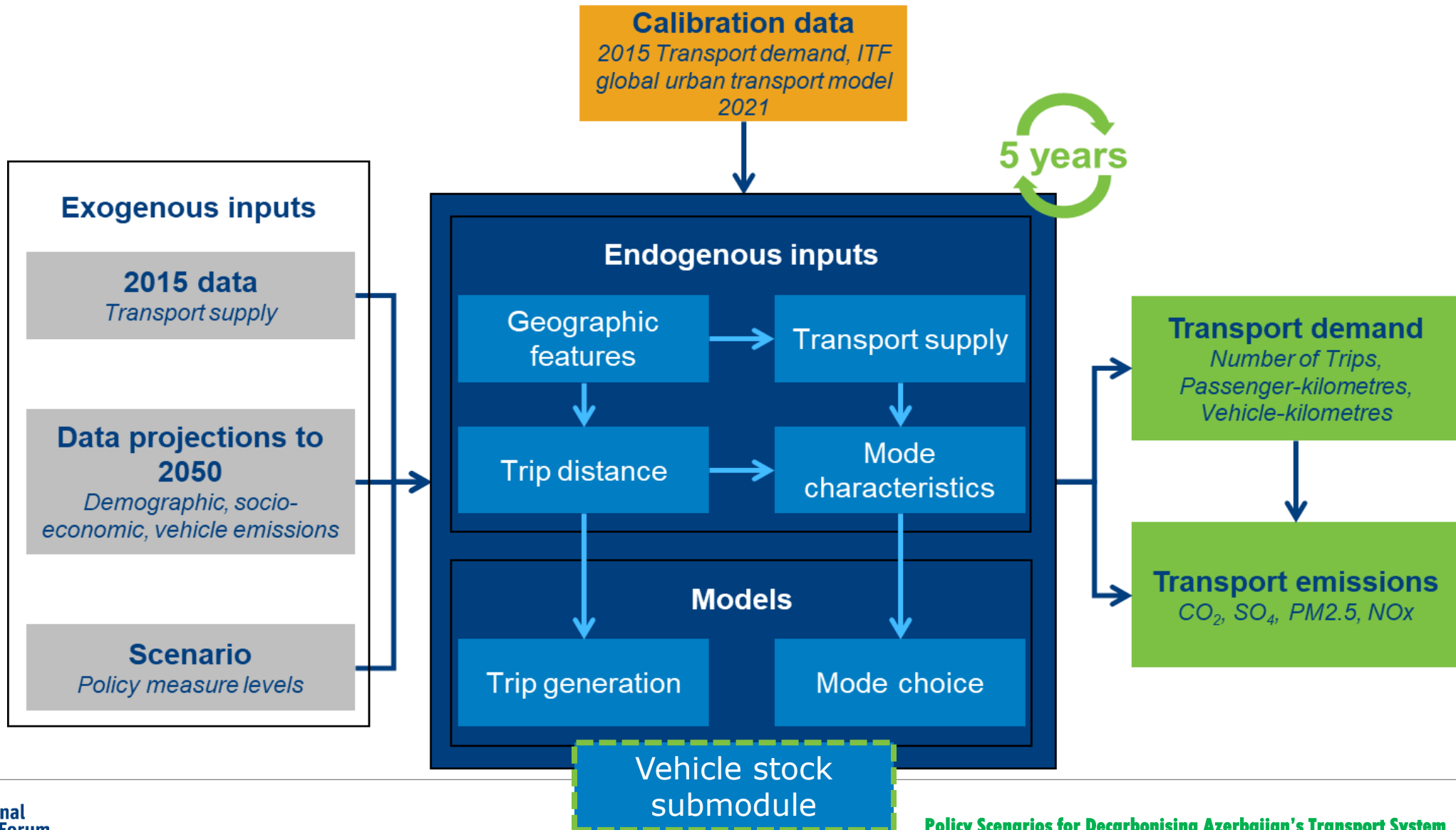
Shared mobility modes

Taxi
Private ride sharing
Motorcycle sharing
Car sharing
Minibus sharing (“Taxi bus”)

Paratransit modes

Informal Bus
Informal 3-wheelers

Model structure



Transport scenario definitions

Baku passenger transport



Current policies scenario

Measures	Assumptions
Prioritising public transport	15% of the bus network gets priority on the roads over other modes (e.g. with dedicated corridors)
Suburban rail improvement	An increase from 26 to 55 rail stations
Light-Rail Transit (LRT) development	Increase the length of LRT from 0 km to 67 km between 2020 and 2040
Bus-Rapid Transit (BRT) development	Increase the length of bus lanes from 8.5 km to 115 km between 2020 and 2040
Private car technology	Car sales composition to be 10% for electric vehicles and 30% for gasoline-hybrid vehicles by 2050
Bus technology	Bus fleet composition of 50% LPG/CNG and 50% electric vehicles by 2050
Bike and pedestrian infrastructure	Six times the current number of bike infrastructure by 2050

Transport scenario definitions

Baku passenger transport



Climate ambition scenario

Measures (in addition to current policies scenario)	Assumptions
Carbon pricing	Set a carbon tax of USD 150 per tonne of CO ₂
Incentives for shared minibuses	Incentives supporting services with 4 minibuses per 1 000 inhabitant
Public transport service improvement	5% enhancement of PT service frequency for metro, 10% for buses.
Private car and bus technology	Follows the IEA Sustainable Development Scenario (SDS scenario)
Teleworking	Support teleworking practices and increase the number of regular teleworkers in the overall workforce by 6%
Transit-Oriented Development	Increases the average land-use as mixed-use developments by 5%

2. The National passenger model

Passenger transport
(excluding Baku)



The National passenger Model



A **strategic** model to assess CO₂ mitigation measures for urban passenger transport in Azerbaijan (excluding Baku).

Test policy scenarios from 2015 to 2050 and estimate transport activity and related emissions

Based on the four-step modelling framework

Developed via consultations with the Ministry of Transport of Azerbaijan

Scope



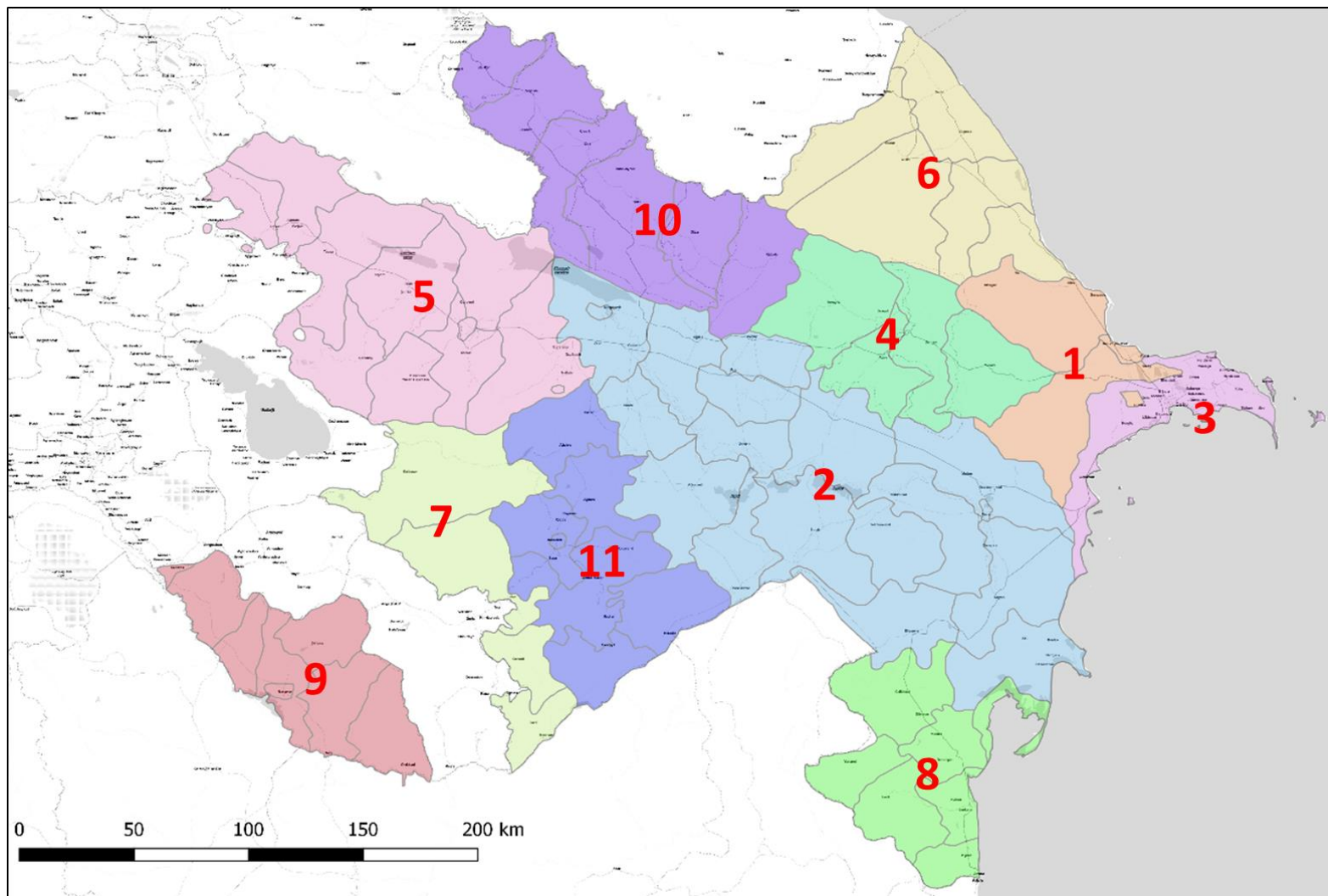
The country of Azerbaijan minus the Baku urban area, divided into 11 zones

4 modes of transport: Car, Rail, Bus, Air

5 fuel types (gasoline, diesel, electric, methane, H2)

5 years step from 2015 to 2050

Zonal system

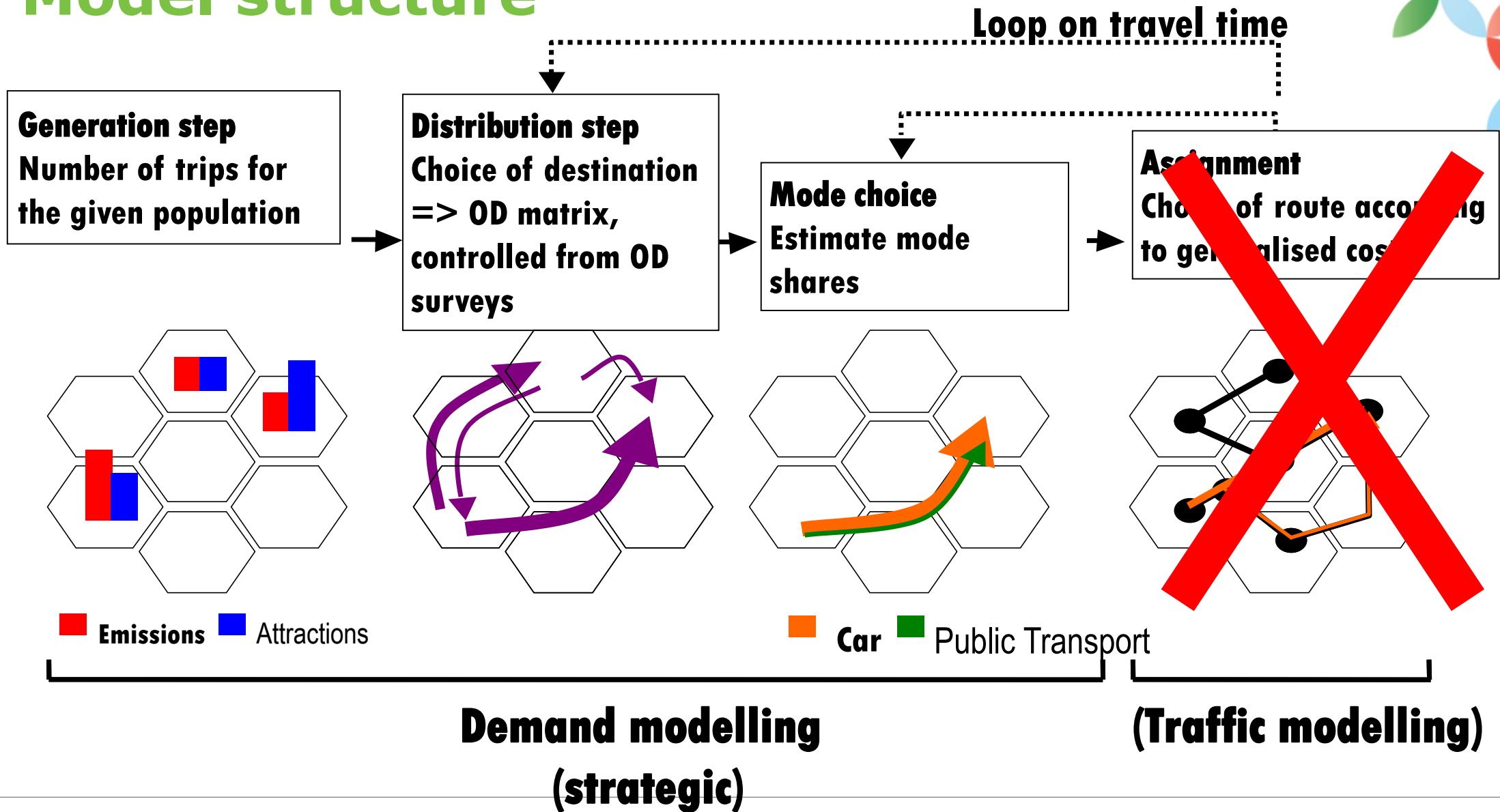


Model Zones (11)

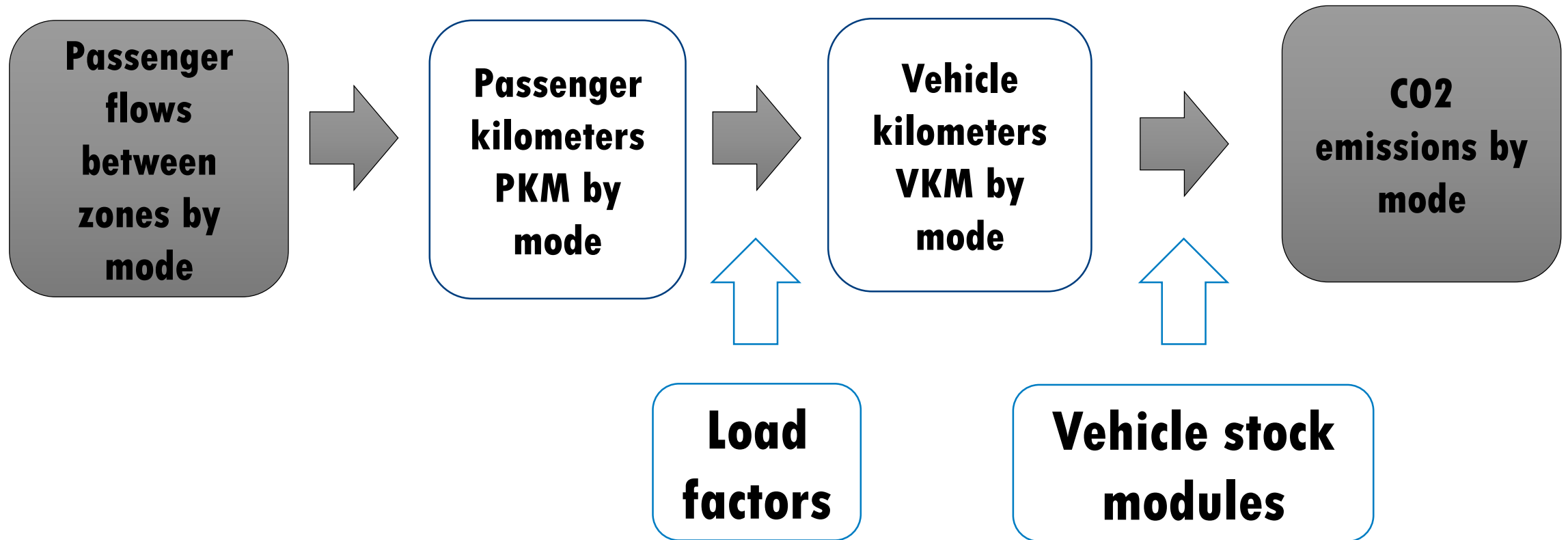
Azerbaijan's Economic Regions

- Models were calibrated on these zones
- Policies will have an effect at this level

Model structure



Step for computing emissions



Scenario definitions

Passenger transport (excluding Baku)



Current policies scenario

Measures	Assumptions
Bus service improvements	Upgrades to urban and interurban lines; happening in 2025
Eco driving	Initiatives taken up in 2025, e.g. driver trainings
New rail line	Extension of the Baku-Ganja high-speed electric train from Ganja to the Georgian border
Update existing rail line	High-speed electric train services between Baku and Naftalan
New motorway developments	Resulting in travel time reductions... <ul style="list-style-type: none"> • by 5% for trips going through Ganja-Gazakh Economic region • by 15% between Baku and Russian border • by 5% within Khachmaz economic region • by 5% within Shamakhy economic region
Alternative fuel vehicles	Private vehicle sales, by 2050 to be: <ul style="list-style-type: none"> •10% fully electric vehicles •40% hybrid vehicles
	Bus vehicle stock, by 2050 to be: <ul style="list-style-type: none"> •13% fully electric •13% CNG/LPG

Scenario definitions

Passenger transport (excluding Baku)



Climate ambition scenario

Measures (in addition to current policies)	Assumptions
Car sharing / load factor increases	Urban trips: +15% from 2030; Intercity trips: +10% from 2030
Fuel price increases	+5% - +10% in each five-year interval from 2025 to 2050
Further new rail lines	New connection between Baku and Karabakh and Eastern Zengezur regions
Further rail improvements	Speed improvements for: <ul style="list-style-type: none"> •Baku<->Balaken and Baku <-> Sumgait from 2030 •Baku <-> Ganza from 2040
	Frequency improvements from 2030 for: <ul style="list-style-type: none"> •Baku <->Balaken •Baku<->Ganza •Baku<->Yalama •Baku<->Shirvan •Baku<->Sumgait
Alternative fuel vehicles	Private vehicle sales, by 2050 to be: <ul style="list-style-type: none"> •87% fully electric vehicles (battery electric or hydrogen) (in line with Sustainable development scenario SDS scenario of the International Energy Agency (IEA) – see slide 12)

3. The Freight visualization tool

Freight transport



The Freight visualisation tool



A **strategic** tool to assess CO₂ mitigation measures for freight transport in Azerbaijan.

Interactive consultation of three pre-set policy scenarios from 2015 to 2050 and estimate transport activity and related emissions

Based on the ITF Global Freight model 2020

Developed via consultations with the Ministry of Transport of Azerbaijan

Scope



The country of Azerbaijan (domestic + international freight)

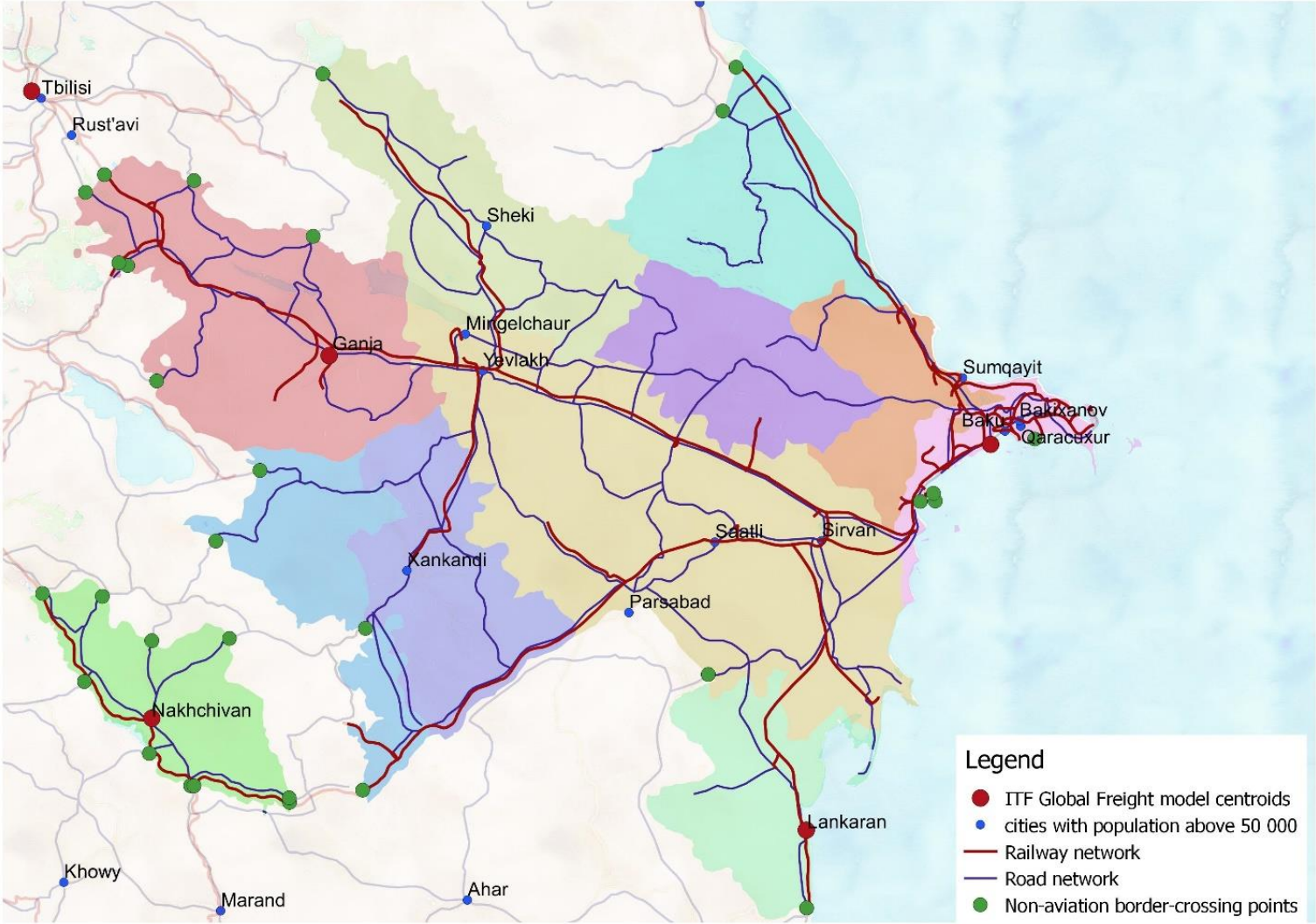
5 modes of transport: Air, Rail, Road, Inland waterways,
Maritime

5 fuel types (gasoline, diesel, electric, methane, H2)

5 years step from 2015 to 2050



Freight network



Scenario definitions

Freight transport



Current policies scenario

Measures	Assumptions
Ship energy efficiency	<p>Aligned with IMO targets based on MARPOL amendments to ensure a:</p> <ul style="list-style-type: none"> •40% reduction of average CO₂ intensity by 2030 for all ship types •70% reduction of average CO₂ intensity by 2030 for all ship types
Railway infrastructure enhancement	Straight-line connections and average operational speed at 140 km/h are used as proxies
Highway infrastructure enhancement	Straight-line connections, four lanes, and an average operational speed of 80 km/h to be used as proxies
ITS Management System and traffic jam prevention	Increase the average speed for road freight transport from 45km/h to 56km/h due to the ITS management system and congestion reduction measures implemented
Stimulus package for clean vehicles	<p>Penetration of electric Heavy, medium and light freight trucks (HFT, MFT, and LFT) are assumed to undertake:</p> <ul style="list-style-type: none"> •1% for HFT, 1.5% for MFT and 2% for LFT of the freight vehicle activities, respectively by 2030 •4% for HFT, 5.5% for MFT and 11.5% for LFT of the freight vehicle activities, respectively by 2050
Eco-driving	Eco-driving to further reduce the average fuel consumption of the truck fleet by 8.5%.

Scenario definitions

Freight transport



Climate ambition scenario (I)

Measures	Assumptions
Distance charges	Charges introduced in 2030 growing to EUR 2.5 cents per tonne-kilometre by 2050
Port fees	Port fees to grow an additional 20% by 2050 decreasing the carbon intensity of shipping by 10%
Carbon pricing	Carbon pricing will vary across regions: USD 300 per tonne of CO ₂ in 2050.
Rail and inland waterway improvements	The penalty for mode transfers at intermodal terminals is decreased and alternative specific constant of rail and inland waterways increases. The rate of change to grow from 0.8% in 2020 to 20% in 2050.
Energy transition for long-haul heavy-duty road freight vehicles	14% of heavy truck tkms are on these systems by 2050. Costs begin higher than conventional fuels but by 2050 become lower. Differences in uptakes and costs by region
Asset sharing and the Physical Internet	4% increase in average loads of road freight by 2020 growing to 10% by 2050
Slow steaming and speed reduction for maritime and trucks	Decrease in the speed of road and maritime transport by 1% in 2020, growing to a 20% decrease by 2050
Fuel economy standards for internal combustion engine (ICE) vehicles and fuel	Carbon intensity per tkm of ICE trucks to reduce by less than 1% in 2020 up to 10% by 2050
Low emission fuel incentives (including electric vehicles) and investment in distribution/supply infrastructure	Increase in low-emission fuel vehicle share to 1.3% by 2025, growing to 10% by 2050
Heavy capacity vehicles (HCV)	5% of non-urban road freight transport activity (tkm) to be done with high capacity vehicles by 2050

Scenario definitions

Freight transport



Climate ambition scenario (II)

Measures	Assumptions
Autonomous vehicles (AVs) and platooning	Up to 15% uptake on non-urban freight by 2050. Uptake on urban freight is lower, at 6%. Decrease of 14% on carbon intensity and 45% on costs.
Electric/alternative fuel vehicle penetration	Follows the IEA SDS Scenario.
Intelligent Transport Systems (ITS) and eco-driving	Reductions of 5% in carbon intensity in 2020, decreasing to 0.1% in 2050.
3D printing	International trade to reduce 10% by 2050. Values differ by commodities; electronic and manufactured goods have higher falls.
Decarbonisation of energy	Yearly decrease of 3.35% for coal and 2.1% for oil. By 2050 coal trade to reduce by 65% and oil close to 50%, compared to 2020 estimates.
E-commerce	Additional demand increase by 15% for urban freight and 6% for non-urban freight by 2050

Thank you for your attention

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