

Integrated Modelling Tool to Evaluate the Transport, Energy and Environmental-related Performance of Low-Carbon Mobility Actions

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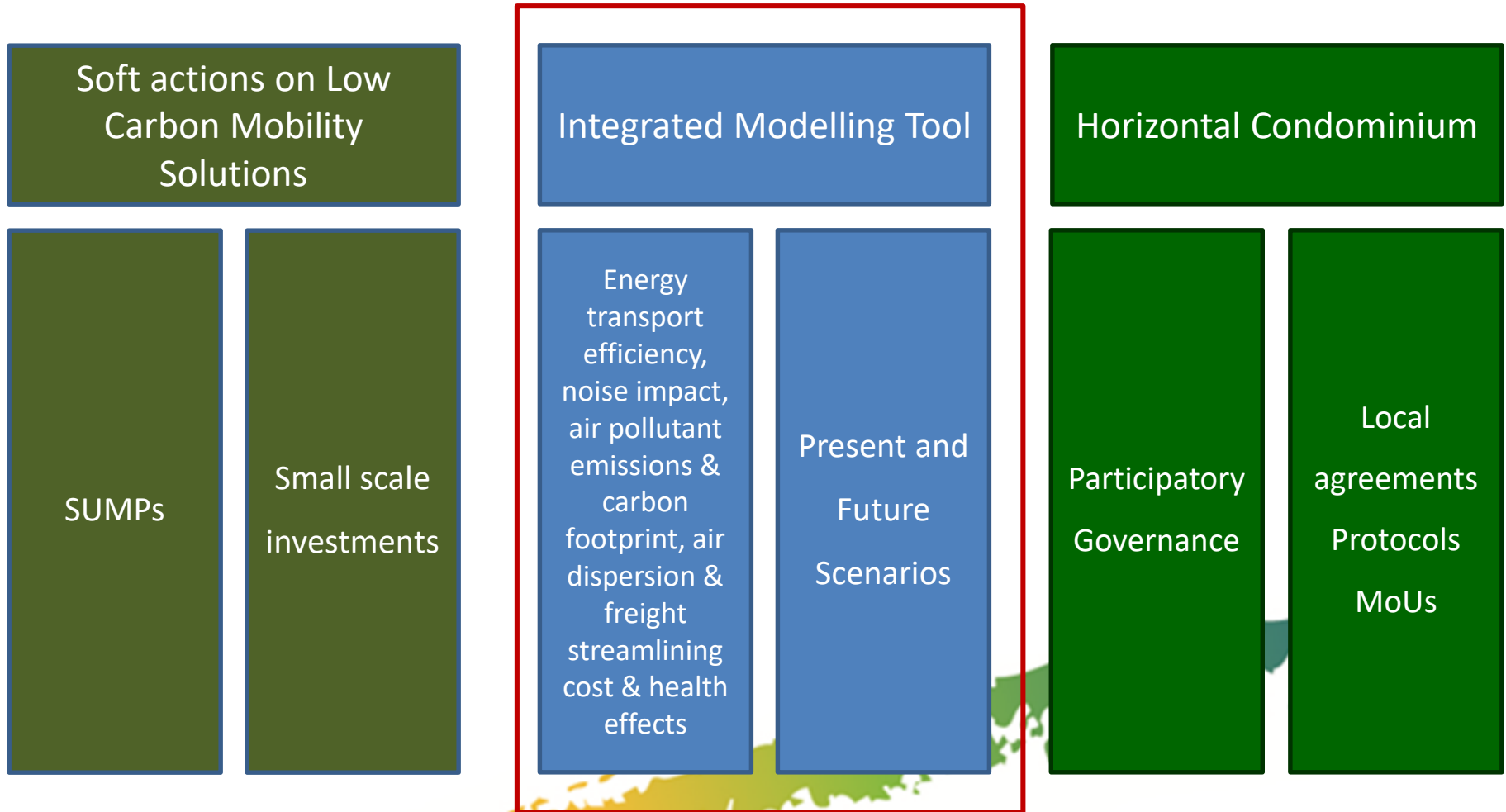
Regional Agency for Environment Protection in Veneto Region

Challenges of REMEDIO



REMEDIO Approach

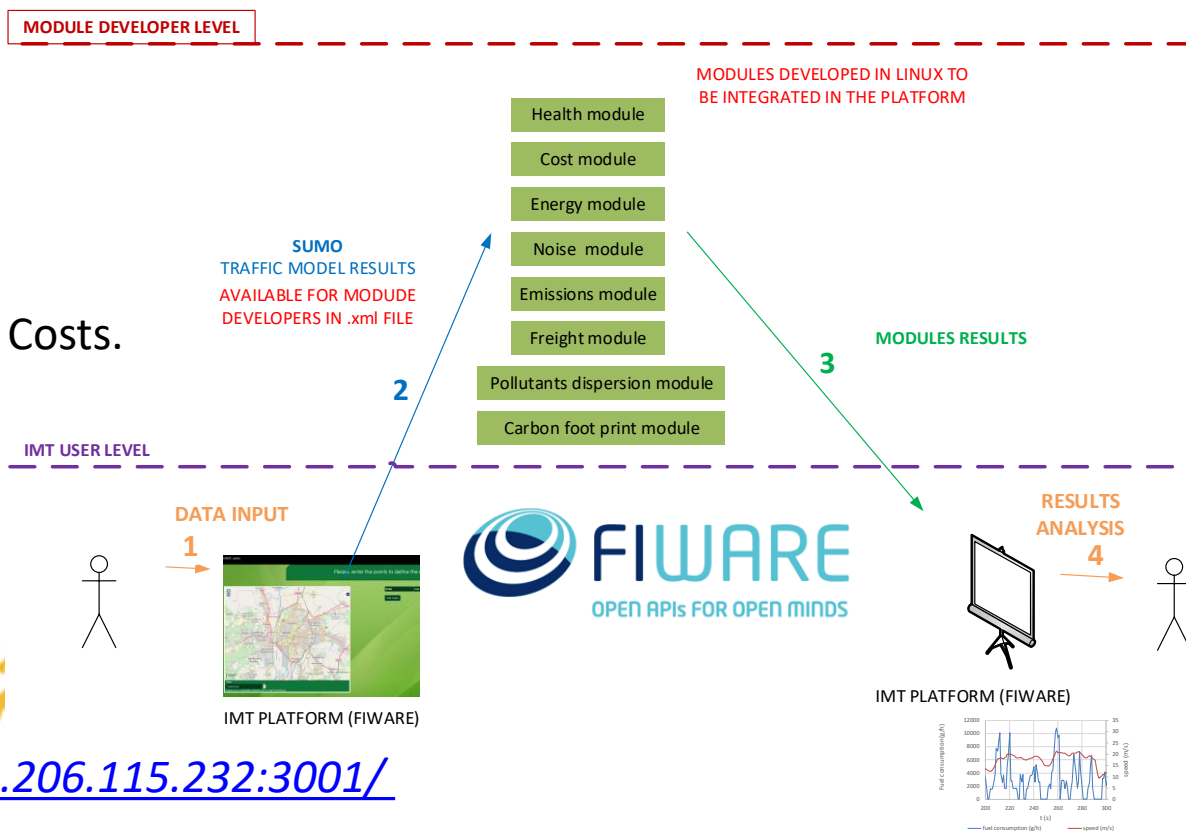
In the general approach of REMEDIO, IMT plays a fundamental role in the decision support system



Integrated Modelling Tool

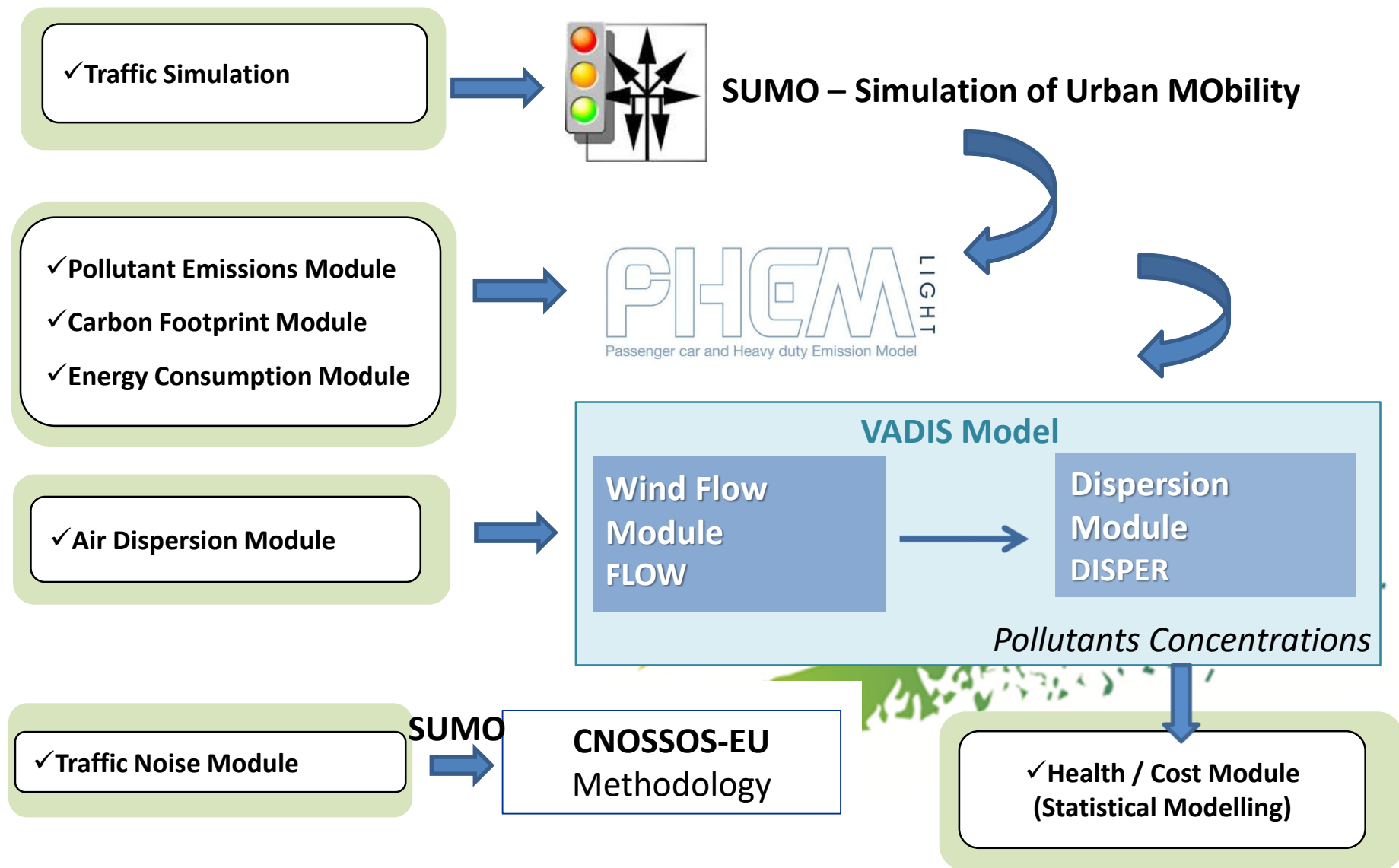
- ✓ Customized modelling tool **to evaluate** at local street level **the environmental-related performance of low-carbon mobility actions.**
- ✓ IMT integrates the following modules for the estimation of traffic related impacts:

- Pollutant emissions
- Carbon footprint
- Atmospheric dispersion
- Energy consumption
- Noise
- Health events and related Costs.

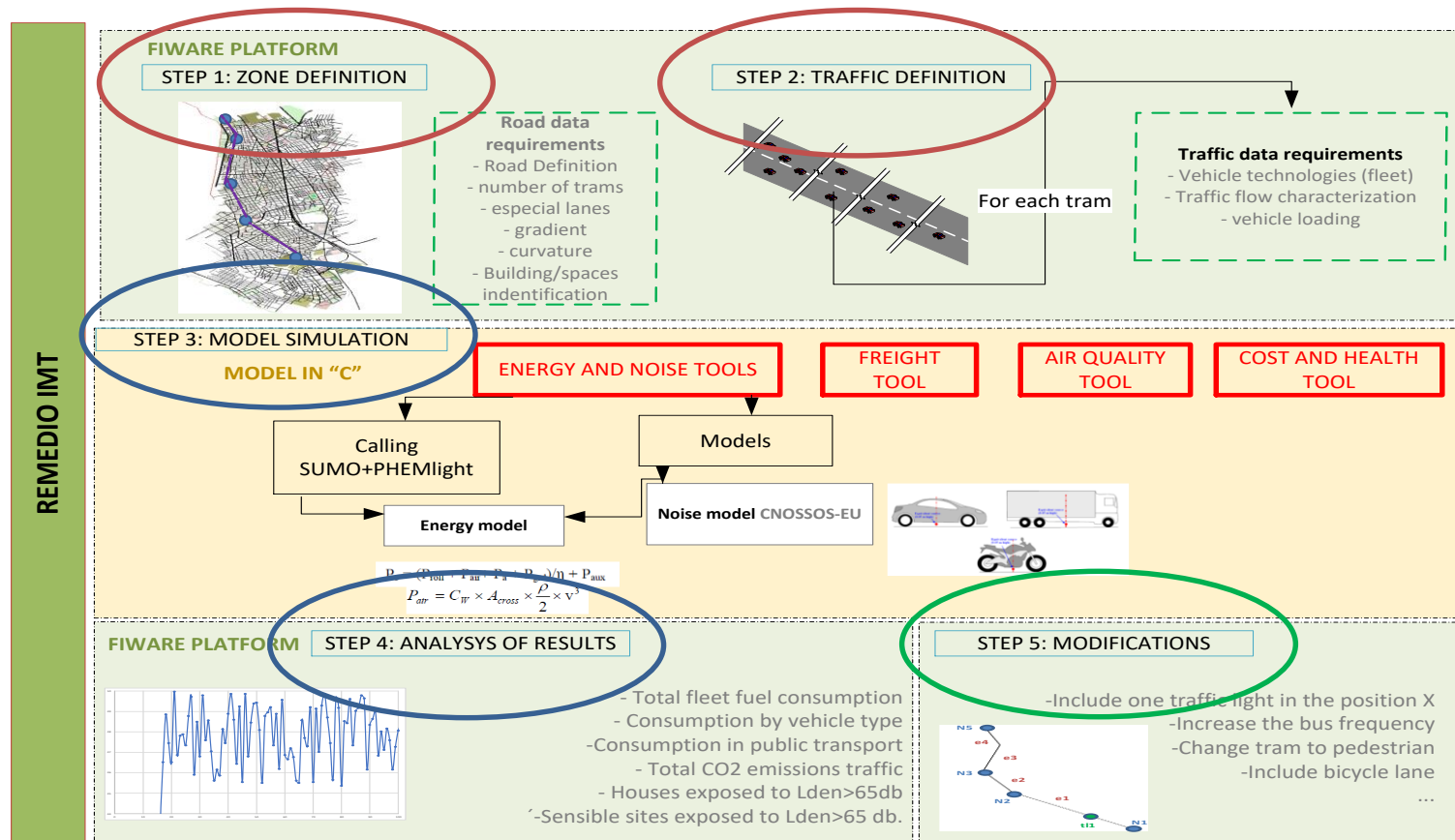


Access through the link <http://130.206.115.232:3001/>

IMT Modules



Conceptual Modelling Approach



Steps 1 and 2:

- ❖ Road description, Traffic data, Buildings dimensions, Meteorology, Air quality data

Steps 3 and 4:

- ❖ Application of modules
- ❖ Raw data, Graphs, Maps
- ❖ Data analysis

Step 5:

- ❖ Traffic scenarios building

IMT Application Exercise

Aim of the First Part of the Hands-on Exercise:

Get acquainted with:

- the **User Interface**
- the **Data Input Process**.

Aim of the Second Part of the Hands-on Exercise:

- Understand better the **Application of Modules**
- Understand better the **Output Results**
- Consider the **IMT Capitalization Perspectives**.



Let's Start!



Did you Run IMT Modules?

Excellent!



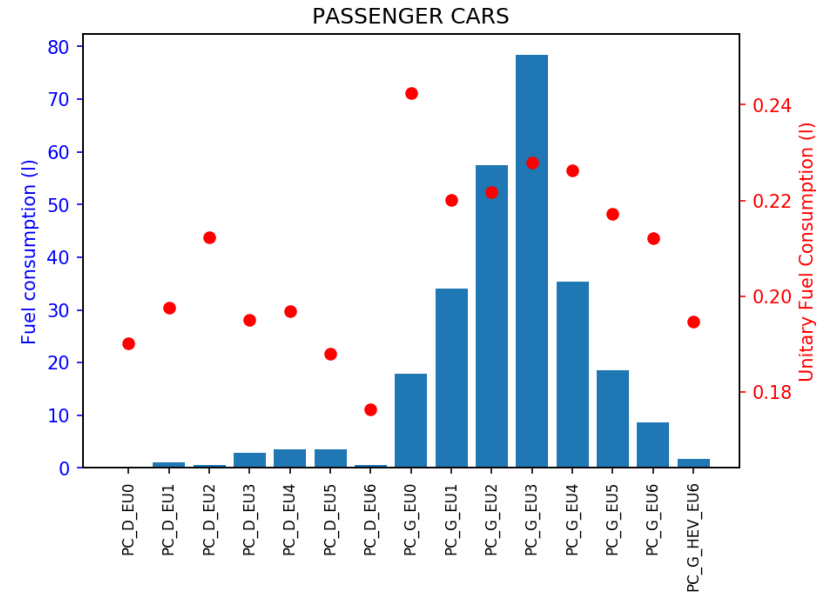
IMT Modules Results:

Exercise Summary

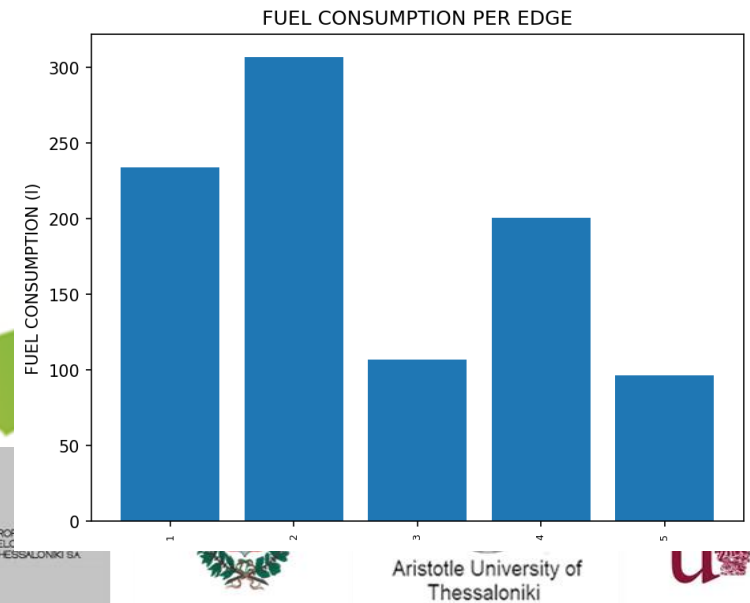


Energy Module

- **Fuel Consumption per vehicle type**
for the whole road axis

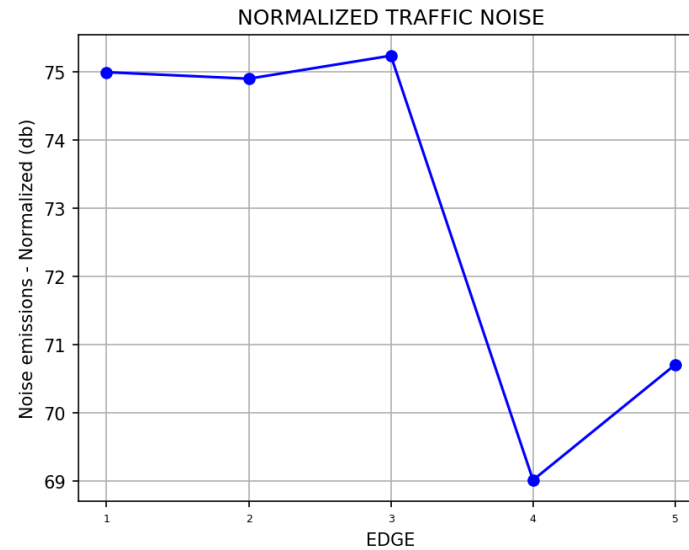
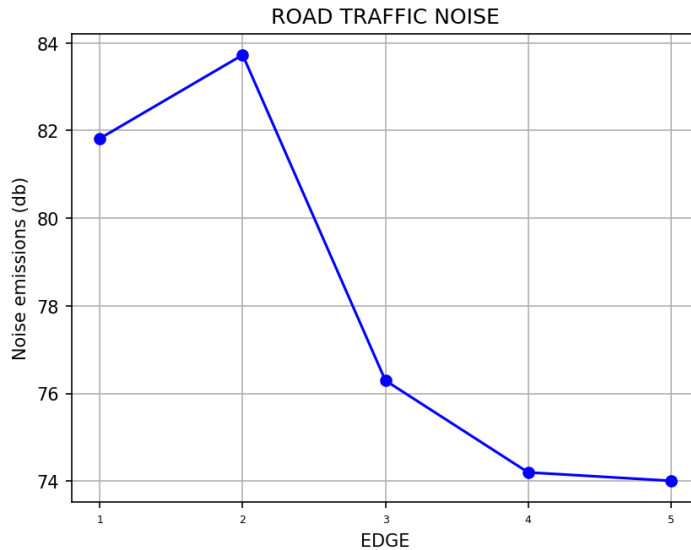


- **Total Fuel Consumption per edge**
(i.e. road segment)

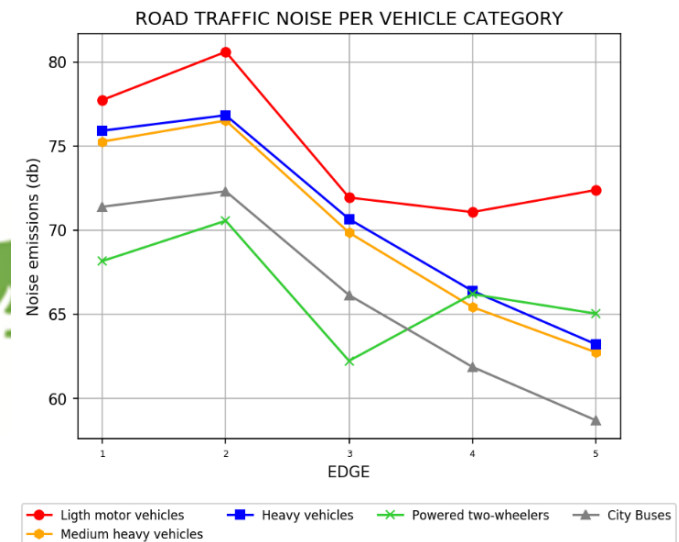


Noise Module

○ Total Noise emissions (absolute and normalized*) per edge



○ Vehicle-type Noise emissions per edge



**Normalized emissions referred to noise values per 100 meters of road length*

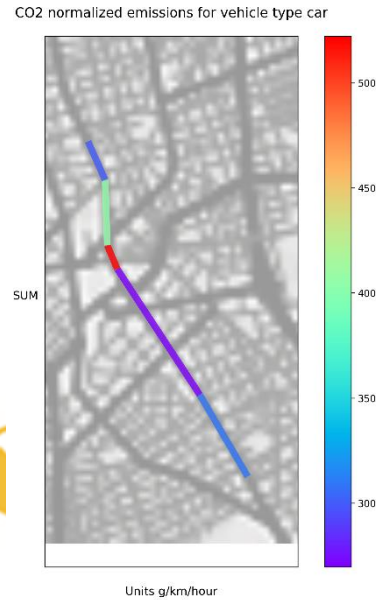
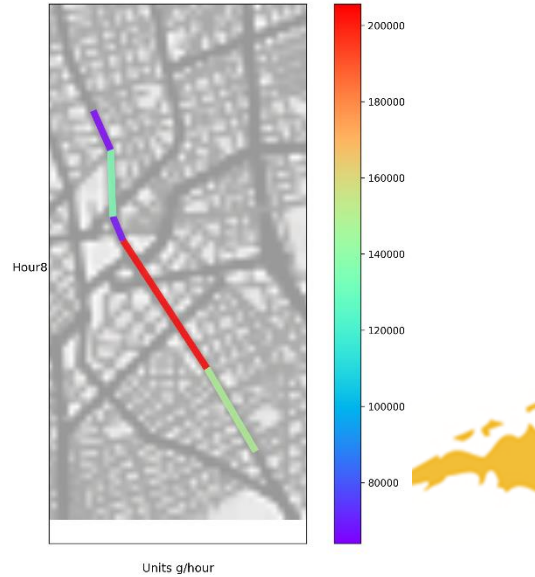
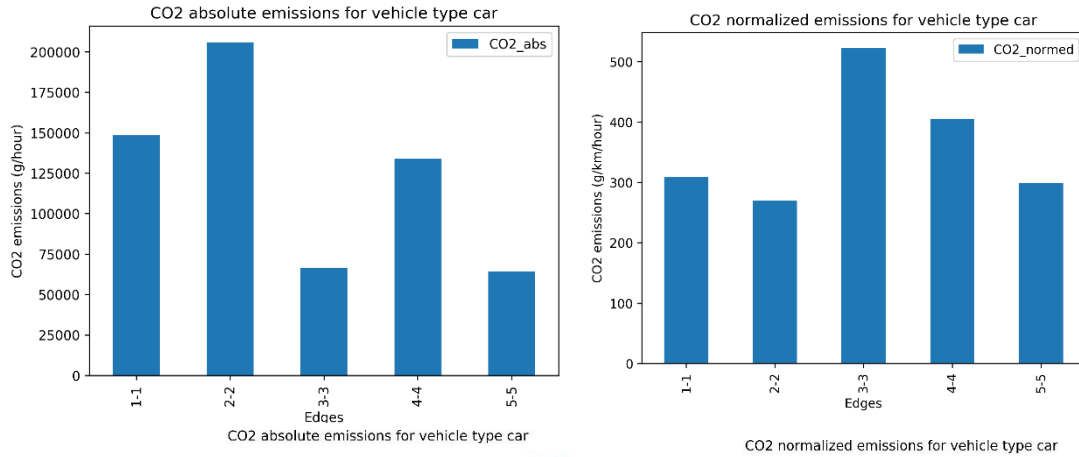
Emissions Module (including Carbon Footprint)

❖ Plots → Graphs and Maps for:

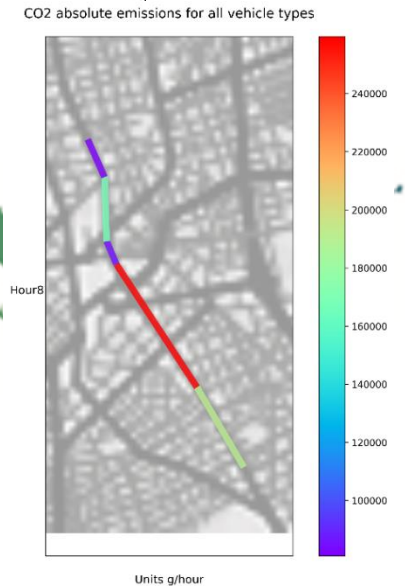
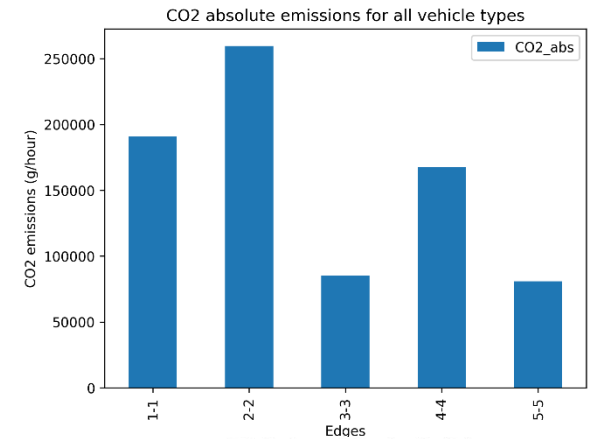
- Pollutants : CO, NO_x, HC, PM_x and carbon footprint (CO₂)
- Vehicle Type : Car, Moto, Trailer, Truck, Bus, Delivery (LCV) , Coach or all vehicle types (i.e. Total)
- Type of Data: Absolute or Normalized (per km) emissions
- Temporal Analysis: Hourly or Daily
- Spatial Analysis: Per edge or the whole road axis.

Spatially Distributed Emissions

CO₂ emissions from Passenger Cars



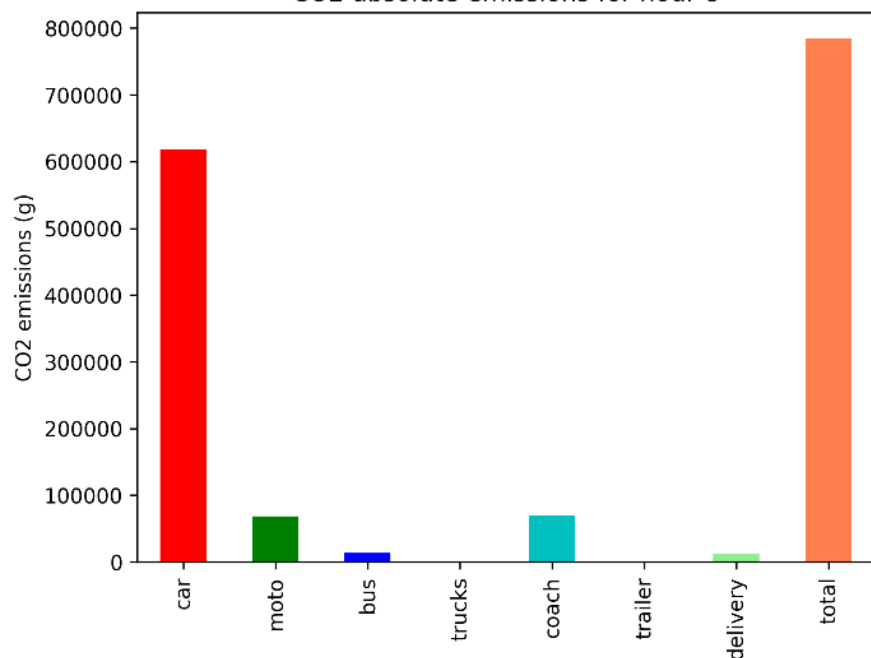
Total CO₂ emissions (all vehicle types)



Emissions per Vehicle Type and Category

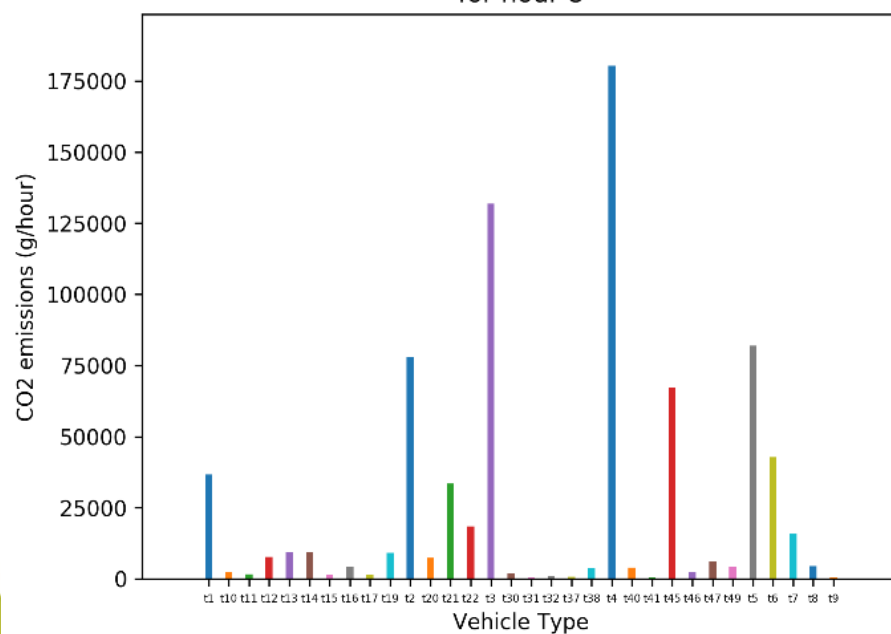
CO₂ emissions per vehicle type in the whole road axis

CO₂ absolute emissions for hour 8



CO₂ emissions per vehicle category (EURO standards, fuel) in the whole road axis

Hourly emissions by pollutant and vehicle type
for hour 8



Vehicle Types

IMT Additional Results:

Dispersion Module

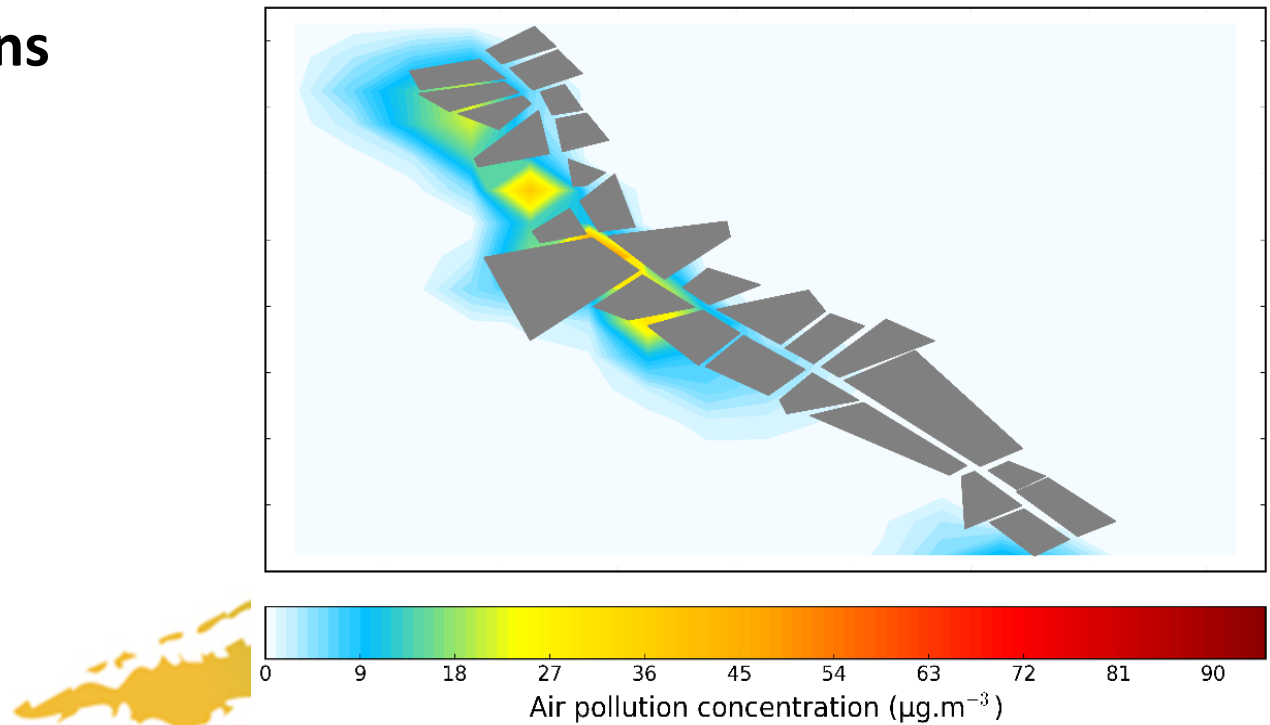


Dispersion Module

- **Air pollutant concentrations**
(CO, NO_x, HC, PM_x)

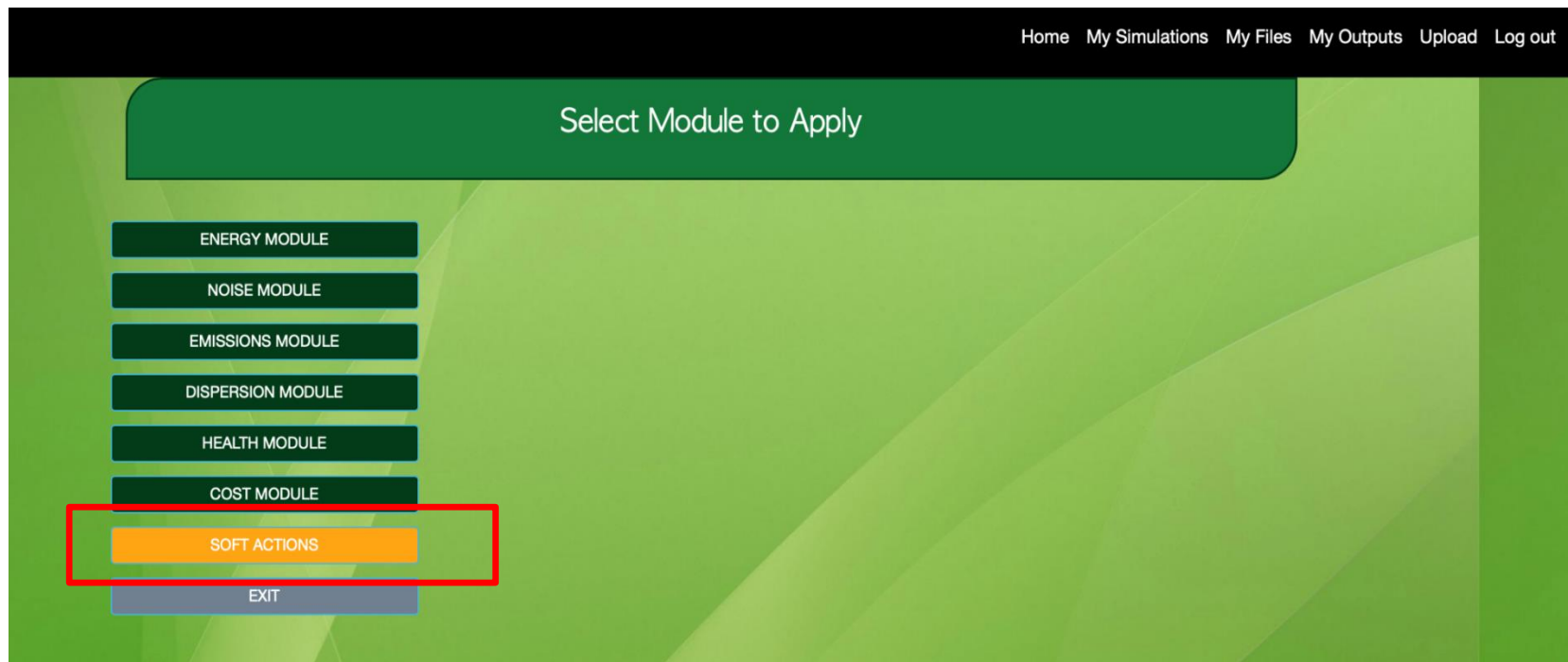
- **CO₂ concentrations**

Example of mapping PM_x concentrations

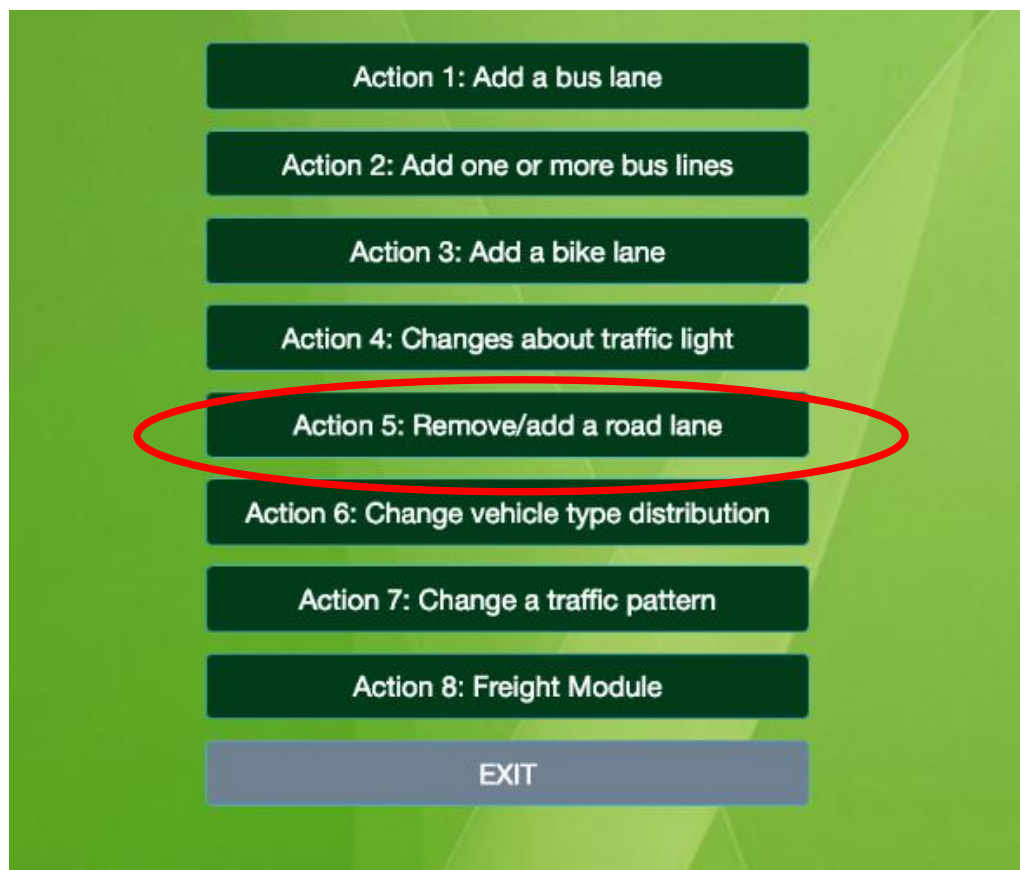


IMT Soft Actions:

Mobility Scenarios Building



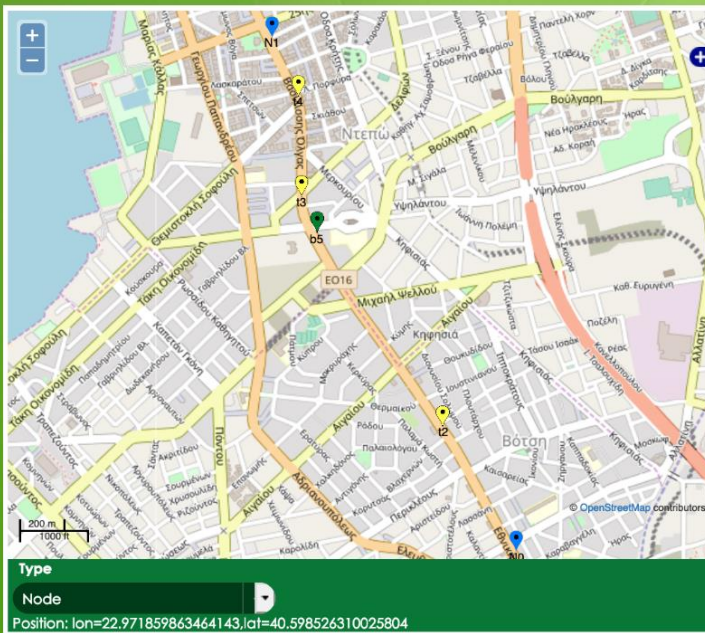
8 Different Soft Actions to be Selected



Example: Add a Road Lane (Action 5)

- In the first step no changes are needed (as in the Base Case)

Action 5: Remove/add a road lane: Please, complete the info



Node	Lon	Lat	Remove
N0	22.96458	40.58366	remove 0
t2	22.961697	40.587394	remove 1
b5	22.95674	40.59314	remove 2
t3	22.95614	40.59422	remove 3
t4	22.95601	40.59721	remove 4
N1	22.95498	40.59897	remove 5
N6	22.97628014392053	40.591676569577885	remove 6

Add by coords

Bus Line	Bus Stop number	Freq pass(min)	Stop time(s)	Remove
2	b5	10	30	remove 0

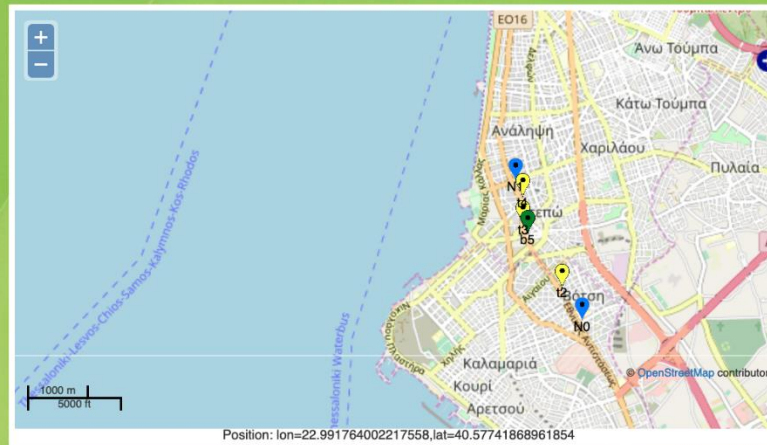
new info

Continue

Example: Add a Road Lane (Action 5)

- In the second step, increase the number of car lanes to 4

Soft Actions Step 2: Please, complete the edges info



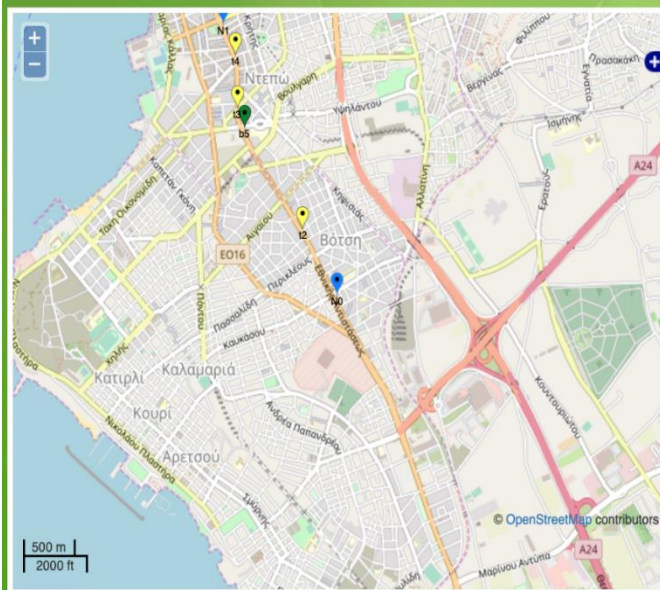
Edge Id	From	To	Length (km)	Two Ways (y/n)	Car Lanes/way	Bus Lane Position	Bike lane Position	Slope (%)	Road surface
1	N0	t2	0.481	<input type="text" value="n"/>	4	0	-	0	Average <input type="text" value="0"/>
2	t2	b5	0.764	<input type="text" value="n"/>	4	0	-	0	Average <input type="text" value="0"/>
3	b5	t3	0.13	<input type="text" value="n"/>	4	0	-	0	Average <input type="text" value="0"/>
4	t3	t4	0.332	<input type="text" value="n"/>	4	0	-	0	Average <input type="text" value="0"/>
5	t4	N1	0.214	<input type="text" value="n"/>	4	0	-	0	Average <input type="text" value="0"/>

Continue

Example: Add a Road Lane (Action 5)

- Step 3 : Insert the same traffic data as for the Base Case

STEP9: Please, complete the traffic information



Select data
Greece

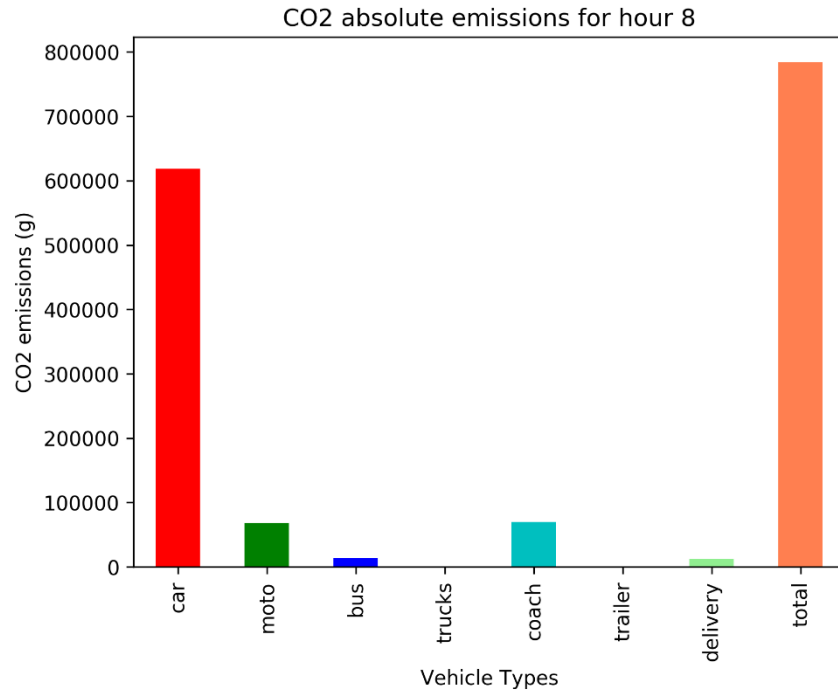
Total Vehicles	Direct						Apply for all
Edge	From/To	Passengers	Motorcycles	Trucks	Trailers	LCV	Coaches
1	N0/t2	1190	135	0	0	27	17
2	t2/b5	1190	135	0	0	27	17
3	b5/t3	1190	135	0	0	27	17
4	t3/t4	1190	135	0	0	27	17
5	t4/N1	1190	135	0	0	27	17

Vehicle type	Fuel type	Group	Probability	Remove
Passenger	Gasoline	PC_G_EU0	0.0548	remove0
Passenger	Gasoline	PC_G_EU1	0.1327	remove1
Passenger	Gasoline	PC_G_EU2	0.2322	remove2
Passenger	Gasoline	PC_G_EU3	0.2843	remove3
Passenger	Gasoline	PC_G_EU4	0.1367	remove4
Passenger	Gasoline	PC_G_EU5	0.0717	remove5
Passenger	Gasoline	PC_G_EU6	0.0200	remove6
Passenger	Gasoline	PC_G_EU6	0.0038	remove7
Passenger	Diesel	PC_D_EU0	0.0003	remove8
Passenger	Diesel	PC_D_EU1	0.0045	remove9
Passenger	Diesel	PC_D_EU2	0.0040	remove10
Passenger	Diesel	PC_D_EU3	0.0122	remove11
Passenger	Diesel	PC_D_EU4	0.0139	remove12
Passenger	Diesel	PC_D_EU5	0.0125	remove13

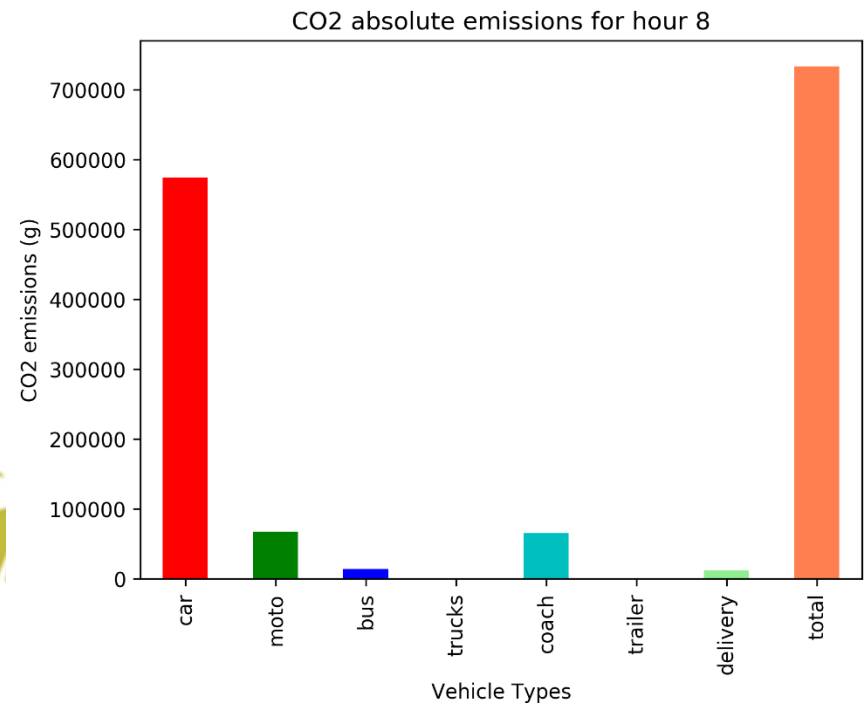
! Run the IMT again for selected modules!

Example: Add a Road Lane (Action 5)

Results for the Emissions Module



BEFORE: Base Case



AFTER:



Increased Road Lanes
(from 3 to 4)

Questions? →

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