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# Integrated Modelling Tool for the Analysis of Traffic-Congested Roads in Urban Centers

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## 1. Research aim

The REMEDIO project, co-funded by the Interreg Med Programme, aims to develop an **Integrated Modelling Tool (IMT)** to analyse the current traffic situation and possible soft actions to reduce congestion for a transition to low-carbon mobility. The IMT is composed by 8 individual modules that cover the main impacts of traffic on the city and its inhabitants, namely, **energy efficiency, noise, atmospheric pollutant emissions and carbon footprint, air pollution dispersion, freight streamlining, cost and health impacts**.

## 2. IMT modelling

User can simulate with each one of the IMT individual modules the main effects caused by traffic in congested-road from **a common platform**, within a step by step process divided in 5 steps:

- **Steps 1-2**: Zone and traffic definition.
- **Step 3:** Traffic calculations using the open-source software SUMO (Simulation of Urban MObility).
- **Step 4**: Execution of each one of the IMT modules with results presented as graphics, figures or tables.
- **Step 5:** Simulation of new traffic conditions because of mobility soft actions implementation to compare different mobility solutions to reduce the impact of traffic.

## 3. IMT platform

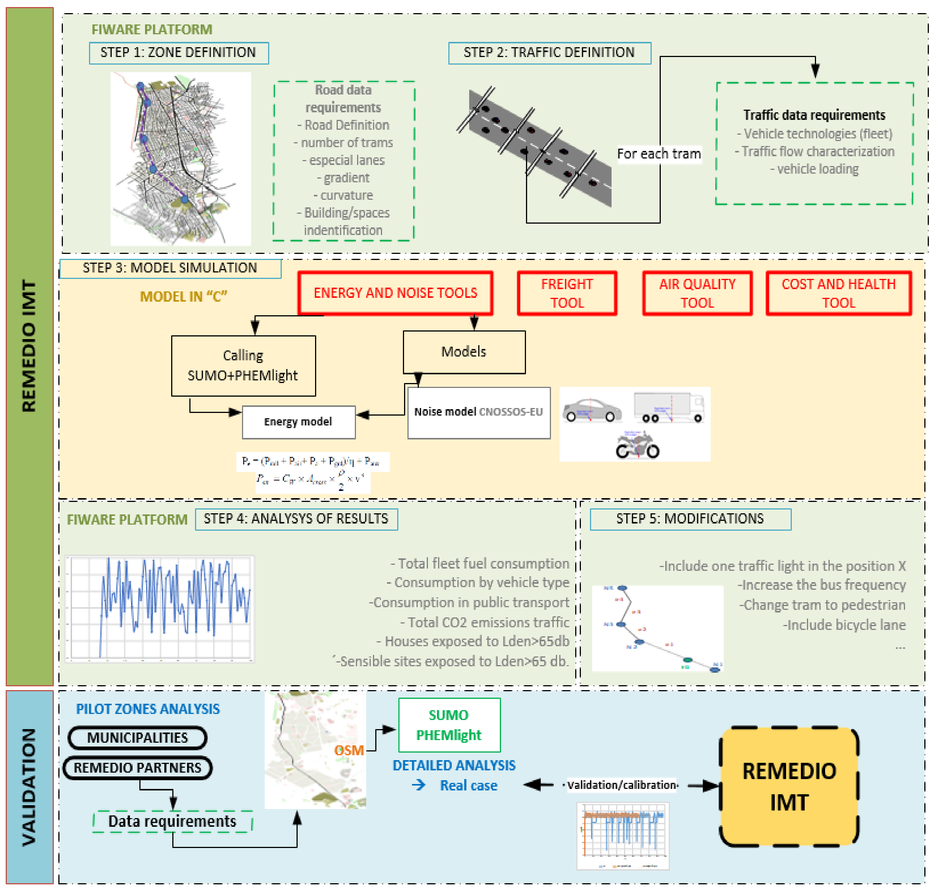
IMT has been developed as a web application based on an **architectural pattern** known as **Model-View-Controller** (MVC) that divides an application into three interconnected parts:

- **Model**: Contains a representation of data managed by the system. Responsible for managing the data of the application.
- **Views**: Components that display the application's user interface. Responsible for displaying information. It is the user's way of interacting with the platform.
- **Controller:** Components that handle user interaction. It does the operations over the models to deliver the results of the query to the user.

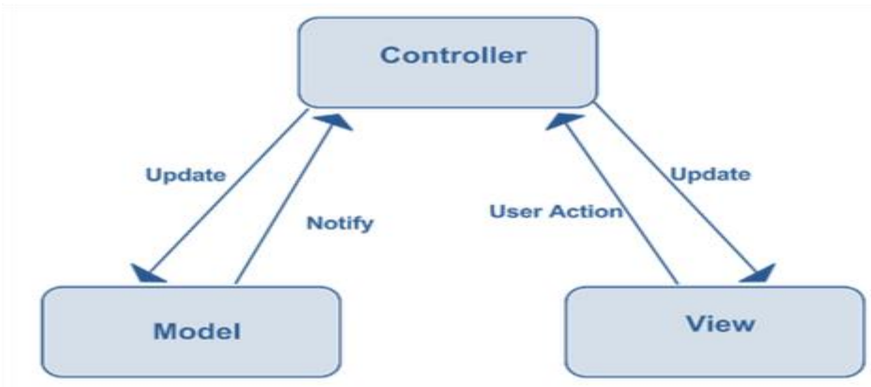
## 4. IMT modules

- **Energy:** fuel consumption caused by traffic.
- **Noise:** based on CNOSSOS EU methodology.
- **Atmospheric pollutant emissions / Carbon footprint:** based on PHEMlight emission model.
- **Air pollution dispersion:** dispersion of pollutants with the VADIS model on the basis of traffic and emission estimations of the previous modules of IMT.
- **Freight streamlining:** impacts in terms of number and type of vehicles for specific scenarios regarding freight deliveries.
- **Health**: health events related to cardiac, respiratory and cerebrovascular diseases due to short-term exposure to concentrations of $PM_{2.5}$, $PM_{10}$, $NO_2$, and $O_3$.
- **Cost:** costs for each health outcome: hospitalizations for cardiac diseases and hospitalizations for respiratory diseases.

**Overall conceptual modelling approach**




**MVC pattern diagram**




**IMT module outputs**