ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Disal

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Generating Air Pollution Maps in Lausanne Using the OpenSense Fine Particle Network Data

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The goal of this project was to produce a pollution map of LDSA (lung deposited surface area) over the Lausanne region using the OpenSense's 2014 data. Similar projects have been done in past years (see students' project DISAL-SP63), but this was the first time that land-use data was used as a predictor for the modeling of air pollution.

The OpenSense project consist of a deployment of 10 buses equipped with mobile sensors to monitor the air quality in the Lausanne region. The resulting data has a high and not fixed temporal and spatial variability.

In order to achieve the main goal of the project, the project was divided in 2 main sub-tasks:

1) Land-use data processing.
2) Modeling of the LDSA concentration.

As it was mentioned before, this is the first time that land-use data was used for the modeling, so the data had to be gathered and processed to be used in the modeling of air pollution. Different predictors were studied and included. The main sources of land-use data were:

1) SwissTopo, which provided the altitude measurements of the Lausanne region and from which the slope of the terrain was derived.
2) GeoSTAT, which consisted of a variety of geo-statistics such as building, population and industry density.
3) TRANSITEC S.A., responsible of the Lausanne's 2010 traffic density count (2015's data was not yet available).

Once these land-use data was adequately processed, the proper modeling of the LDSA concentration was performed. For doing so, this project focused on a log-linear regression model as can be seen in the equation below:

$$\log_{10} LDSA = a_0 + a_1 \log P_1 + \cdots$$

The -use data of the first part of the project and also form the NABEL and the Pully meteorological station in Lausanne which provided air quality measurements and meteorological measurements, respectively.

Different models were produced for the prediction of LDSA concentration at different time resolutions and for the whole Lausanne region. The time resolutions ranged from year-quarter (3-mont period), to daily values. The resulting models showed a decreasing fitness of predicted log (LDSA) concentration with increasing time resolution. See figure below: