unisanté EPFL

Section Sciences et Ingénierie de l'environnement
Design Project 2023 (semestre de printemps)

Proposition n°7

Investigating the History of Dioxins Pollution in Lausanne

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Descriptif du projet
(Merci d'indiquer le contexte de l'étude, le domaine de recherche à mettre en œuvre et une description générale des attentes ; max ½ page)

The recent episode of dioxin soil contamination in Lausanne reveals that many past and present industrial pollution are still unknown while continuing to exert their harmful effects in the general population. Based on this local and current case, this project aims to develop an approach to reconstruct the history of this industrial pollution, with the goal of enhancing its public health monitoring. More specifically, an analysis of the soil measurements in Lausanne areas will be carried in support with a review of the literature in environmental chemistry. This approach will determine the characteristics of the soil contamination in Lausanne in comparison to other polluted sites worldwide. The research will focus specifically on the level of contamination, the profile of dioxin congeners, their half-lives in soil, the meteorology, and the topography of the city. All these parameters could be modeled to develop potential scenarios to explain the current dioxin congener profile. In addition, a principal component analysis (PCA) might be carried out to verify the presence of clusters among the 17-dioxin congeners quantified in the soil samples. This information will determine the extent of the past pollution and its possible causes (nature of the waste burned, combustion technology).

Objectif et buts
(Décrire 1 objectif général et 3-4 buts réalistes)

The main objective is to develop an approach to reconstruct the history of this industrial pollution. The specific goals will be to:

- Determine and obtain the requested parameters to develop historical scenarios explaining the current dioxin profile using modeling;
- Analyze and interpret the soil measurements and the dioxin profile in comparison with other contaminated soil worldwide in term of environmental and health impacts;
- Identify and analyze potential clusters among the 17-dioxin congeners quantified in soil samples using PCA or other (geo)statistical methods.

Descriptif tâches
(Décrire 3 à 4 étapes de la démarche de projet en spécifiant s'il y a une partie expérimentale - terrain, mesures, prototypage)

The project may be divided into different steps:

1) A literature review in environmental chemistry to determine the characteristics of the soil contamination in Lausanne (hall-life of each dioxin congeners in soil, data from other contaminated soils, etc.)
2) A development of historical scenarios based on modeling
3) An investigation of potential dioxin congener cluster using PCA and GIS.
4) A literature review to interpret the results.

Divers
The project will use data from the Canton of Vaud, and will probably request some discussions with the Direction Générale de l'Environnement (DGE) of Canton of Vaud. It is also a collaboration between different departments of EPFL and University of Lausanne.