Laboratory DEEP – Wastes Water Environment Pollutions

DEEP conducts multidisciplinary research in environmental engineering, from pilot scale laboratory experiments to long term monitoring of full scale urban and industrial sites. Knowledge, methods, processes and models developed by the laboratory result in concrete actions aiming to protect or restore the environment, in two fields of application: 1) urban water and hydrosystems, 2) solid wastes, contaminated sediments and soils.

General approach and research themes

DEEP undertakes research in a range of engineering sciences, dealing with concrete environmental issues across urban and industrial environments. Mobilizing multidisciplinary skills within DEEP leads to knowledge, methods and tools for efficient action to protect the environment, aiming for example to protect or restore ecological health for a given environment (preventive and/or curative actions) or to develop ecotechnological processes. Our approach is based on a dynamic balance between the overall study of integrated systems and understanding their basic processes; as well as their linkages at different time and space scales.

DEEP works principally in two fields of application :
1) water and urban hydrosystems (EHU),
2) solid wastes, contaminated sediments and soils (DSS).

Three complementary lines of research are developed for these two areas of application, by combining experiments and observation on the one hand, and modelling on the other hand.

Knowledge of emissions and transfers of pollutants (C).
Research aims to identify pollutants sources, to characterise pollutants (particulate, dissolved and gaseous phases), to determine and quantify their emissions, transfers (concentrations and loads) and physical, chemical and biological transformational processes in both industrial and urban systems. In many cases, modelling tools are developed (emissions, transfers and processes) in order to structure knowledge and to deliver operational tools.

- The nature (physical and chemical characterisation), sources, concentrations and loads of both particulate and dissolved pollutants in urban hydrosystems, mainly wastewater and stormwater.
- Physical, chemical and biological processes within urban hydrosystems (solid transport, emissions, multiphase flow of gases and odours).
- Characterisation of solid wastes, contaminated soils and sediments.
- Characterisation of biogas.

Physical, chemical and biological processes for treatment and reuse/recovery (P)
Research aims to develop, characterise, improve and evaluate processes and technologies for treatment and reuse/recovery of wastes and pollutants from industrial and urban environments, from laboratory pilot scale experiments to full size facilities or systems.

- Treatment and reuse/recovery of organic wastes (recovery of matter and energy: pre-treatment, composting, methanisation, gasification).

- Treatment and reuse/recovery of biogas resulting from degradation of organic matter (methanisation or wastes storage facilities).
- Treatment and reuse/recovery of mineral wastes, bioremediation of metallic and organic contamination.
- Treatment and use of urban stormwater (settling and infiltration of surface runoff, vegetated roofs, alternatives techniques (i.e. BMPs) for stormwater source control and use…).

Methods for environmental and performance assessment (M).
Research aims to develop and/or adapt methods and evaluation tools (performance indicators, product behaviour analysis for their eco-conception), and decision support (multicriteria analysis) applied to the two fields of application of DEEP.
- Asset management of urban sewer systems.
- Multicriteria and performance analysis of alternatives techniques (i.e. BMPs) for stormwater management.
- Evaluation of resource management, of solid wastes, contaminated soils and sediments.

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