



Aims & Objectives

➔ LGEI is one of three laboratories at the École des Mines d'Alès.

The lab carries out multidisciplinary research, focusing on water resources quality analysis (detection and measurement of physico-chemical parameters and biological indicators), integrated environmental management of resources in a region, industrial park or at an industrial site (pollutant, matter and product flows), and risk management and mitigation (hazard, impact and vulnerability analysis).

LGEI's work encompasses a number of connected disciplines such as process engineering, metrology, molecular biology, hydrology, geostatistics, modelling, and decision-making support tools.



RESEARCH TEAMS  
INVOLVED INTO IM2E

Team:

*Water. Anthropogenic Systems and Hydrosystems (ESAH)*

Description:

The ESAH team's work focuses on the linkage between continental waters and societal development. It looks at the importance of water resources to human societies, with a particular emphasis on anthropogenic systems and hydrosystems.

The team seeks to develop a more effective, integrated approach to water management, both now and in the future. Through its multidisciplinary research, it develops measurement, modelling and management methods that seek to reduce/mitigate the impact of human activities, focusing on both upstream processes (modelling and biological control) and downstream actions (water treatment and wastewater reuse at regional scale, i.e. industrial ecology).

Its work involves four main methodological fields: measurement for diagnosis, modelling, treatment, and resource management.

The team's core areas of research interest are as follows:

- physical-chemical properties of continental waters (persistent organic pollutants, biological contaminants).
- hydrosystems modelling (neural network models).
- karst and fractured-rock systems.
- industrial and territorial ecology and analysis of the environmental impact of human activities (including mining).

Responsible :

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The main IM2E disciplines and challenges covered by LGEI's work are as follows:

Disciplines

1. Hydrosystems: movements and resources.
2. Metrology and innovative treatment processes.
3. Contaminant processes and aquatic system responses

Challenges

1. Water resources and foresight studies
2. Water preservation, savings and reuse through technological innovation
3. Risks, contaminants and health

Linkage with IM2E research fields and emerging issues



Study areas

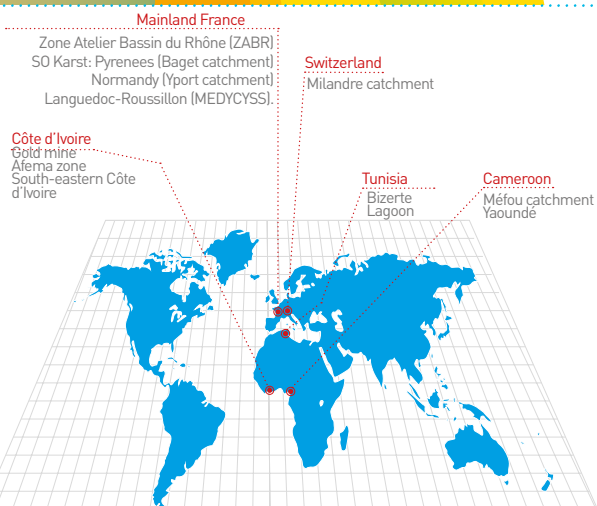


Photo : Diagnostic de la présence de produits phytosanitaires (BV Méfou, Cameroun)



## highlights:

### Scientific and/or technical

#### ● Thesis topic:

Flash flood forecasting through statistical learning: application to ungauged catchments.

PhD. Adrien COUTOIS

#### ● Thesis topic:

Identification of pesticide and drug residue risks to urban populations: study of the interactions between run-off and chemical contaminants in the Méfou hydrosystem, Cameroon.

PhD. Perrine BRANCHET

#### ● Thesis topic:

Water footprint and life-cycle analysis of water consumption impacts: development of water quality indicator(s). This is an ELSA-Pact industrial chair thesis.

PhD. Charlotte PRADINAUD

#### ● Thesis topic:

Treated wastewater reuse: guaranteeing adequate biological quality.

PhD. Erwan CARRE

#### ● Thesis topic:

Development of an effective method for managing the environmental impact of mining activities in the Bandama catchment, Côte d'Ivoire.

PhD. Kouadio Assemien F. YAO

## Platforms and Equipments

LGEI has access to a range of laboratory equipment (HPLC/MS/MS, GC/MS/MS, pyrolysis/GC/MS, ion chromatography, ICP, ASE, etc.) and two test facilities where it can carry out semi-industrial pilot experiments (600 m<sup>2</sup> and 300 m<sup>2</sup>). It also has a crisis simulation room where it conducts so-called "serious games" (floods, post-industrial accident pollution, etc.) and a fully equipped experimental site (Tourgueil). In addition, LGEI enjoys shared access to all laboratory facilities (analytical chemistry, biology P2).

The lab hosts entrepreneurs via the EMA incubator, focusing on innovative topics such as neurotoxin (mainly pesticides) detection tools and modular wastewater treatment systems..

## LGEI Keywords

Biosensors

Modelling

Neural networks

Pesticides

Karst Hydrosystems

Sustainable mining

Industrial ecology



## Academic and industrial partners

### France

- Competitiveness clusters: Pôle EAU and SAFE cluster
- Terinov: board member and website coordinator
- Institut de l'Économie Circulaire
- Institut Mines-Télécom, "ICT and environment" thematic network
- CEA Grenoble (LETI)
- Institute of Molecular and Cellular Biochemistry and Biophysics, UMR 8619, Orsay
- SCHAPI
- ESPCI ParisTech
- University of Rouen (LM2C2)
- University of Technology of Troyes (CREIDD)

### Europe

- Public University of Navarre (Spain)
- Linköping University (Sweden)
- Autonomous University of Barcelona (Spain)
- University of Aveiro (Portugal)
- University of Surrey (UK)

### International

- Texas A&M University (United States)
- University of San José (Costa Rica)
- University Félix Houphouët-Boigny (Côte d'Ivoire)
- University of Bizerte (Tunisia)
- Swiss Institute for Speleology and Karst Studies (SISKA) (Switzerland)
- School of Higher Technology, Experimental Station of Pilot Processes in Environment, Montreal (Canada)



## Examples of partnership projects

### ANR COMBITOX project

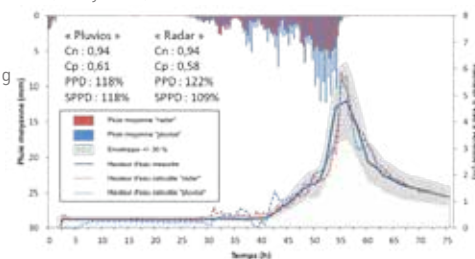
*Development of a biological system for continuous, multi-parametric measurement of toxic compounds.*

> Research supported by the Languedoc-Roussillon Regional Council through the "future researcher prize" awarded to Ingrid Bazin (2014).

### ANR FLASH project

> Flash flood forecasting through statistical learning (application to the Gard, Cèze and Somme catchments). Coordinated by LGEI and partners (ESPCI ParisTech, Edytem, SCHAPI).

Two-hour forecast of water levels in Anduze during the September 2000 event, using radar and rain gauge data (Master 2 placement, Yann Visserot).



### Métropole Aix-Marseille-Provence project

> Regional modelling to support local development planning. Demonstration of the circular economy in practice; stakeholder representations of the region and matter and energy flow analysis.

LGEI (Laboratory of Industrial Environmental Engineering)

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