

# Research Institute of Life, Earth & Environment (ILEE)

The Research Institute of Life, Earth & Environment investigates the mechanisms of Life on Earth and the interactions with the Environment.

Life is in constant evolution. The environment is changing rapidly. Societal challenges arise and require a strong involvement of scientists. At ILEE, the researchers explore the evolution of organisms, human populations, natural- and agro-ecosystems. The objectives include:



- Understanding the fundamental biological processes regulating life on earth.
- Characterising anthropogenic pressures on the environment, including historical and socio-economic aspects.
- Developing sustainable alternatives to manage natural resources, reduce pollution, conserve and restore biodiversity.

ILEE combines a large panel of competences in fundamental and applied sciences. This allows a significant contribution to the understanding of the evolution of life. To face current and future environmental challenges, we search for sustainable solutions, integrating ecological, technological, socio-economic and historical/cultural perspectives.

#### Evolution, Adaptation and Biodiversity



Humans impact on our natural environment with consequences for the adaptation & evolution of organisms, composition of communities, biodiversity & ecosystem functioning.

Models
Field data
Experiments

Physiology Behaviour Proteomics Epigenetics

**Biological mechanisms** 

Sexual & asexual reproduction Natural & experimental populations

#### Pollution and Environmental Toxicology

**Evolutionary processes** 

Physiological
Immune
Nervous
Reproductive
system
Aquatic
organisms

Conceptional

→ mathematical models

Case

→ plankton
microcosmic
experiments

**Ecosystem changes** 

Photochemical and –voltaic devices

Bioinspired materials

Pollutants (pesticides, pharmaceuticals, neurotoxins, etc.) but also other stressors (chemical, physical or pathogenic) act on individuals and entire ecosystems.



## Characterisation and Management of Natural Resources

**Sustainable technology** 



If not done responsibly, the extraction and processing of non-renewable resources can cause heavy environmental problems.

Geological resources Supergene ores Aquifer & karstic flow processes

Non-renewable resources

Relationship between natural resources, architecture & art From antiquity to modern age Sensible productivity of freshwater species Restoration of aquatic ecosystems Water quality analysis with ecological indicators New georesources

### **Ecosystem services**

Integrated valuation frameworks Social Economic Biophysical values ES Mapping Modelling Integrated ES assessments The concept of ecosystem stems from a strong sustainability framework and its first aim was to help preserve biodiversity. Today, it is increasingly used to foster sustainable landscape management and planning, to increase the well-being of local actors.



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Human utilisatior

#### Sustainable plant and animal production



Looking for alternatives of chemical and pharmaceutical products is essential to face the challenges in plant and animal production. Plant molecular & cellular biology

Association breeding – agronomical performance Phytopathology & signal transduction

Elicitor molecules stimulate plant defence Spin-off: FytoFend S.A.

Aquaculture

Immunostimulation
Plant ingredients
instead of fish meal
Improve fish welfare
Temperate & tropical
species

#### Environmental impacts on human populations

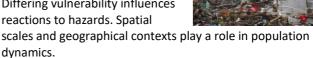
Distribution Migration Vulnerability Land use Health risks

Environment & population

Vector-borne & zoonotic diseases

Population dynamics Disease risks Spatial scales Resilience indicators
Game, Census, Focus groups
Integrated spatial analyses
Satellite image & mobile data

Droughts, land use, environmental and health risks impact on distribution of human populations and migration. Differing vulnerability influences reactions to hazards. Spatial



# **Environmental History and Law**



Since man appeared on earth, he began to influence and alter his environment.

History & Perception 18<sup>th</sup> – 20<sup>th</sup> century Urbanisation Industrial exploitation River pollution Relationship between men & animals « Produits du terroir » Natural disasters; volcanic eruptions & earthquakes

Treaties, regulations, directives

Mobilized principles
International level

Environmental

### Environmental and natural resource management in the South

Socio-historical aspects

ILEE collaborates with partners located in Southern countries: Africa, Central and South-America and South-Eastern Asia. Focus lies on:

- Characterisation and sustainable management of natural resources
- Production of aquatic ecosystems and the sustainable development of aquaculture
- Impact of environmental changes on human populations
- Environmental history



A strong asset of ILEE is its combination of multiple disciplines offering completely new insights and interdisciplinary approaches on interactions of organisms, species and ecosystems being exposed to anthropogenic impacts. These disciplines range from natural sciences such as biology, geography, geology, chemistry and physics to social science disciplines such as architecture, art, environmental history and law.

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