



European Project Semester



PROJECT OUTLINE

Project dates: March – June 2020

Title: Mapping the risk of groundwater pollution by pesticides

Project activity areas: food ,agriculture, sustainable development

Keywords: sustainability, agriculture, pollution, pesticide, artificial intelligence, vulnerability, exposure, risk, mapping, health,

Tutor's name and coordinates

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Project origin :

Research collaboration with the [University of Sydney](#) (Australia) and the [Sydney Institute of Agriculture](#)



Project technical background:

Progress in [plant protection](#) has contributed significantly to increased yields and regular production. [Synthetic plant protection products](#) are easy to access and use, relatively inexpensive, and have proved to be very effective and reliable in a large number of cases, over large areas. Agriculture has developed production systems based on the use of these products; it currently appears to be highly dependent on pesticides. Until now, at different levels of use, all countries engaged in agricultural production are users of plant protection products.

However, today the systematic use of these products is being called into question, with the growing awareness of the [risks](#) they can generate for the environment and even for human health.



[Diffuse contamination of groundwater](#) by various types of products used in agricultural activities is a major environmental problem because the progressive degradation of groundwater quality threatens its function as a drinking water resource in the medium to long term. The management or control of this form of pollution is made difficult both by its non-localized nature and by the fact that it is the result of a progressive accumulation, the recognition of pollution as well as the effect of corrective measures being often only possible after a period of several years. The [identification of risk areas](#) at both state and regional levels and the implementation of preventive measures adapted to local conditions could, in this context, constitute an effective instrument for a genuine natural resource management policy.

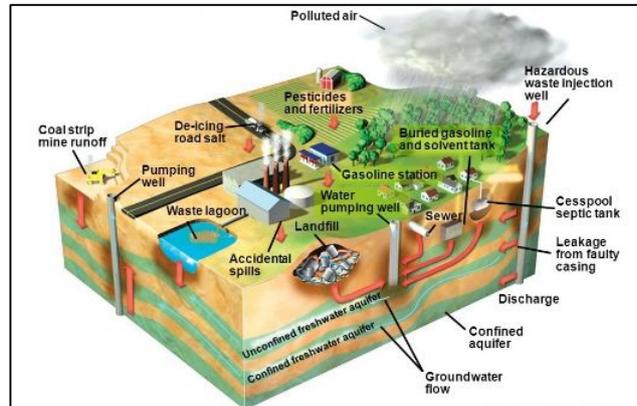
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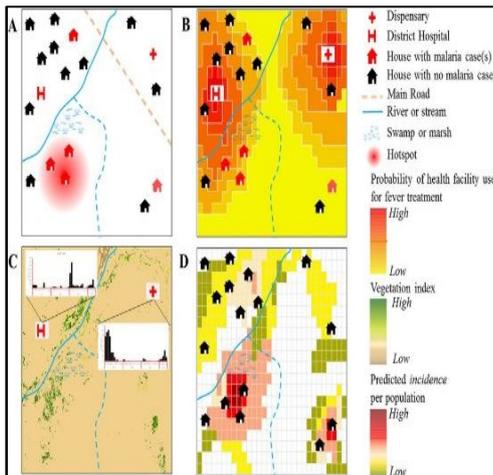
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Identifying vulnerable regions means systematically assessing the risk over a large area. Through the techniques and instruments it uses as well as the difficulties it raises, such a regional assessment requires the coupling or integration of **geographic information systems (GIS)**, environmental databases and simulation models, whose objectives are not only to develop predictive tools for management purposes, but also to obtain a better understanding of the phenomena.

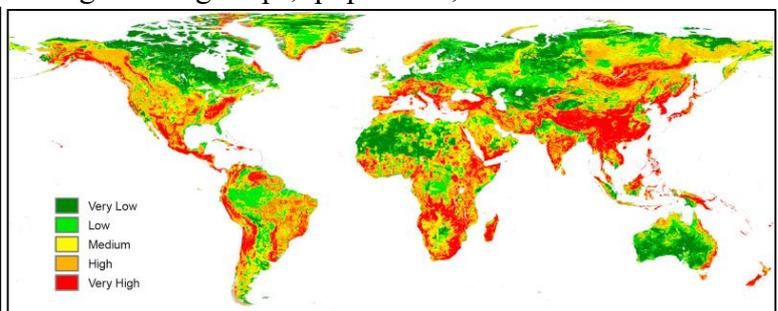
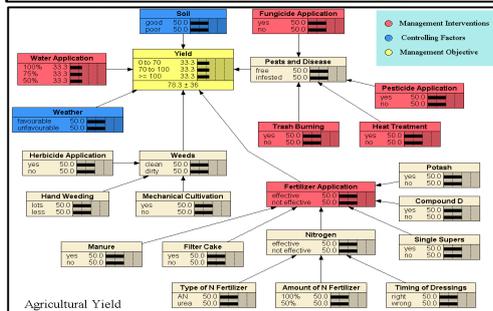


Based on knowledge of pesticide use data and of the process of pollutants infiltration into the soil, the work targeted by this project will consist in **modelling the risk of groundwater contamination and its downstream impact on other issues** (products, crops, populations).

Studied topics:



- mapping of the pesticide use
- identification of the variables involved in the pollution process
- determination of a causal graph describing the process
- constitution of the databases (from sensors or Monte-Carlo techniques) required to feed the model
- characterization of a dynamic Bayesian model for the probabilistic assessment of pollution
- mapping the risk of groundwater contamination
- quantification of the downstream effects of the pollution to other stakes
- mapping of the exposure and vulnerability of neighbouring crops, population,...



The techniques used will be based on the use of R or Python programming language and modeling tools (Netica or Matlab Toolboxes). **No pre-requisite knowledge** of these modelling tools or even of the field of agriculture or pollutants is required to start the project.

This project will be carried out in close collaboration with the **University of Sydney** via regular video conferences between the Sydney Institute of Agriculture and the ENIT.

