

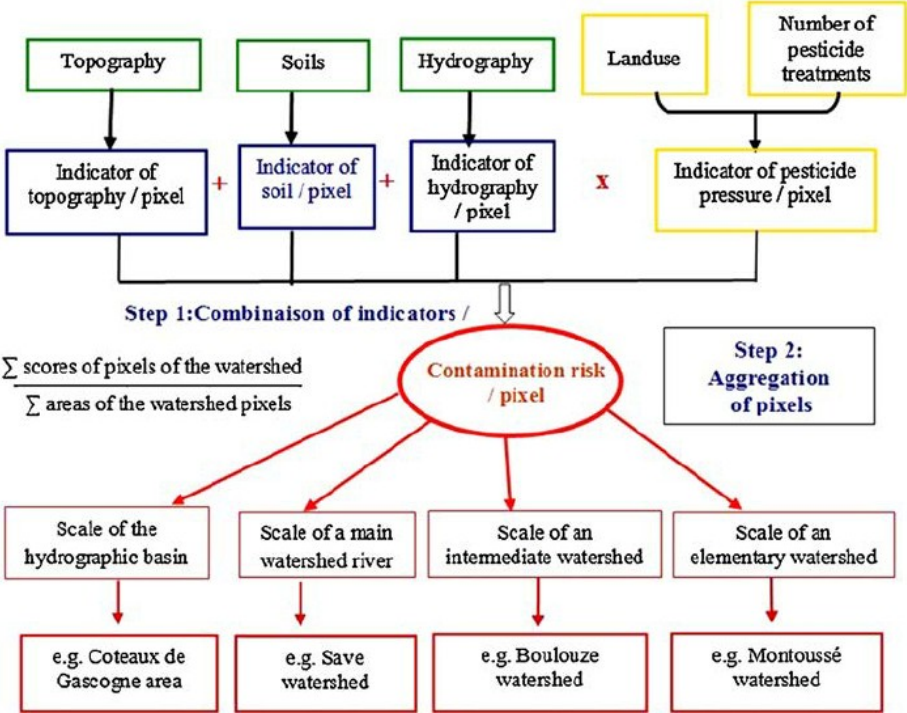
9. PHYTOPIXAL

FAIRWAY partner: Nicolas Surdyk (BRGM, FR)

Brief description

PHYTOPIXAL is based on a combination of indicators relating to the environmental vulnerability of the surface water environment (slope, soil type and distance to the stream) and the agricultural pressure (land use and practices of the farmers). The combination of these indicators for each pixel provides the contamination risk. The scoring of variables was implemented according knowledge in literature and of experts. To use PHYTOPIXAL a model is built with a GIS at pixel level of remote sensing.

Contaminants covered (e.g. nitrate, pesticides etc.)	Pesticides
Intended end users (e.g. farmer, water quality manager, policy maker)	Public stakeholder Farmers, Farm advisers,
Level of expertise and/or training required	Required skill in GIS. Need for a good understanding of multi-criteria modelling (Electre model) and multi-criteria analysis
Geographical resolution (e.g. field, catchment, national)	Catchment scale (watershed) from some dozens of kilometres to some thousands kilometres
Temporal resolution (e.g. daily, annual, long-term).	Annual
Real-time component (e.g. live weather data, soil moisture data feeds etc.)	None
Number and type of mitigation measures included	No mitigation measures are included but thanks to the GIS-model association, different land use and practices of the farmers can be tested
Platform (e.g. paper-based tool, phone app, bespoke software).	GIS French (But many article available in English).
Frequency of updates	Irregular (Depending of the research team)
Cost/availability	A request must be made to the research team Method could be applied using indications provided in the publication
Number of users or number of copies distributed/downloaded/purchased	10
Links to demo material and other relevant information (e.g. user guides).	No demo material available See publication
Additional comments	

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Input data required to run the DST	<p>The figure below presents the input data of the tool (step 1 according to the author)</p>  <p>Step 1: Combinaison of indicators /</p> $\frac{\sum \text{scores of pixels of the watershed}}{\sum \text{areas of the watershed pixels}}$ <p>Step 2: Aggregation of pixels</p> <p>Contamination risk / pixel</p> <p>Scale of the hydrographic basin e.g. Coteaux de Gascogne area</p> <p>Scale of a main watershed river e.g. Save watershed</p> <p>Scale of an intermediate watershed e.g. Boulouze watershed</p> <p>Scale of an elementary watershed e.g. Montoussé watershed</p>
Outputs (including links to water quality and economic or financial aspects)	<p>This method is used to target specific agricultural input transfer risks. Characterization of areas at potential risk of surface water contamination by phytosanitary products at the watershed scale, with methodologies adapted to the integration of different levels of spatial organization. There no link to economic aspects.</p>
Age/provenance of supporting data used to develop the DST	Based on field experiments
Country-specific calibration or data requirements (including restrictions on use)	<p>This tool is site specific. A calibration on site and site data are needed.</p>
Details of validation and testing	Tested at a site in the south of France
Date developed/released (or planned release date)	Last updated in 2014
Author/developer names and affiliations	Macary et al. University of Toulouse with IRSTEA, CNRS
Member state(s) where developed	FR
Member State(s) where currently used	FR
Key publication references (including url)	<p>Macary, Francis and Morin, Soizic and Probst, Jean-Luc and Saudubray, Frédéric A multi-scale method to assess pesticide contamination risks in agricultural watersheds. (2014). Ecological Indicators, 36 . pp. 624-639. ISSN 1470-160X, http://www.sciencedirect.com/science/article/pii/S1470160X13003336</p> <p>In this document the AZOPIXAL (for nitrogen) is also described: https://pdfs.semanticscholar.org/7bce/851275c7f2b56d3ed15df9f35b2fa4d0b58a.pdf</p>

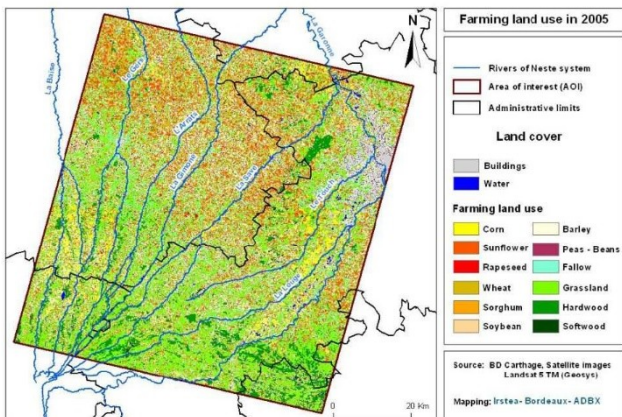
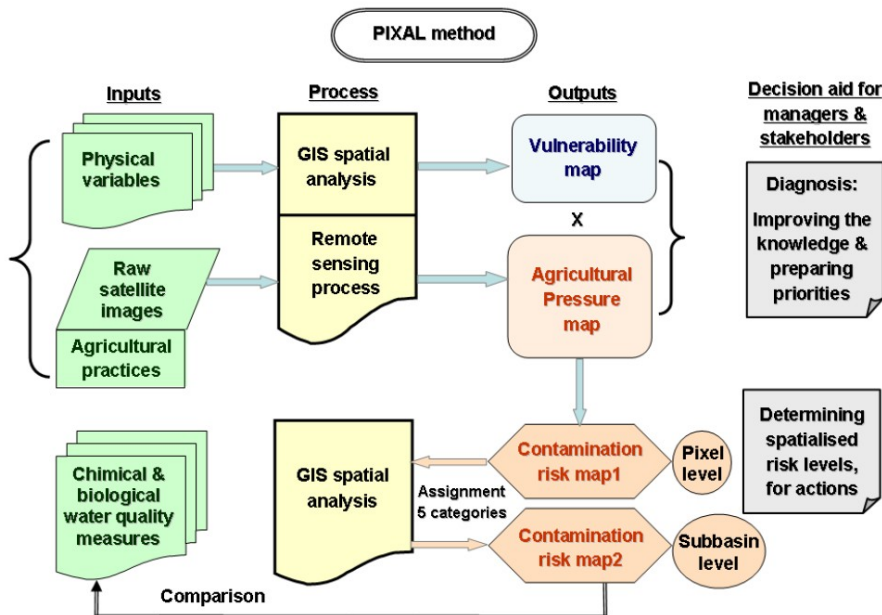
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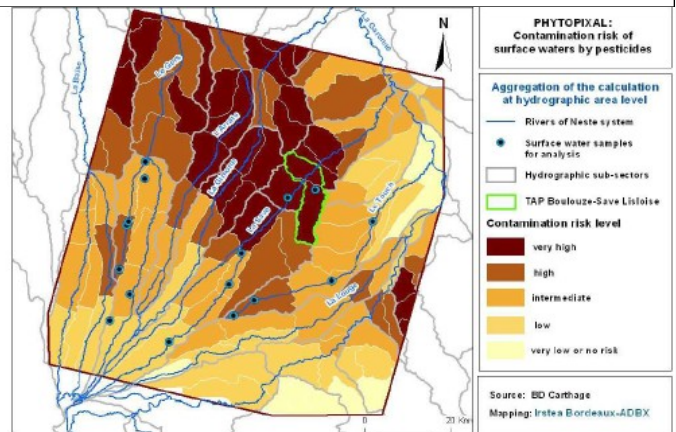
Any other useful information (e.g. screenshots of DST input/outputs)

Conceptual model of the generic PIXAL method

Generic method based on the combination of spatial risk factors, is calculated at the pixel scale (of the satellite image).
 The Risk of contamination is : $[(\text{slope}) + (\text{hydrographic proximity}) + (\text{type of soil}) + \dots] \times [\text{Phytosanitary} / \text{production pressure}]$.
 The risk indices calculated for each pixel are then aggregated at the scale hydrographic zone (watershed). The aggregation is made on the principle of the average of the indices obtained, by a linear procedure.



Example of input data : the land use of the study area



Example of output data : the estimated risk at the scale of the watershed