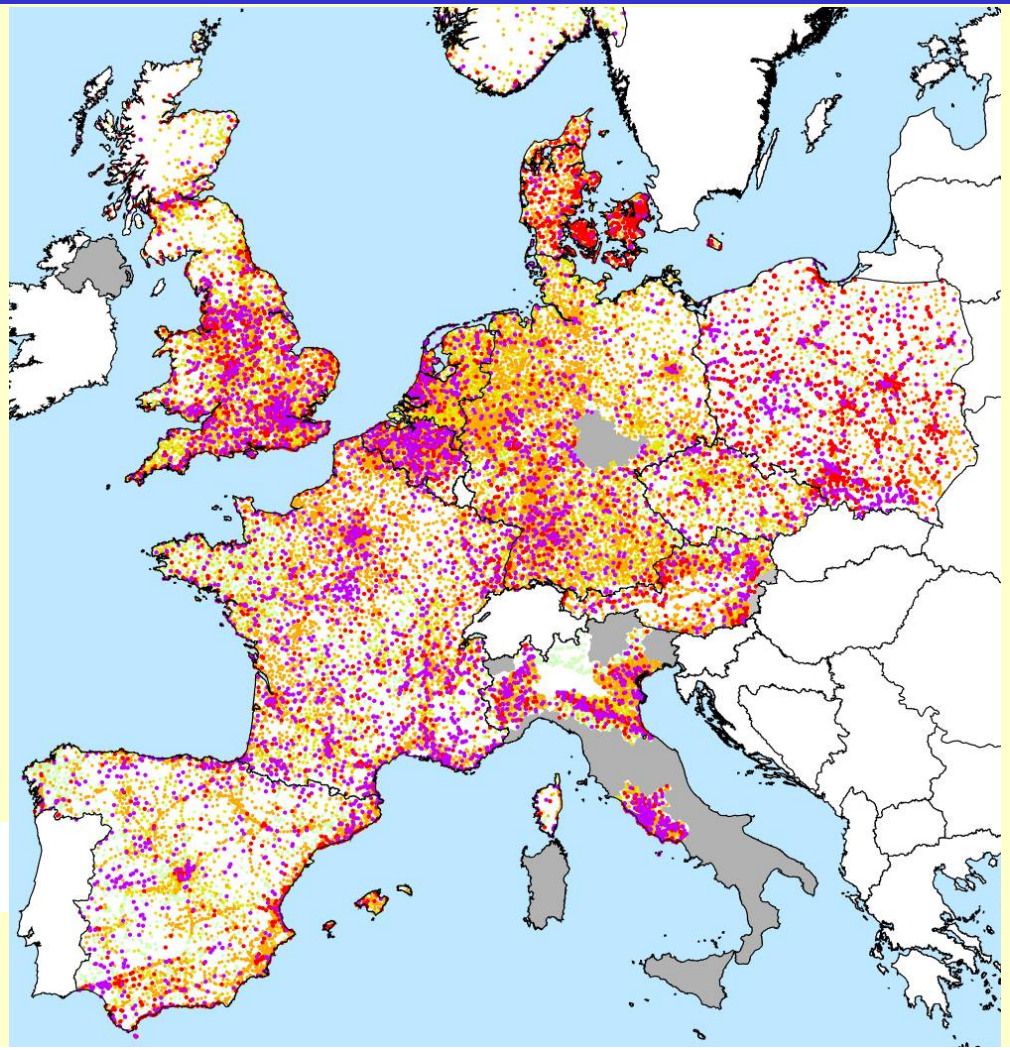
Assessing the Environmental Sensitivity of Petrol Station Locations across Europe

San Diego, 5 August 2008



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ARCADIS

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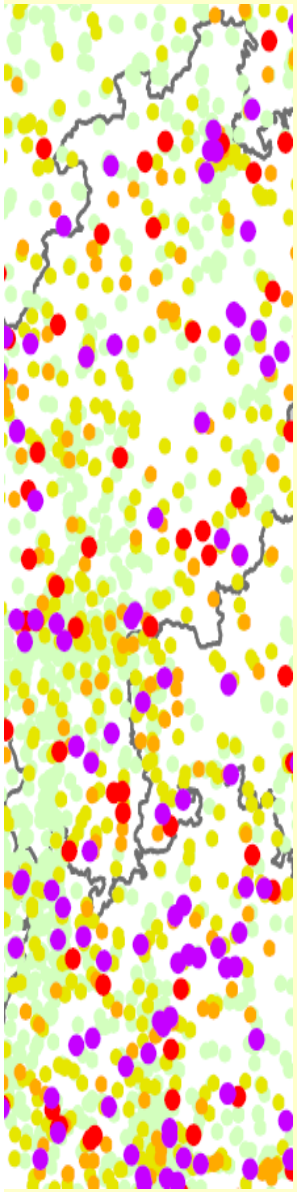
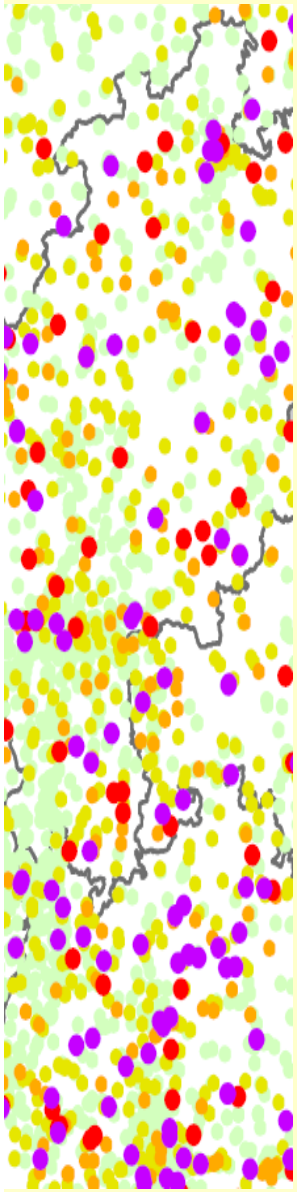
Agenda



- Objectives
- Methodology
- GIS Illustration
- Data Limitations
- Results
- Key Conclusions and Findings to Date

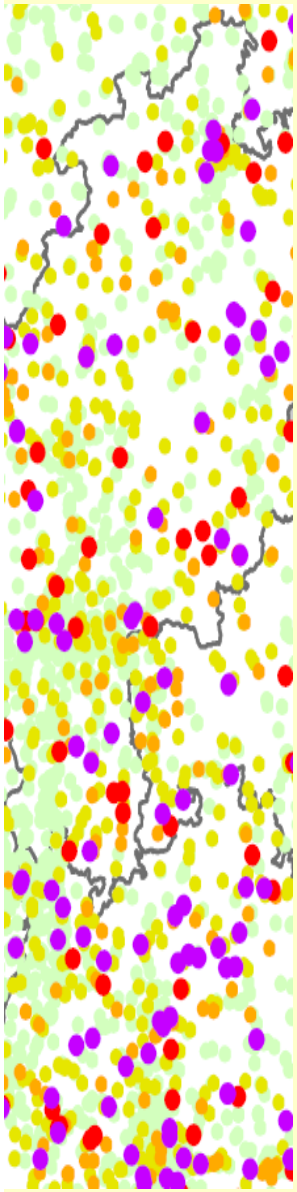
- Arcadis GMI – Global Engineering and Environmental Consultants
- CONCAWE – CONservation of Clean Air and Water in Europe – Established in 1963 by leading oil companies to carry out research on environmental issues relevant to the oil industry in Europe.

Strategic Objectives



- To assess the scale of the potential risk to water resources in the European Union (EU) posed by downstream oil industry facilities
- To promote a site specific, risk-based approach to the management of groundwater and surface water contamination.
- To input to the debate on implementation of the EU Water Framework Directive (WFD) and Groundwater Daughter Directive (GWDD)
  - Greater focus on water quality
- To enable CONCAWE member companies to identify facilities with high environmental risk potential to facilitate the development of risk management plans.

Technical Objectives

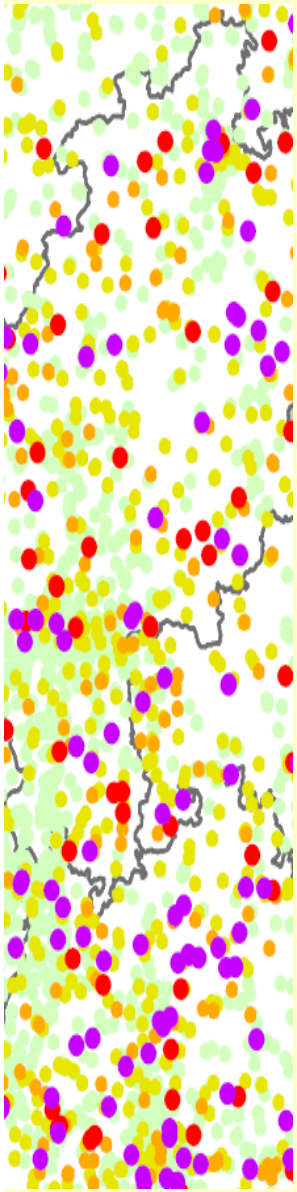


To assess the scale of the potential risk posed by downstream oil industry facilities to:

- Groundwater
- Surface waters
- Ecologically sensitive environments potentially impacted via the groundwater migration pathway

arising from leaks and spills to land, independent of the site facilities (e.g. type and age of containment)

Methodology



- Long-term project (2004 – 2008)
- Phased approach
  - Data availability and format
  - Country prioritisation
- Location of sites (initial focus on petrol filling stations)
- Groundwater and surface water usage in the vicinity
- Aquifer type
- Groundwater Protection Zones (GPZ)
- Distance to receptors
  - GW Abstraction points (e.g. drinking water supply wells)
  - Surface water features
  - Ecologically sensitive areas (e.g. Natura2000 sites)
- GIS-based

Countries Researched, by Phase

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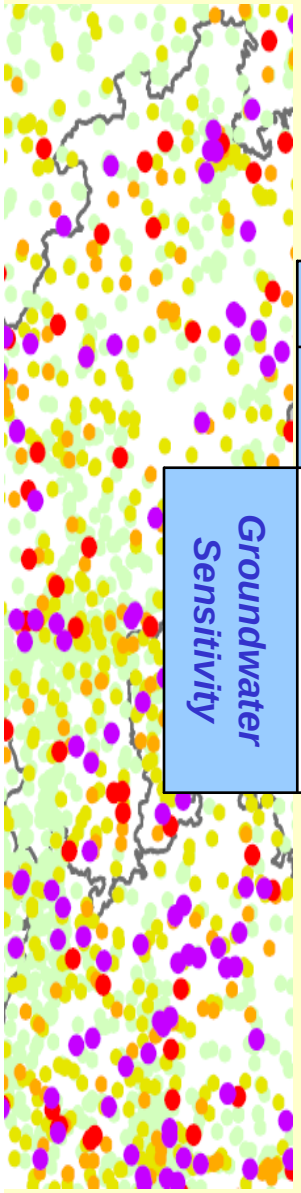
Work in Progress

Sensitivity Categories



- Each Petrol Filling Station location assessed for its sensitivity in relation to underlying aquifer class and groundwater protection zone (GPZ)
- Use of GIS allows large numbers of sites to be processed quickly

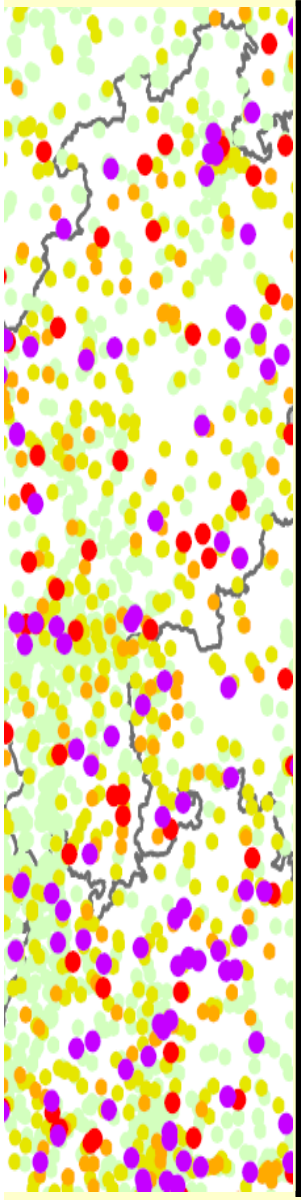
	Sensitivity Category						
	Category 1	**Category 2**	**Category 3**			**Category 4**	**Category 5**
Groundwater Sensitivity	Within a GPZ1	Within 100 m of a GPZ1 GPZ2 **AND** Major Aquifer Class	Other GPZ2	GPZ3	Not in a GPZ but on, or within 100m of a Major Aquifer Class.	Minor Aquifer Class **AND** not in a GPZ	Non-Aquifer Class **AND** not in a GPZ

High → Low

Sensitivity Range

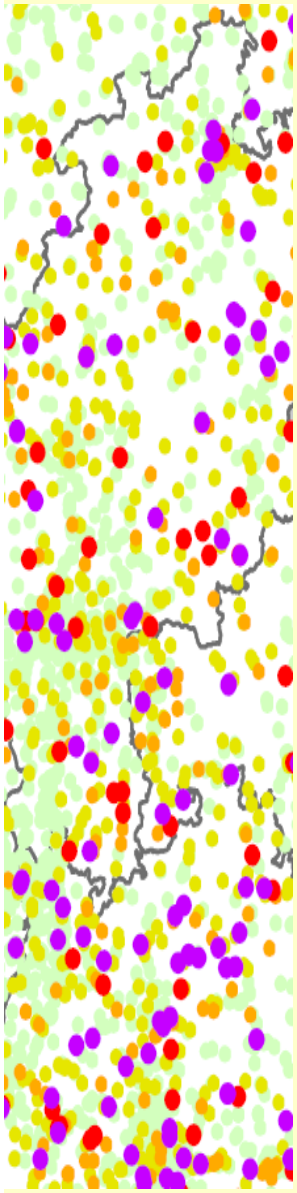
- Equivalent categorisation for surface water and ecological sensitivity based on proximity to features.
- Overall Environmental Sensitivity category for each site defined by whichever of the three factors are most sensitive

Groundwater Protection Zone Classifications Across Europe



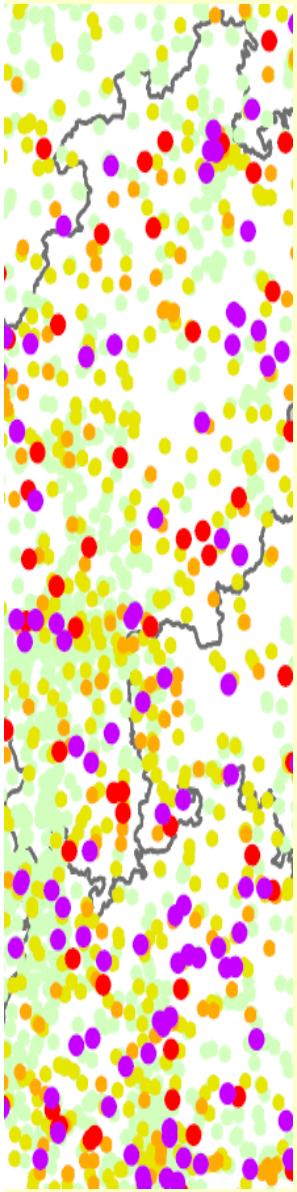
Country	GPZs Defined	Regulation Basis	Digital Format	Number of GPZ Classifications	Notes
Austria	✓	Regional	✓	5	Two types of GPZ; one protects aquifers (2 Classes) and another abstractions (3 Classes)
Belgium	✓	Regional	✓	3	GPZs in Wallonia are not as established as in Flanders. No data for Brussels
Czech Republic	✓	National	✓	3	Water protection zones – not GPZs. Additional data on areas of General GW Accumulation (Natural Spring areas)
Denmark	✗	-	✗	-	Groundwater Vulnerability is focused on quality of groundwater for public supply
Finland	✓	National	✓	4	Not all GPZ have been digitally mapped to date.
France	✓	Local	✗	3	Many GPZs are yet to be designated, very few are digitally mapped. The third class of GPZ is not always defined.

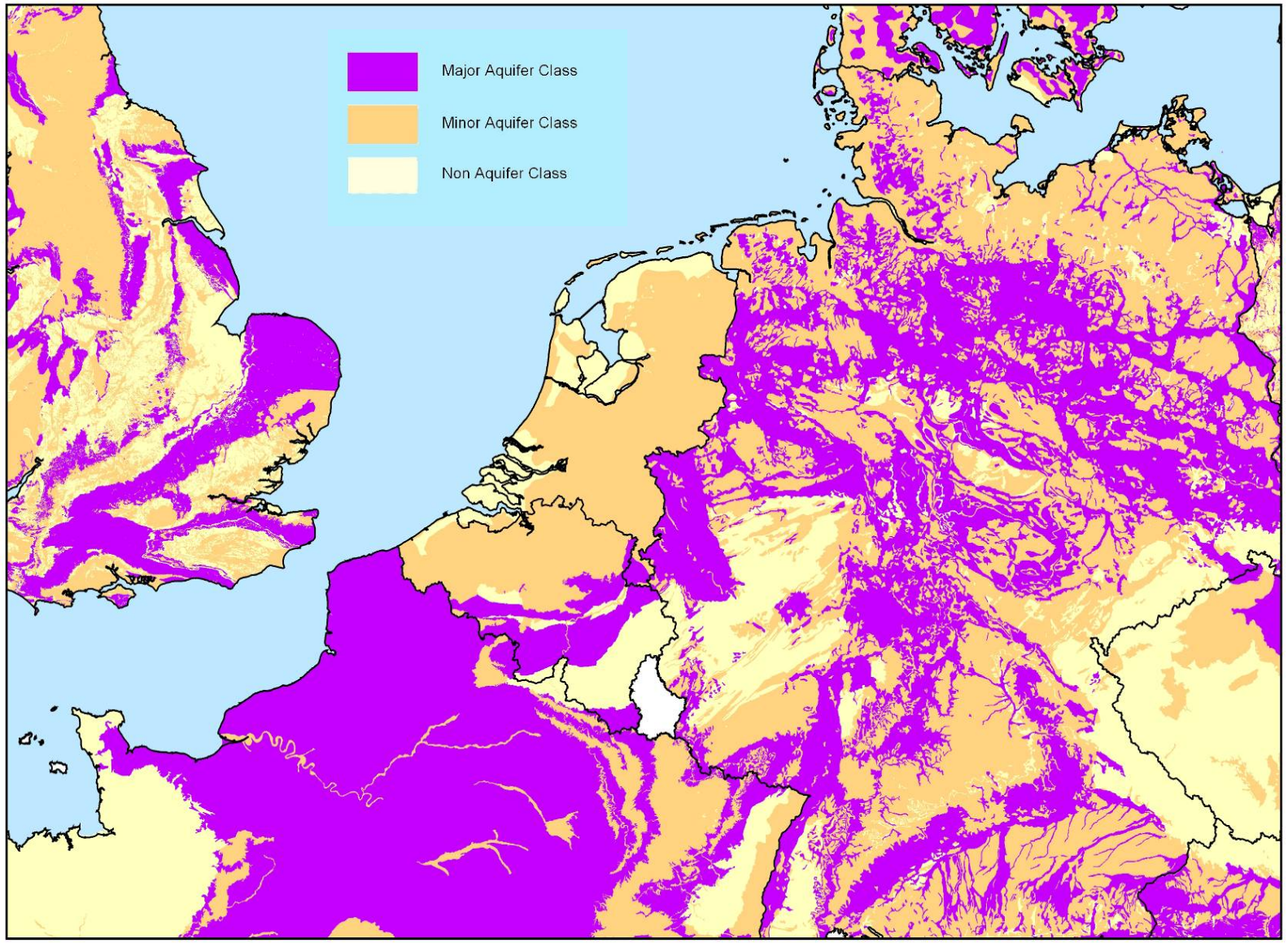
Groundwater Protection Zone Classifications Across Europe



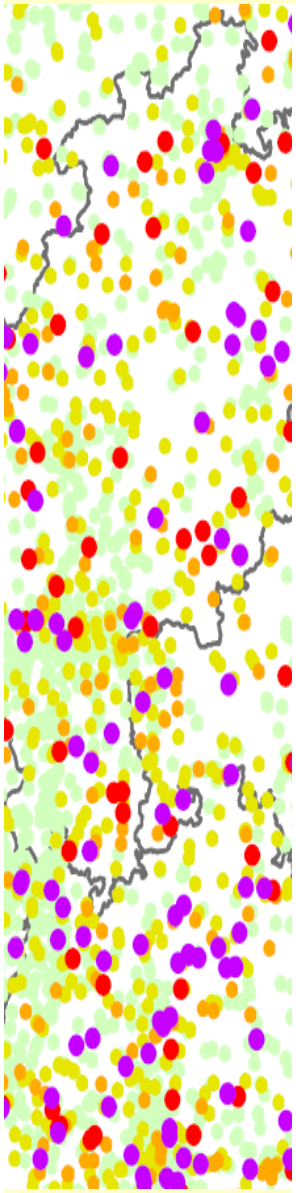
Country	GPZs Defined	Regulation Basis	Digital Format	Number of GPZ Classifications	Notes
Germany	✓	Regional	✓	3	Water protection zones – not GPZs. Some definitions of classes vary between regions.
Italy (5 Regions)	✓ ✗	Regional	✓ ✗	2-4	Where designated, definitions of GPZ class vary widely between regions.
Netherlands	✓	National	✓	3	
Norway	✗	-	✗	-	
Poland	✓	National	✓	2	Spatially, GPZs are wide ranging throughout Poland.
Spain	✗	-	✗	-	
UK	✓	Regional	✓	3	GPZs only defined for England & Wales

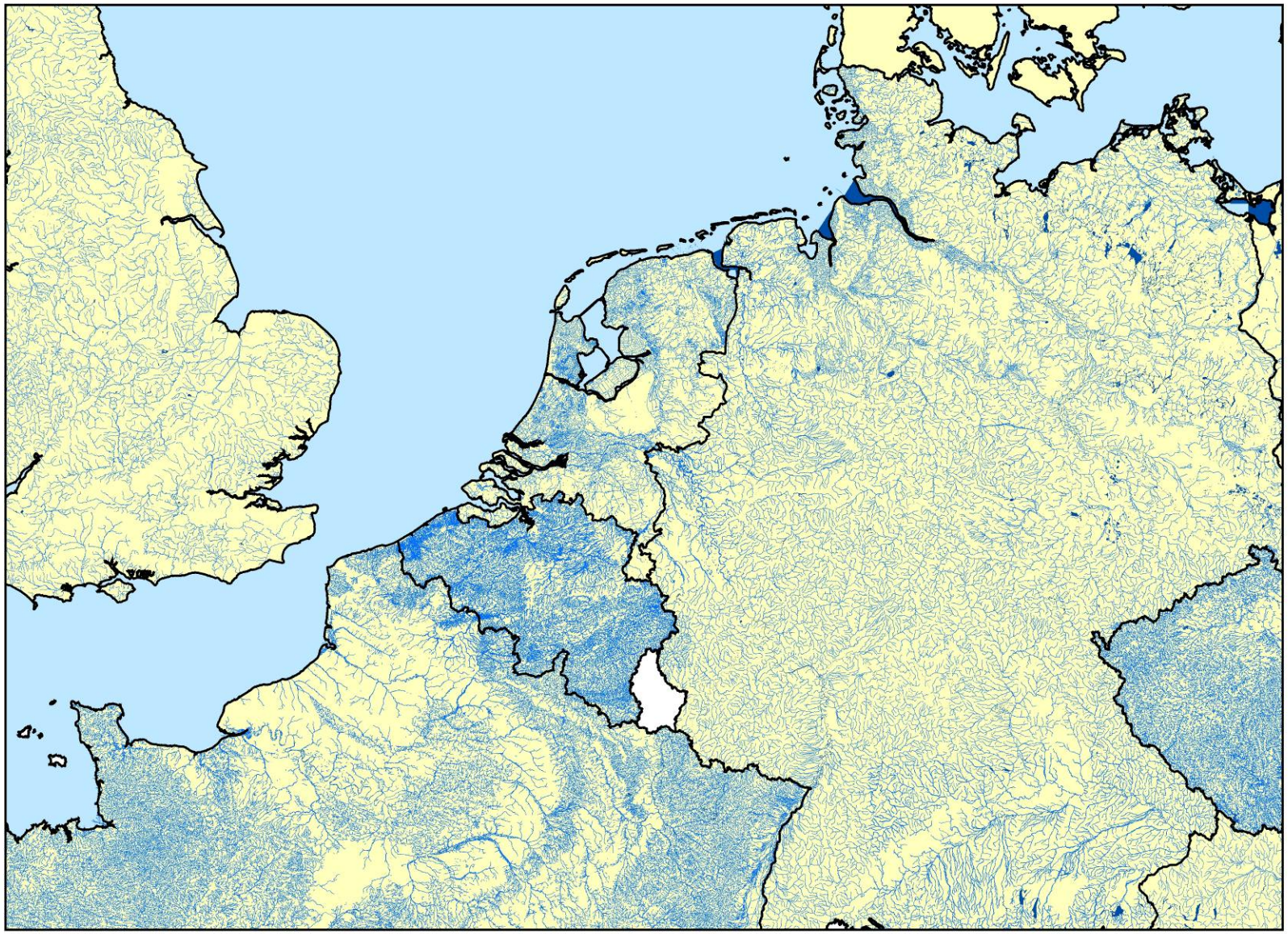
Aquifer Distribution



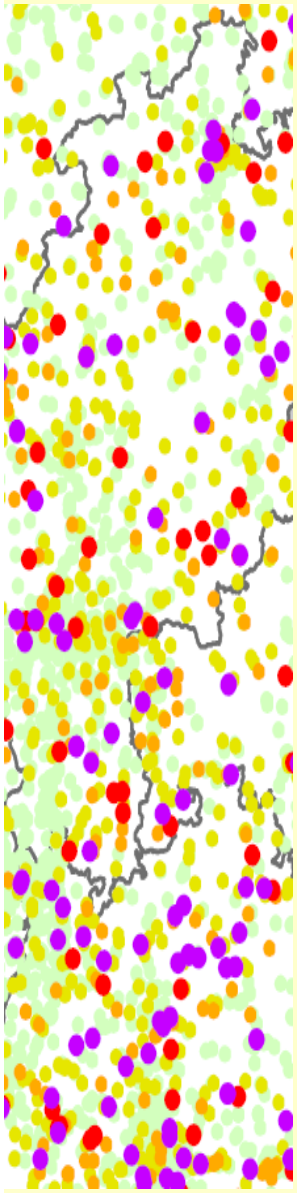


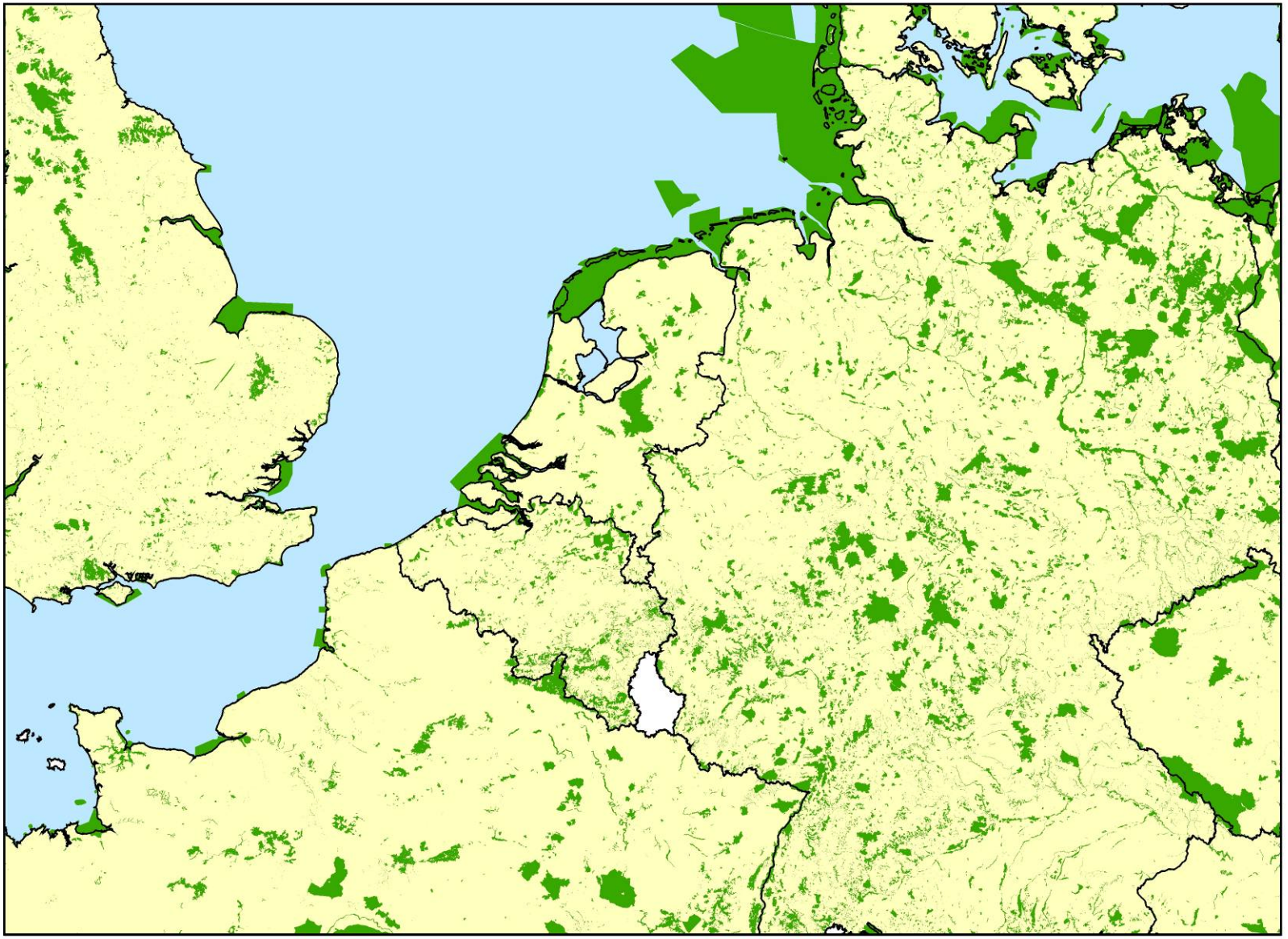
Surface Water Feature Distribution



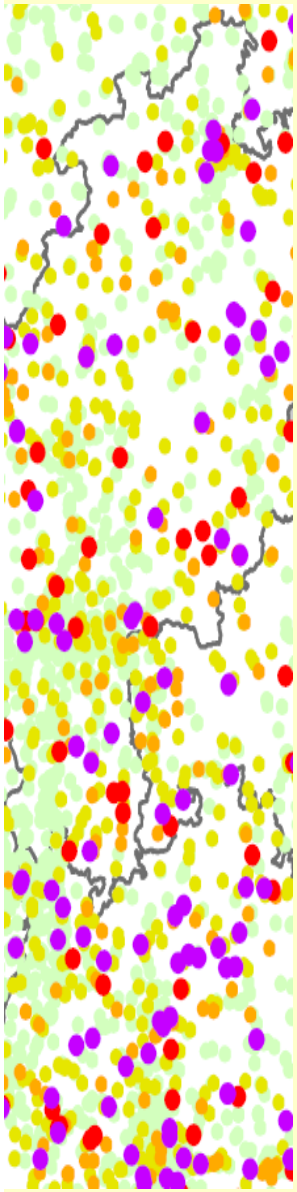


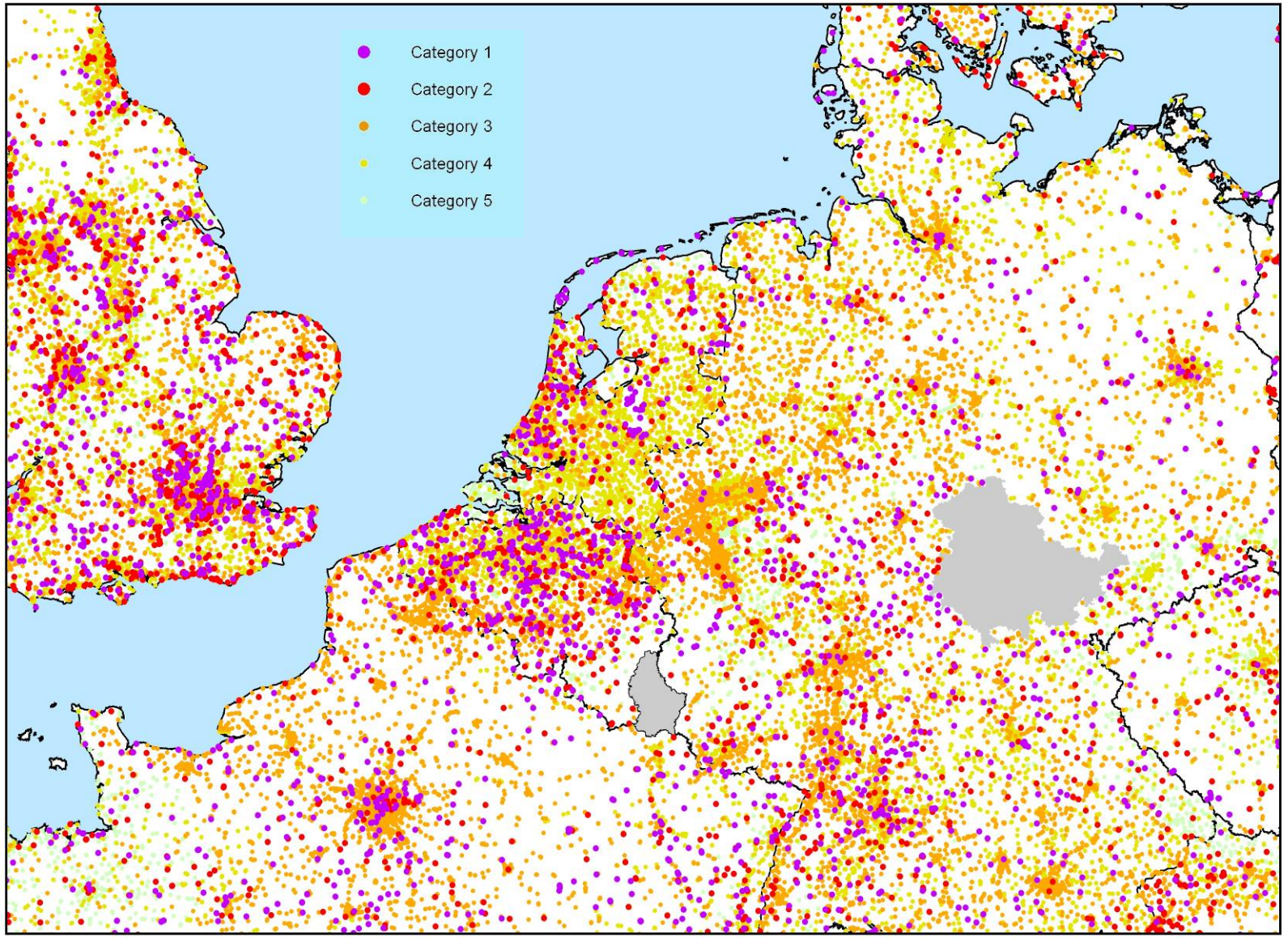
Ecologically Sensitive Area Distribution





Petrol Filling Station Environmental Sensitivity Distribution





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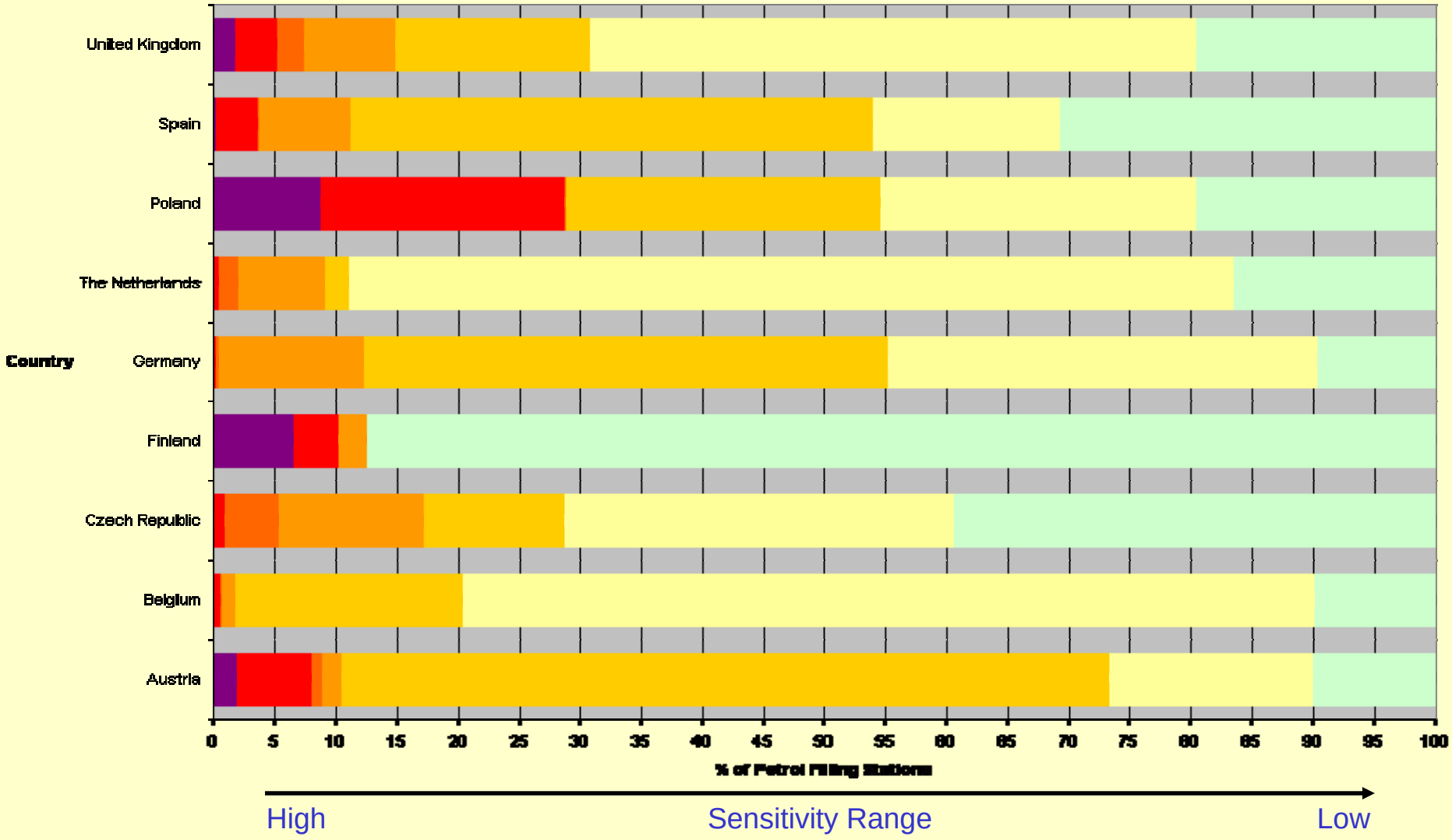
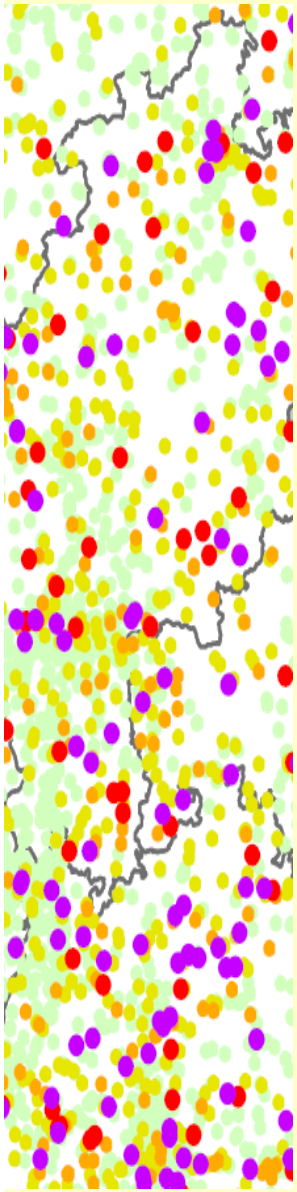
Work in Progress

Groundwater Sensitivity of Selected Phase II and Phase III Countries

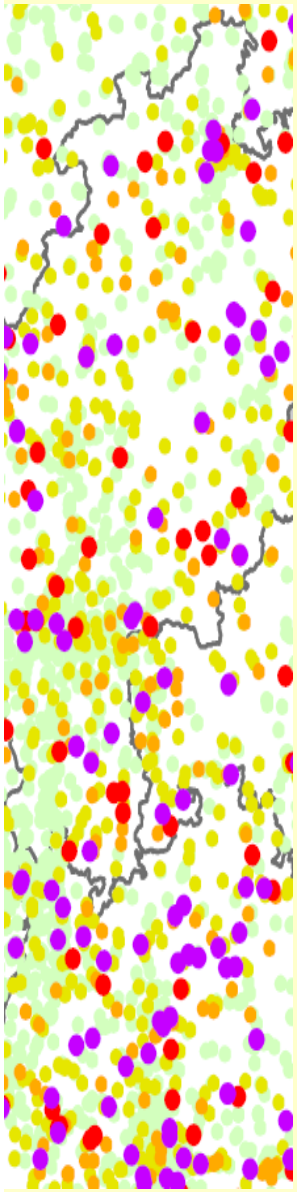


Findings to Date



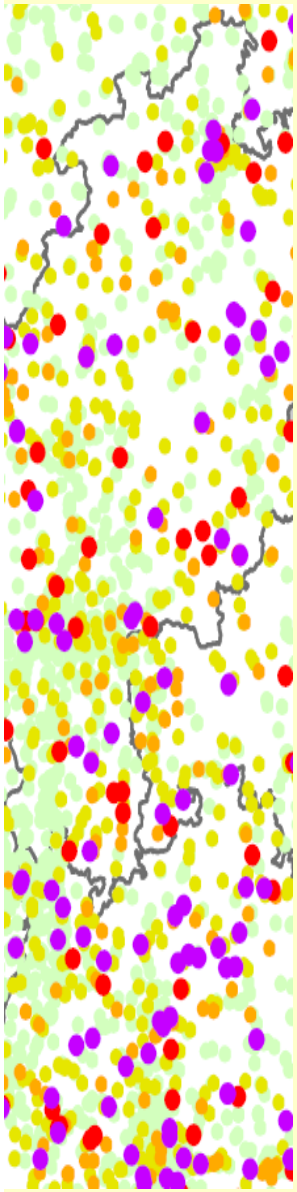
- Percentage of sites in the different environmental sensitivity categories varies by country and regions within a country. At a European level, 14% of sites fall into Categories 1 or 2.
- Retail filling stations generally do not pose a widespread threat to potable groundwater resources across the EU
  - Numbers of sites with high risk potential are limited
  - Risk potential is manageable
- Variability in data and definitions between countries
  - Country to country comparisons should be made with caution at this stage.
  - GPZs are an important concept in protecting public water supplies, but this study has revealed that their definition is inconsistent across the EU.
  - Surface Water data mapped at different scales and quality
  - Ecological Areas – consistency of Natura2000 designations
- Regional comparisons within a country are generally robust.

Next Steps

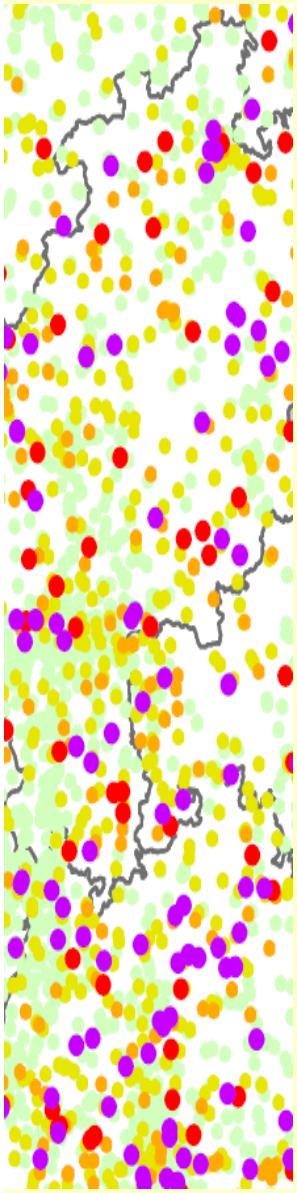


- Supporting Case Studies
  - Assessing temporal change in the sensitivity results.
  - Understanding regional patterns in the sensitivity results (e.g. comparisons with land cover).
  - Assessing sensitivity results and differences in data across national borders.
  - Site specific studies to relate environmental sensitivity results with surrounding land cover.
- Assessing the use of proximity to GW abstractions as an alternative to represent GPZs where data are not available or defined.
- Extend methodology to refineries, terminals and pipeline routes.
- Scope to include further European countries if data becomes available in a useable format.

Summary



- Environmental sensitivity assessment completed for over 85,000 petrol filling station locations across 13 European countries
- The study has identified a number of issues relating to data consistency across, and in some cases within, countries.
- A risk-based approach is the most scientifically sound and resource-effective method of managing potential risks to human health and the environment.
- This study provides the basis of a risk-based management methodology for industrial facilities.
- The approach is applicable to any size or type of facility.
- First pan-European study of this type.



THANK YOU

For further information on CONCAWE, please visit
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