REGIONAL AND NATIONAL PUBLIC MONITORING DATA COMPILATION FOR ASSESSING THE FATE AND TRANSPORT OF PLANT PROTECTION PRODUCTS: INSIGHTS, CHALLENGES, AND OPPORTUNITIES

Andy Newcombe and Virginia Houck (Arcadis)

INTRODUCTION

Many local, state, and national entities include plant protection products (PPP) in their monitoring programs, but a holistic synthesis of these data is not readily available. Long-term water monitoring data can often provide valuable insights into water quality implications under actual conditions of PPP use. Additionally, there is an increased emphasis on utilizing water monitoring data to evaluate the leaching potential of PPPs and to place conservative modeled estimates in context of real agricultural use.

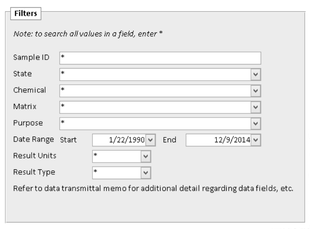
Monitoring data may be obtained through governmental agencies, third parties, or industry sponsored/designed monitoring programs. However, data quality is variable and the representativeness depends on many factors such as:

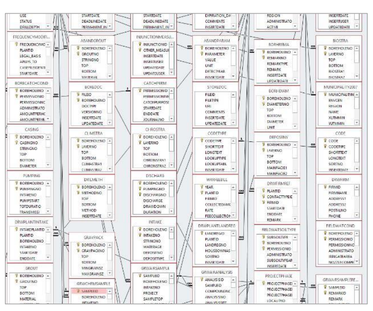
- Collection of samples by trained professionals versus volunteers
- Integrity of sampling location
- Location of sample (stream, deep well, shallow well, tile drain etc.)
- Data redundancy across databases
- Elevated/variable analytical result reporting limits
- Sample preservation
- Analytical methodology quality
- Lack of geospatial coordinates for monitoring locations

APPROACH

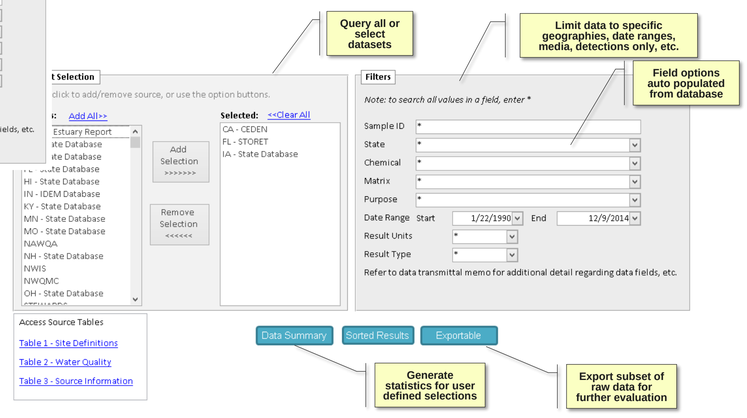
A typical approach to assimilate water monitoring data would include the following steps:

- Conduct an extensive literature search to identify publicly available groundwater and surface water monitoring data (identification of potential new sources of data).
- Query state, regional, national databases for analyte(s) of interest.
- Potentially leverage professional relationships and internal data sets to access additional monitoring data.
- Compile data from a wide array of data formats into a standardized relational database management system (RDMS).
- Conduct thorough QC review of data, remove redundancies, assign water type, identify and interrogate data quality and outliers as feasible.
- Where possible, develop a graphical user interface (GUI) to facilitate data query and database interaction.





Example of publicly available monitoring data source.

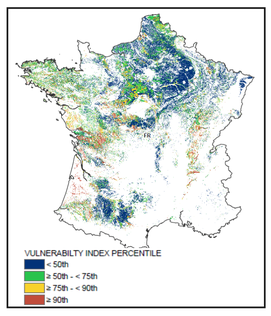


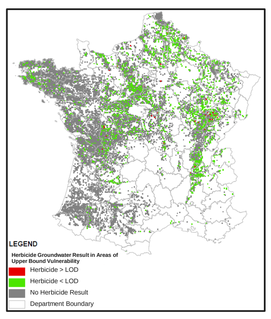
VULNERABILITY ASSESSMENTS

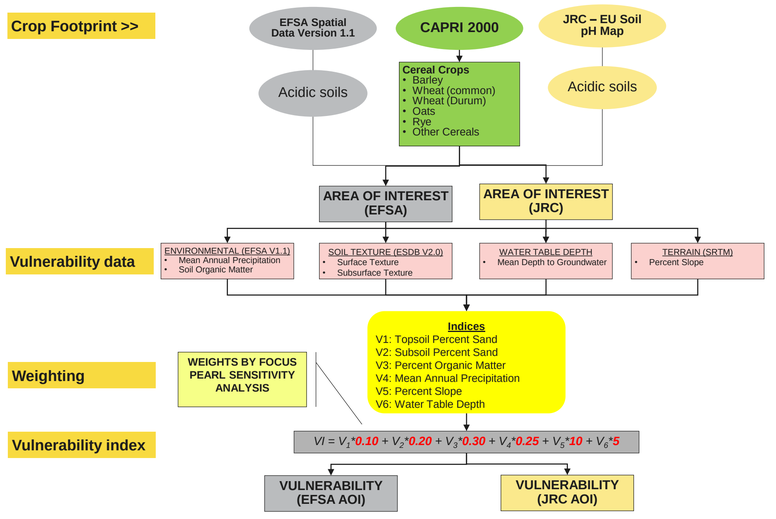
Despite ongoing debate regarding suitable approaches, vulnerability assessments can help place monitoring data into context.

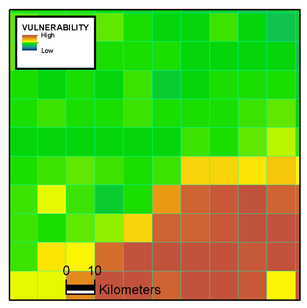
Screening tools can be developed to estimate leaching potential at regional, country, and continental scales.

These tools can pre-process data to a user-selected extent, aggregate spatial data, perform weighting calculations, and calculate a vulnerability index at specified scale (e.g., 1km, 10km).









User-defined inputs

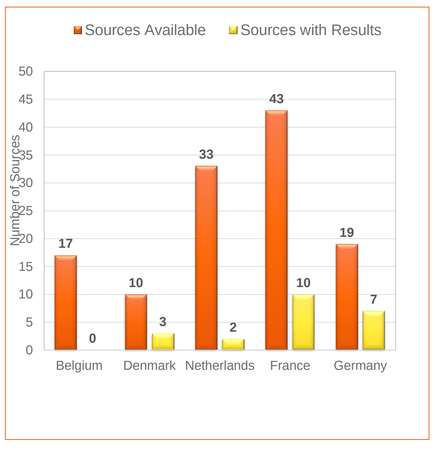
- Relevant spatial data (in-house and/or externally obtained)
- Crop/use footprint
- Weighting method

CASE STUDY

Groundwater and surface water monitoring data identification and compilation was conducted for an active ingredient across five countries; France, Denmark, Netherlands, Belgium and Germany.

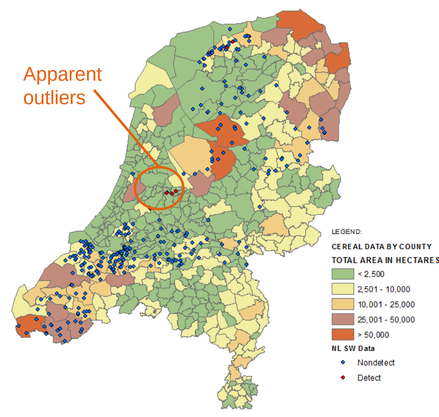
- An open literature search was conducted and public databases were identified in each country. Databases were queried and data (where available) were obtained.
- Local water authorities and environmental agencies were contacted in an attempt to identify additional monitoring data.
- Data were compiled into an RDMS and subsequently interrogated, QC'd, and redundancies identified and removed.
- Monitoring locations and cropping intensity (potato and cereals) were plotted to assess the possibility of a correlation between detections and high cropping intensity.
- More than 104,000 analytical records were identified across 144 databases.

Country	Notes
Belgium	• No analytical data returned
Denmark	• Jupiter Database maintained by GEUS. • PLAP = Pesticide Leaching Assessment Programme (summary stats available only) • GEUS = Geological Survey of Denmark and Greenland.
Netherlands	• Water Quality Portal and Pesticide Atlas (Water Boards). • Water Quality Portal maintained by the Informatiehuis Water - public/private partnership. Pesticide Atlas maintained by Water Boards
France	• French Federal or Regional Authorities • Water Agencies • Health Ministries or Environmental Groups
Germany	• Regional Offices (Bundeslander). • Results were compiled from 6 states. • Summary statistics only for 3 states.



Country	Matrix	Analytical Data (compound A)	Number of Results	Number of Detects	Number of Locations	Years	Detect Range (ug/L)	Reporting Limit (ug/L)
Belgium	GW or SW	No GW or SW data	--	--	--	--	--	--
Denmark	GW or SW	No GW or SW data	--	--	--	--	--	--
Netherlands	GW	No	--	--	--	--	--	--
	SW	2 data sources	1,463	7	331	2011-2013	0.05 - 65.0*	0.01 - 0.05
France	GW	6 data sources 95 Departments 23 Regions	48,379	3	11,879	2006 - 2014	0.005 - 0.06	0.005 - 0.25
	SW	5 data sources 3 Regions 2 Water Agencies	49,992	11	2,090	2007 - 2015	0.02 - 0.121	0.002 - 0.15
Germany	GW	2 Regional sources; 3 Regional sources of summary stats only	2,163	0	131+	2007 - 2011	--	0.01 - 0.02
	SW	3 Regional sources; 2 Regional sources of summary stats only	2,533	11	227+	2003 - 2013	0.01 - 0.054	0.01 - 0.1

*Detected results appear to be errors in source data. Other analytes from the same sample are reported with the same value of 65 µg/L.



- Only 32 detections (0.03%) were determined from more than 104,000+ records.
- A significant number of non-detections were observed in areas with extensive potato and cereal cultivation.
- Where the active ingredient was detected at elevated concentrations, these appear to be transcription or database entry errors.
- Public monitoring data suggest detection of the active ingredient in groundwater and surface water is unlikely.

CONCLUSIONS

- Monitoring data can be compiled into relational databases or data catalogues to facilitate data queries, interaction and broader application.
- Long-term, good quality monitoring data can provide valuable insight into water quality implications under actual conditions of PPP use.
- There is inherent uncertainty in public monitoring data. Data obtained should be thoroughly interrogated, duplicates removed, and outliers investigated.

andy.newcombe@arcadis.com