

Pressure (point, diffuse) assessment techniques for groundwater bodies

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WaterAct

Joint actions for more efficient management
of common groundwater resources

Outline

- Pre-estimation of pressure types and overview of available GIS data.
- Overview of input data for GIS analysis and general assumptions.
- Description of GIS analysis.
- Valuation of impact for each pressure type



The starting points of our approach

WFD Reporting Guidance 2016. Annex 1a: List of Pressure Types (SignificantPressureType_Enum)

- A list of various pressure and main drivers types:
 - Point sources of pollution;
 - Diffuse sources of pollution;
 - Groundwater abstraction and recharge
- A list of Estonian groundwater bodies, which are at risk or in bad status.



Pre-estimation of pressure types

Considered insignificant:

1.8 - Point - Aquaculture Fisheries and aquaculture

2.9 - *Diffuse – Aquaculture Fisheries and aquaculture*

3.4 – *Abstraction or flow diversion – Cooling water Industry, Energy - non-hydropower*

3.5 – *Abstraction or flow diversion – Hydropower Energy - hydropower*

2.7 - *Diffuse - Atmospheric deposition*

These pressure types do not exist or are very rare in Estonia or have no impact for groundwater bodies.

Point pressure types (1)

- 1.1 - Point - Urban wastewater
- 1.2 - Point - Storm overflows
- 1.3 - Point - IED plants Industrial point sources from plants included in the E-PRTR.
- 1.4 - Point - Non IED plants Any industrial point sources not included in the E-PRTR.



Point pressure types (2)

- 1.5 - Point - Contaminated sites or abandoned industrial sites
- 2.5 - Diffuse – Contaminated sites or abandoned industrial site
- 1.6 - Point - Waste disposal sites.
- 1.7 - Point - Mine waters. Point sources due to the collection of water in an open pit or underground mine



Diffuse pressure types

- 2.1 - Diffuse - Urban run- off
- 2.2 - Diffuse – Agricultural
- 2.4 - Diffuse – Transport
- 2.6 - Diffuse - Discharges not connected to sewerage network
- 2.8 - Diffuse – Mining
- 6.1 - Groundwater - Recharges
- 3 – Groundwater abstraction

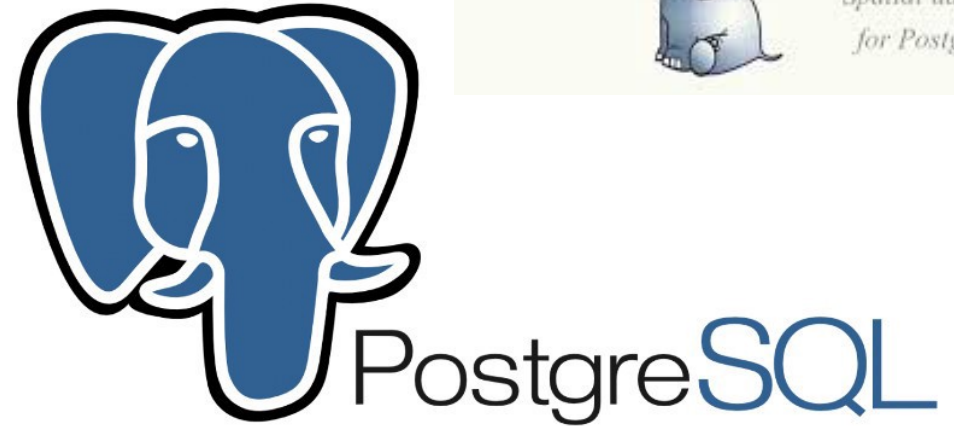
GIS analysis

Input data:

- point and diffuse pressure data;
- map of the groundwater bodies;
- map of river sub-catchment areas;

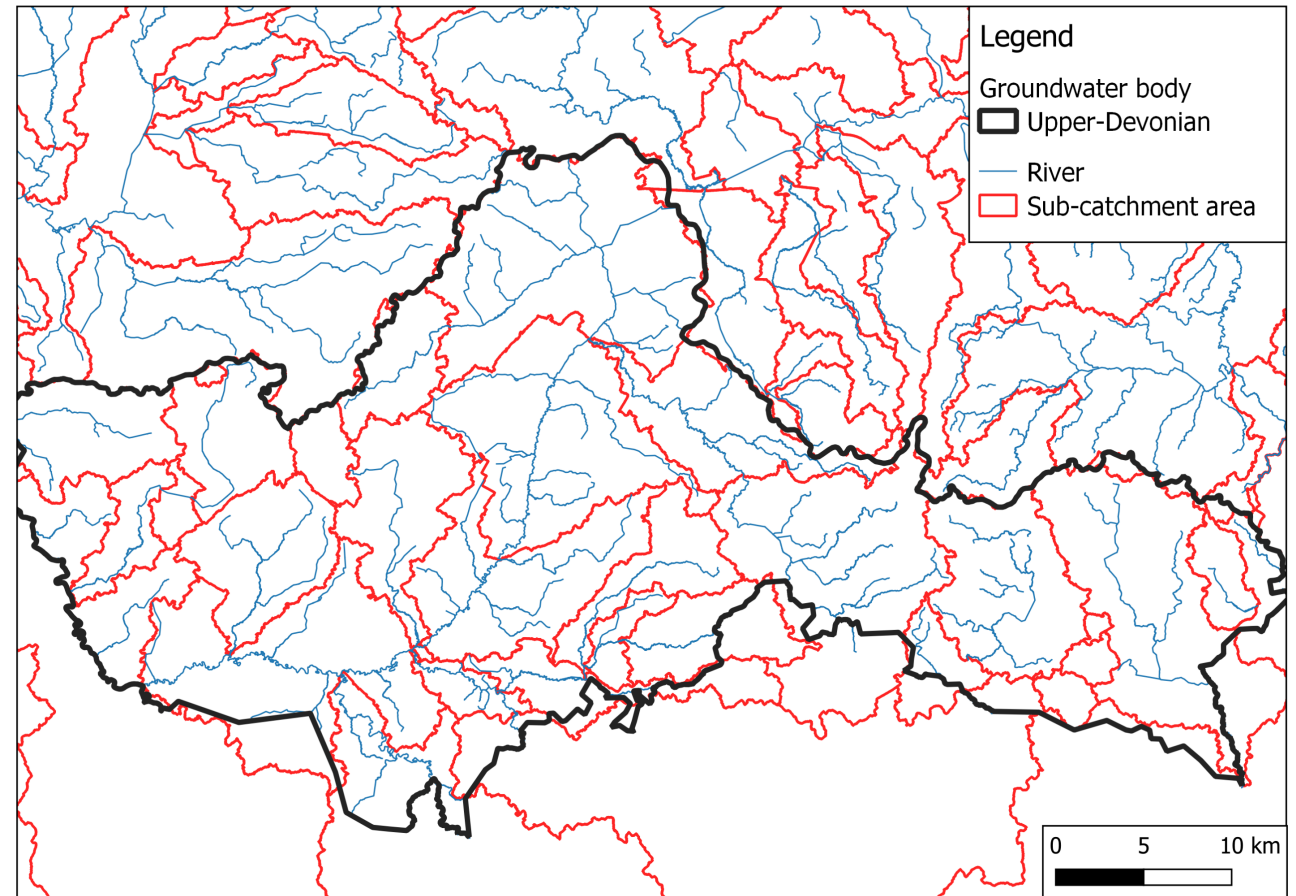
Assumption:

We assumed that all pressure types affect only the uppermost groundwater body, except groundwater abstraction.



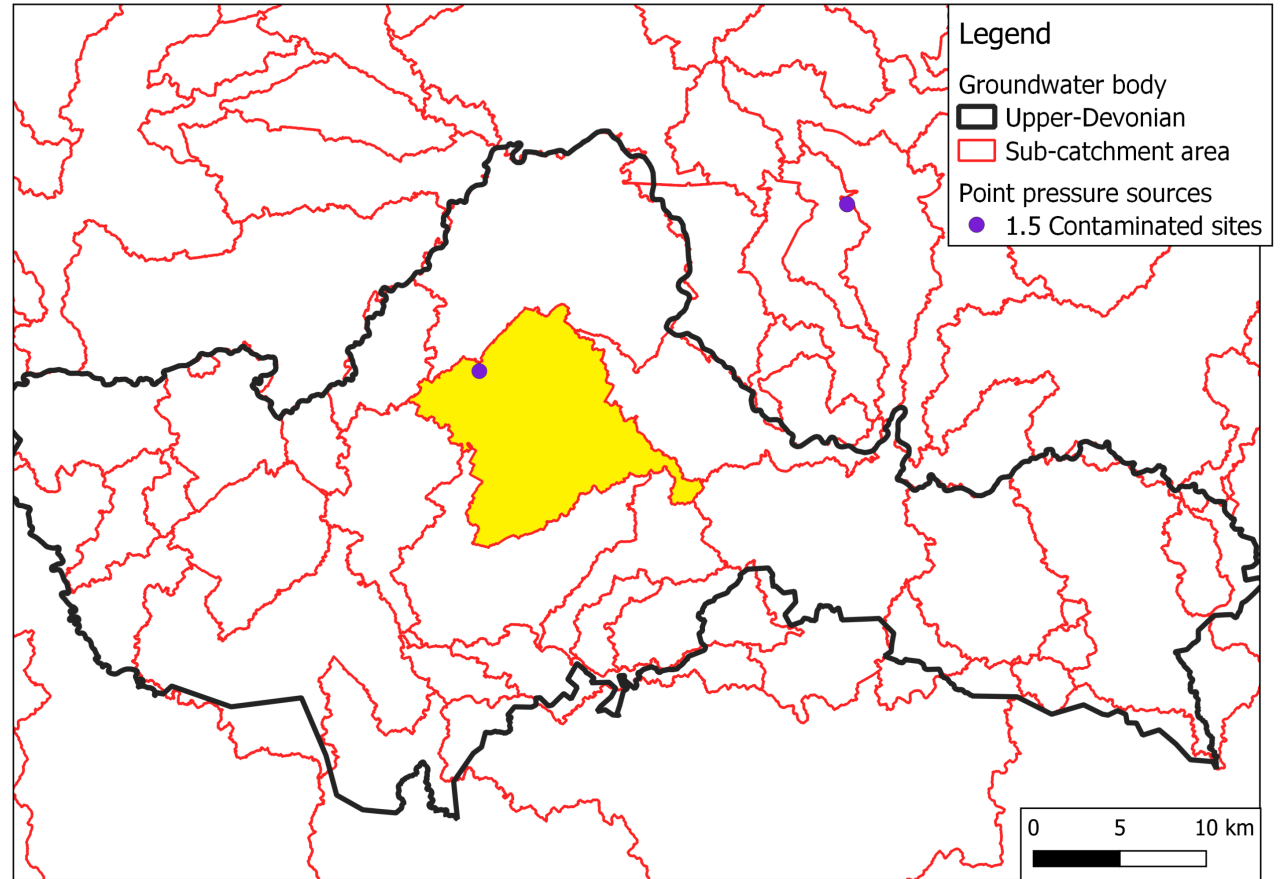
GIS analysis – Computing overlapping areas

- We assumed that point pressure source impact area is related only to the sub-catchment area where the pressure source is situated.
- The areas of geometric intersection between the groundwater body and each overlapping sub-catchment area were calculated.



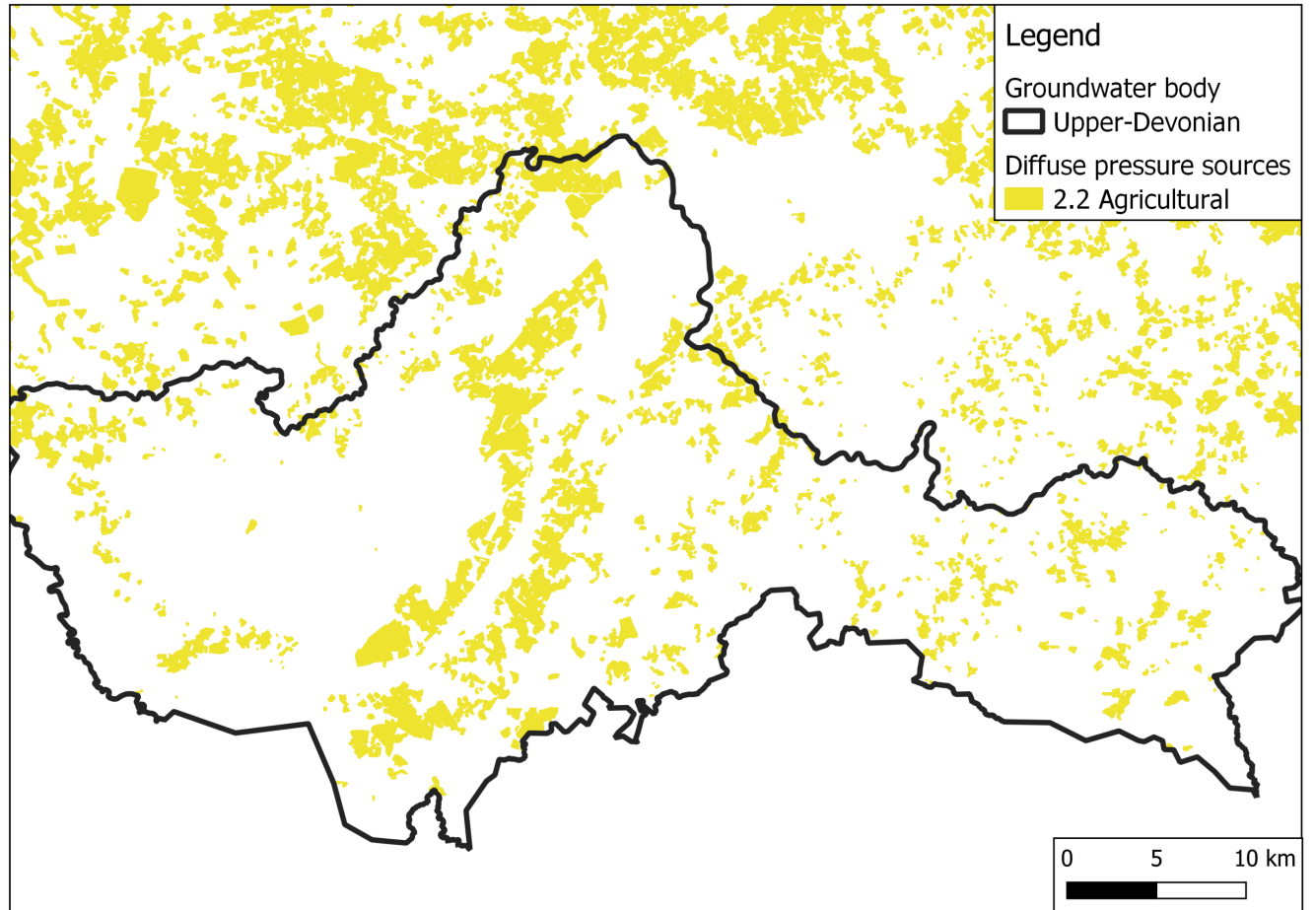
GIS analysis – point pressure sources

- The spatial query was performed to find the relation between points and areas.
- Percentage of selected areas in the groundwater body was calculated.
- The analysis was repeated for each point pressure type separately.

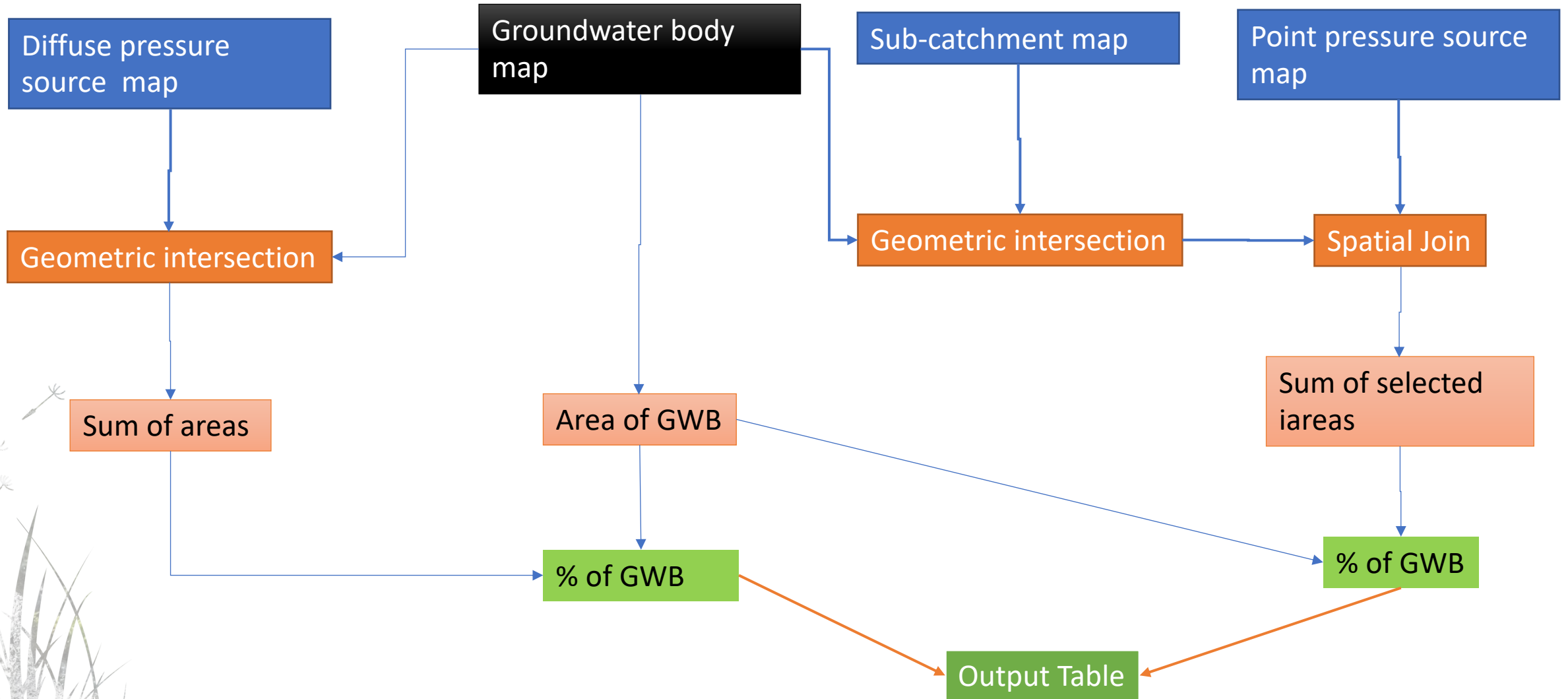


GIS analysis – diffuse pressure

- Percentage of diffuse pressure areas (example: all agricultural areas) on the groundwater body was calculated.
- The analysis was repeated for each diffuse pressure type separately.



Workflow of GIS analysis



Valuation of impact for each pressure type

- The result of the GIS analysis shows the percentage of the groundwater body area that may be affected by a particular pressure type.
- Based on GIS analysis, the impact of pressure sources for a groundwater body was assessed qualitatively in the three categories:
 - ✓ **no impact** – Pressure type affects less than **25% of GWB area.**
 - ✓ **minor impact** – pressure type affects **25-50% of GWB area**
 - ✓ **major impact** – pressure type affects **more than 50% of GWB area**

• Thank you for the attention!



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GIS analysis – Computing overlapping areas

Percentage of weakly or unprotected areas on the groundwater body was calculated using groundwater vulnerability map.

For the Upper-Devonian GWB it was less than 1%.

