

# Session 1

## Monitoring, management & EU WFD environmental goals

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UNESCO Technical Webinar - October 2020  
Guidelines for Monitoring Strategies in Transboundary Aquifers: Goals, Methods and Tools.  
The Case of the DRIN project (ALB-MTN)

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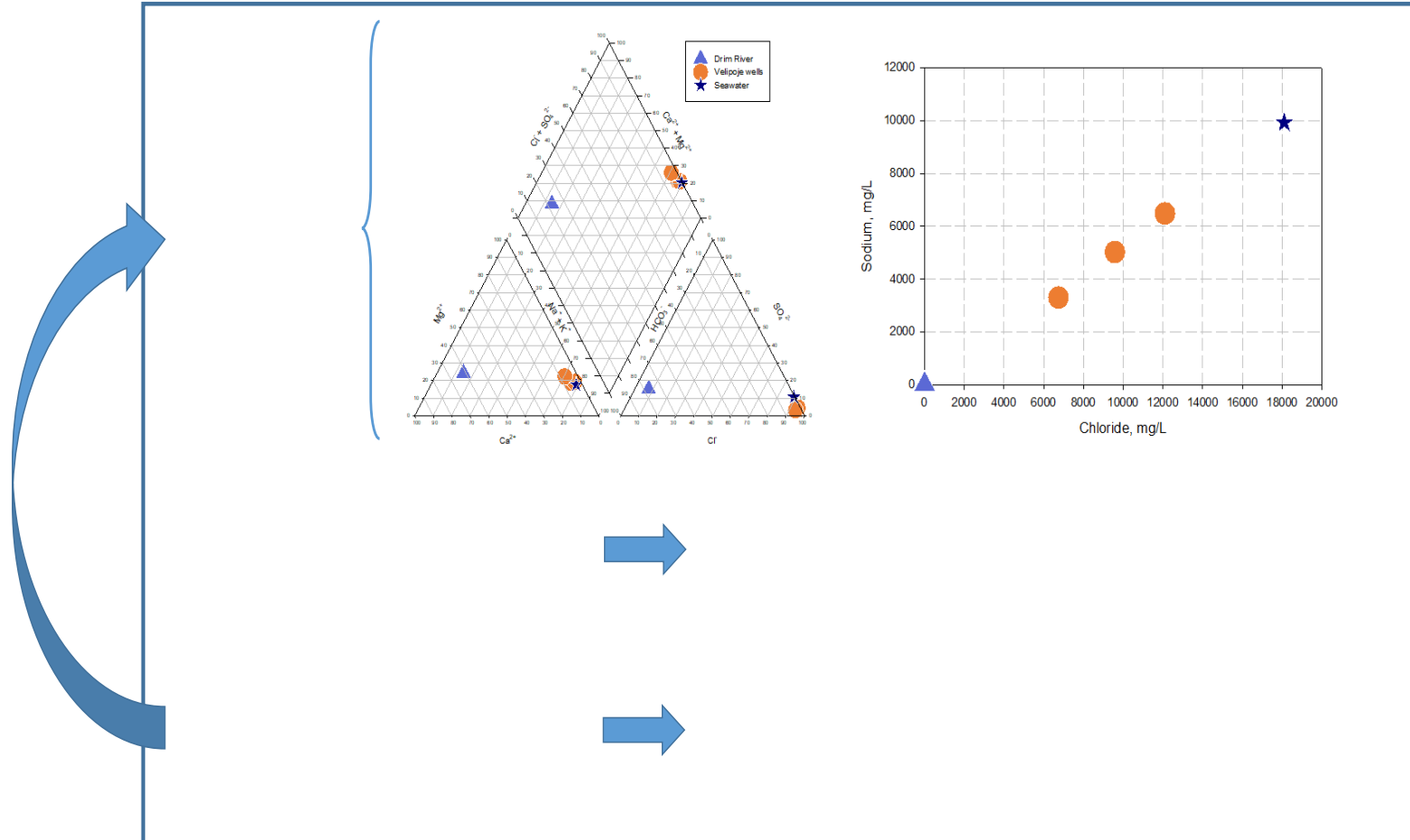
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Photos: J M-P

# 1. Justification

## Why taking data?

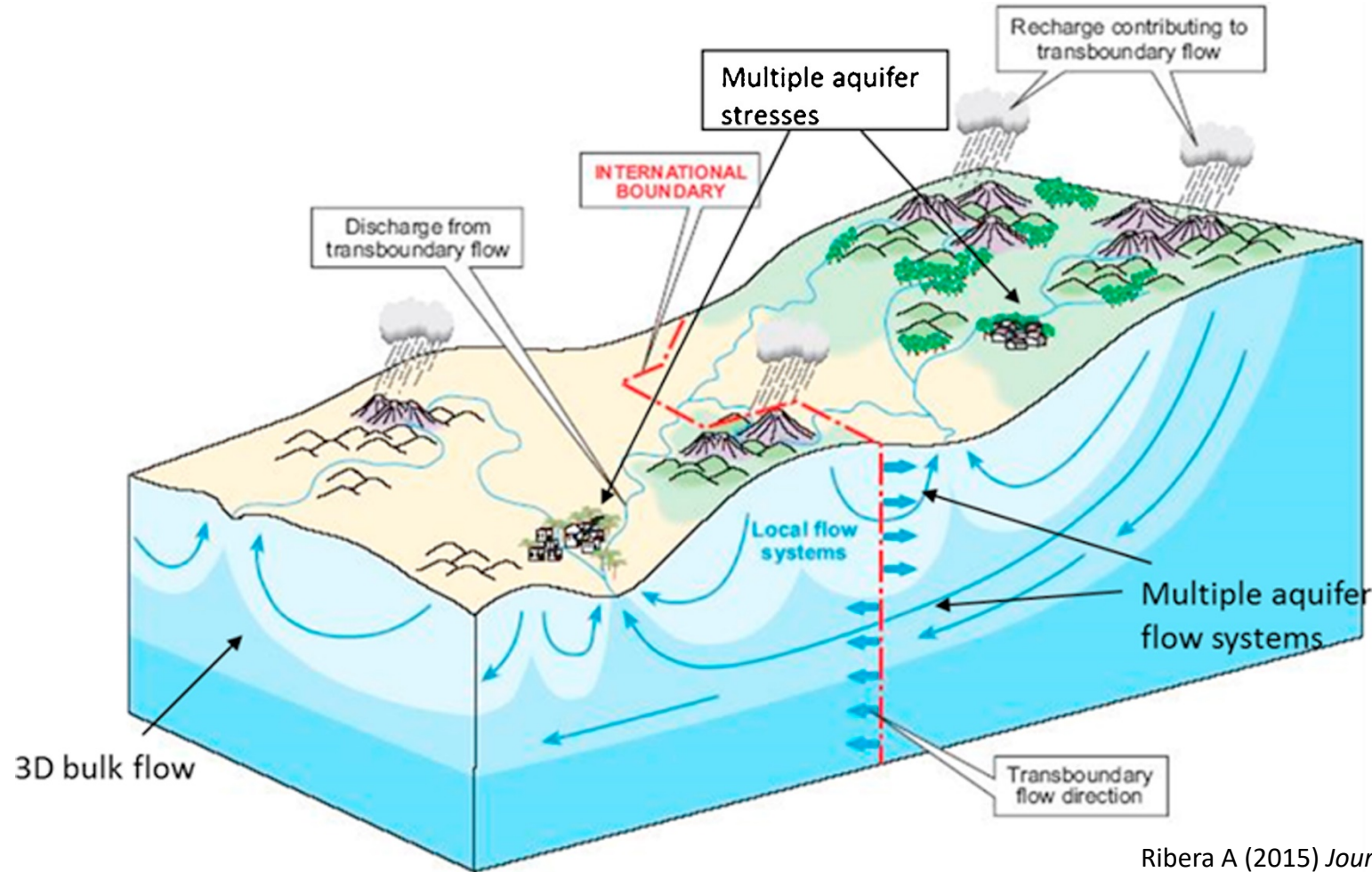


## 2. EU Water Framework Directive

Under the WFD, the **framework for groundwater protection** imposes on Member States to:

- i. Delineate groundwater bodies,
- ii. Establish a *groundwater monitoring network*
- iii. Set River Basin Management Plans, with emphasis on those that may have *transboundary effects*.

## 2. EU Water Framework Directive



Ribera A (2015) *Journal of Hydrology: Regional Studies*, 4(B): 623-643

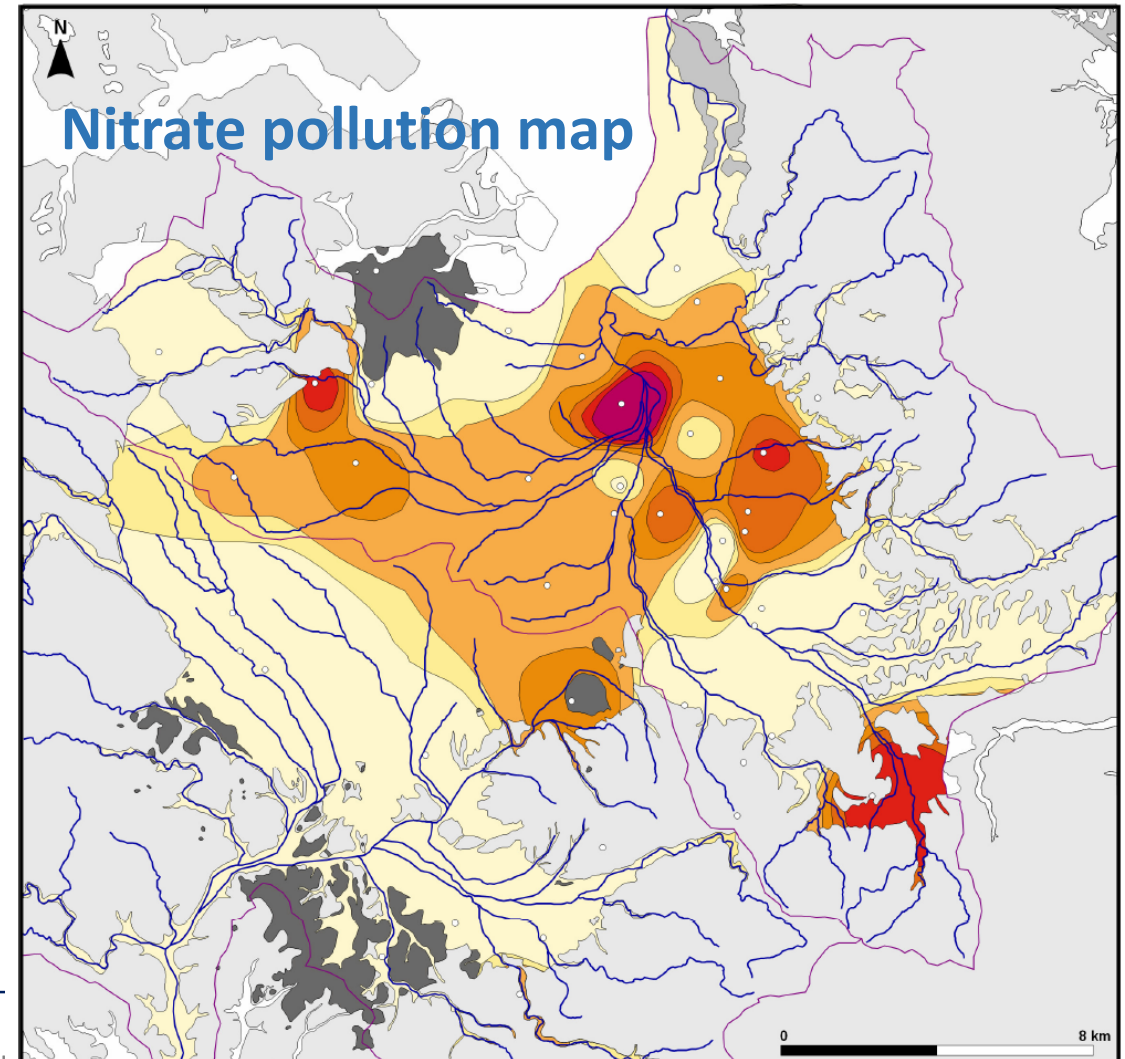
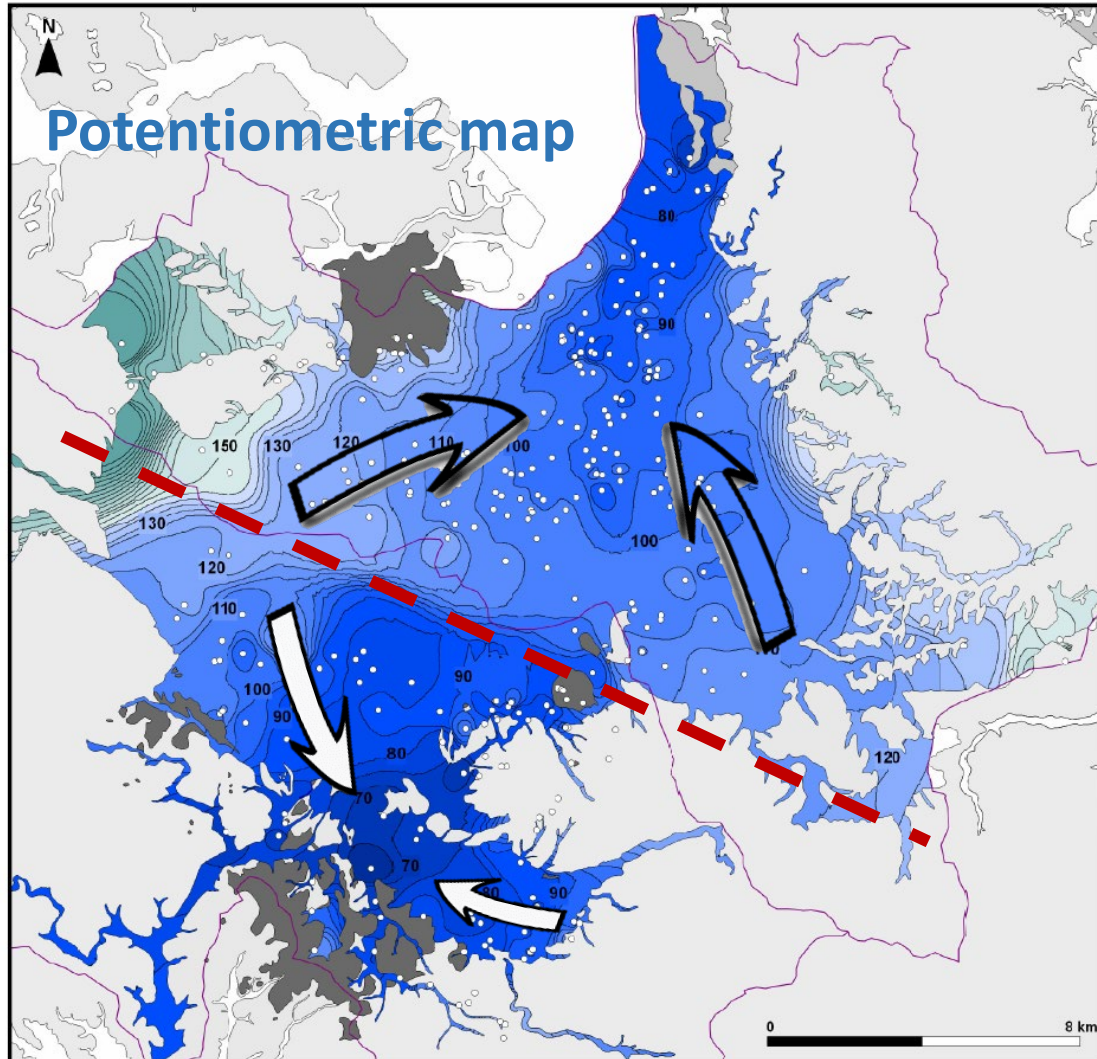


## 2. EU WFD environmental goals

Under the WFD, the **environmental goals** for groundwater bodies consist on:

- i. implementing the measures necessary to prevent or limit the input of pollutants into groundwater,
- ii. protecting, enhancing and restoring all bodies of groundwater, ensuring a balance between abstraction and recharge, with the aim of achieving good groundwater status, and
- iii. implementing the measures necessary to reverse any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity.

# 3. Which information do we look for?



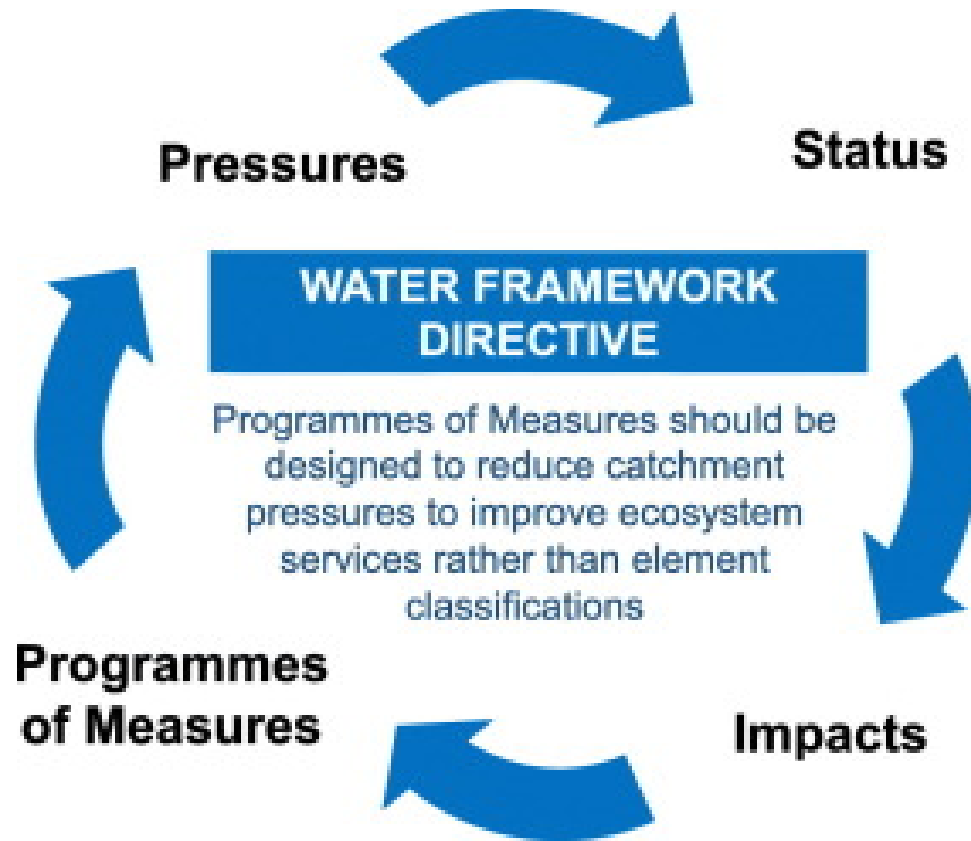
## 4. Monitoring must provide information on ...

Knowledge of GWBs must include:

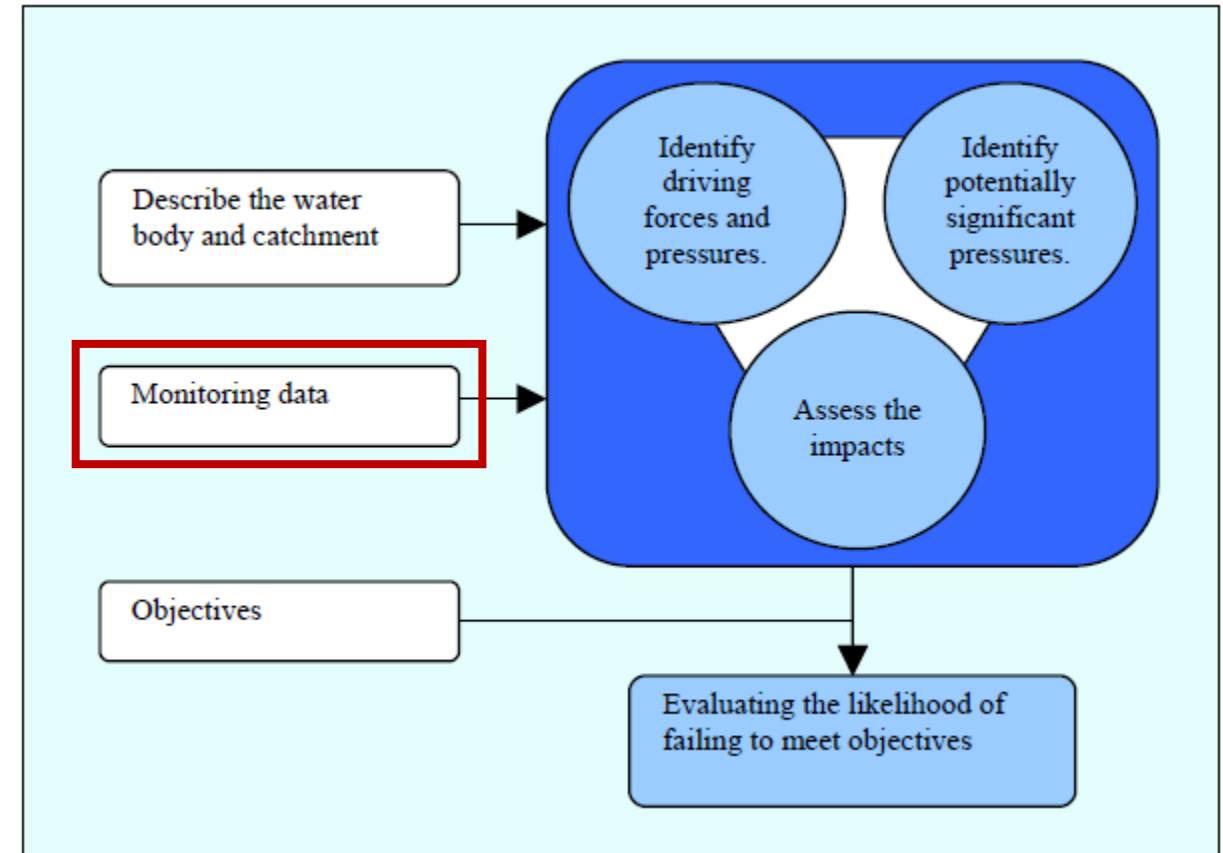
- a) Geological features of the hydrogeological system,
- b) Hydrogeological characteristics : recharge/discharge areas, regional & local flow systems, interaction surface water and groundwater, ...,
- c) Potentiometric maps under non-influenced conditions**, where possible,
- d) Natural (background) hydrochemical composition** of the aquifer (quality),
- e) Human **pressures** affecting quantitative and qualitative status of the GWBs (Table 1). Concept of over-exploitation,
- f) Measure impacts derived from the identified pressures.**



# 5. Pressures vs Impacts



Giakoumis T, Voulvoulis N (2019). *Science of The Total Environment*, 668: 903-916



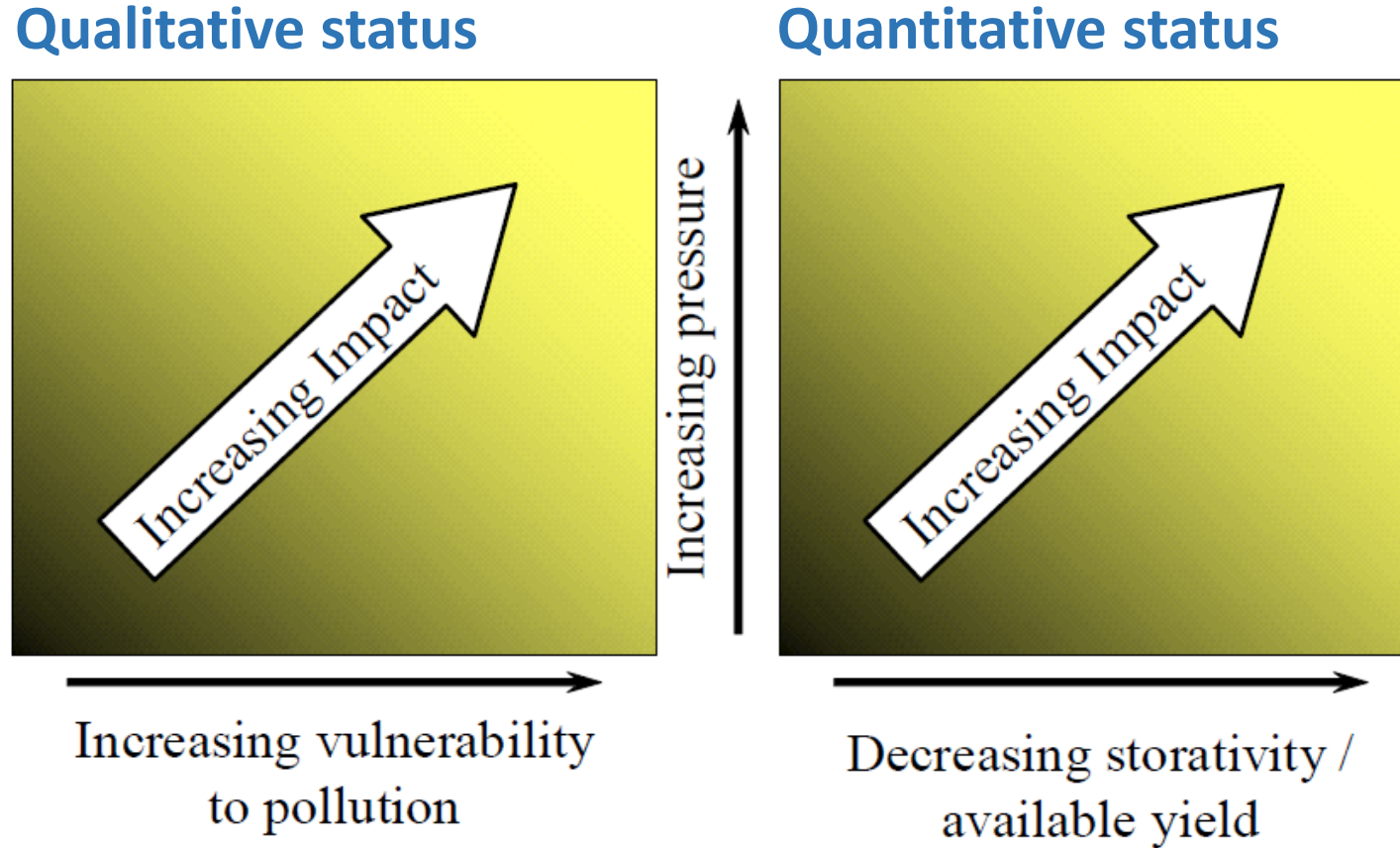
COMMON IMPLEMENTATION STRATEGY FOR THE WATER FRAMEWORK DIRECTIVE (2000/60/EC) Guidance Document No 3, Analysis of Pressures and Impacts, 2003

# 5. Pressures & Impacts

Term	Definition
Driver	an anthropogenic activity that may have an environmental effect (e.g. agriculture, industry)
Pressure	the direct effect of the driver (for example, an effect that causes a change in flow or a change in the water chemistry)
State	the condition of the water body resulting from both natural and anthropogenic factors (i.e. physical, chemical and biological characteristics)
Impact	the environmental effect of the pressure (e.g. fish killed, ecosystem modified)
Response	the measures taken to improve the state of the water body (e.g. restricting abstraction, limiting point source discharges, developing best practice Guidance for agriculture)

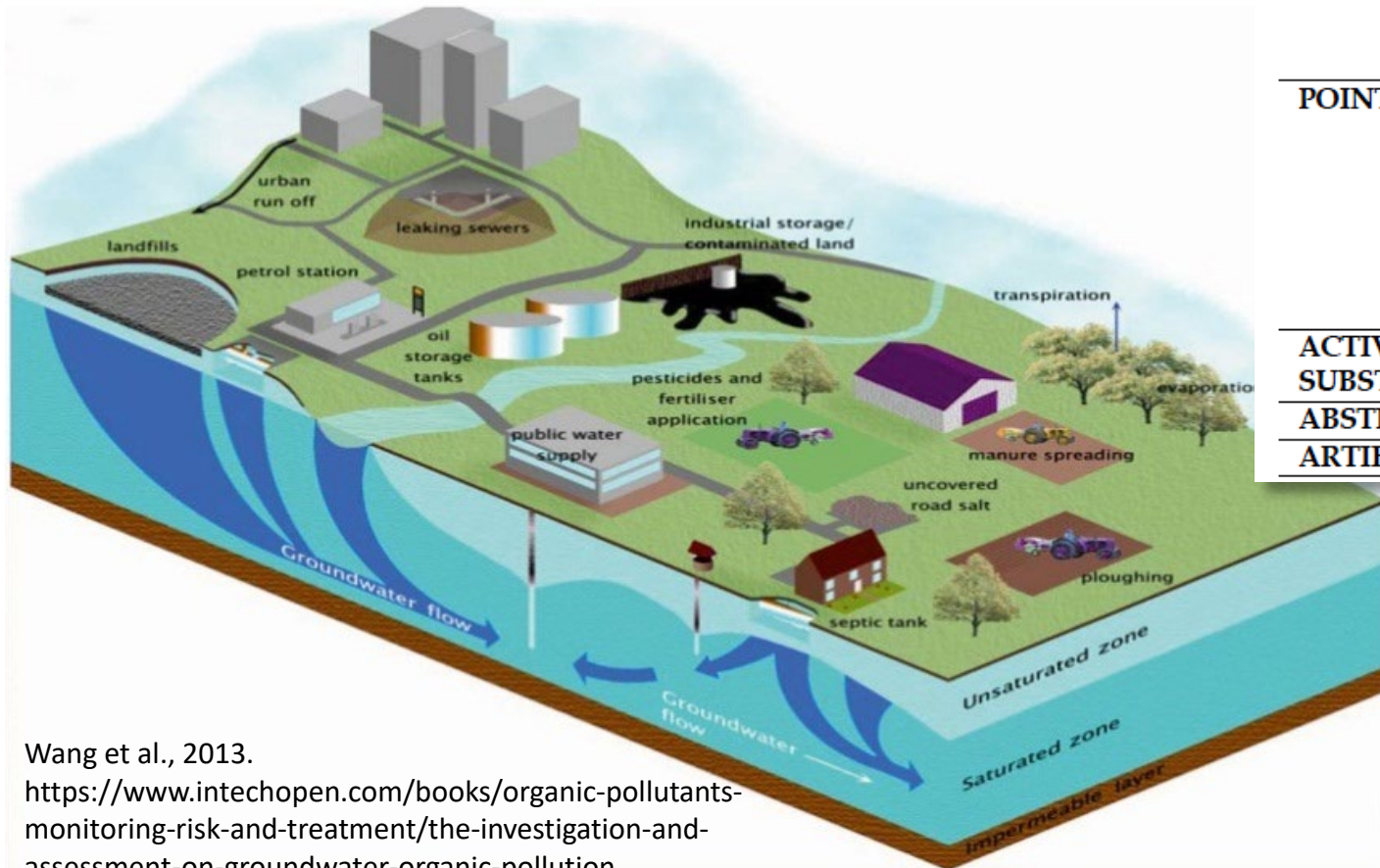
COMMON IMPLEMENTATION STRATEGY FOR THE WATER FRAMEWORK DIRECTIVE (2000/60/EC) Guidance Document No 3, Analysis of Pressures and Impacts, 2003

# 5. Pressures & Impacts



COMMON IMPLEMENTATION STRATEGY FOR THE WATER FRAMEWORK DIRECTIVE (2000/60/EC) Guidance Document No 3, Analysis of Pressures and Impacts, 2003

# 6. Types of pressures



Wang et al., 2013.  
<https://www.intechopen.com/books/organic-pollutants-monitoring-risk-and-treatment/the-investigation-and-assessment-on-groundwater-organic-pollution>

DIFFUSE SOURCE	urban drainage (including runoff) agriculture diffuse forestry other diffuse
POINT SOURCE	waste water industry mining contaminated land agriculture point waste management aquaculture
ACTIVITIES USING SPECIFIC SUBSTANCES	manufacture, use and emissions from all industrial/agricultural sectors
ABSTRACTION	reduction in flow
ARTIFICIAL RECHARGE	groundwater recharge

COMMON IMPLEMENTATION STRATEGY FOR THE WATER FRAMEWORK DIRECTIVE (2000/60/EC) Guidance Document No 3, Analysis of Pressures and Impacts, 2003



# 7. Examples

## Agriculture: diffuse pressure



Photos: J M-P



# 7. Examples

## Industry: point or diffuse pressure



Photos: J M-P



# 7. Examples

## Urban activity: point pressure



<https://kleenkuip.wordpress.com/2011/05/29/carpet-cleaning-wastewater-dumping/>



<https://envirotecmagazine.com/2018/03/22/student-dissertation-adds-detail-to-landfill-mining-feasibility/>



# 7. Examples

## Gravel mining: point pressure



[https://www.researchgate.net/figure/Gravel-and-sand-mining-of-the-Comoro-River\\_fig3\\_272792835](https://www.researchgate.net/figure/Gravel-and-sand-mining-of-the-Comoro-River_fig3_272792835)

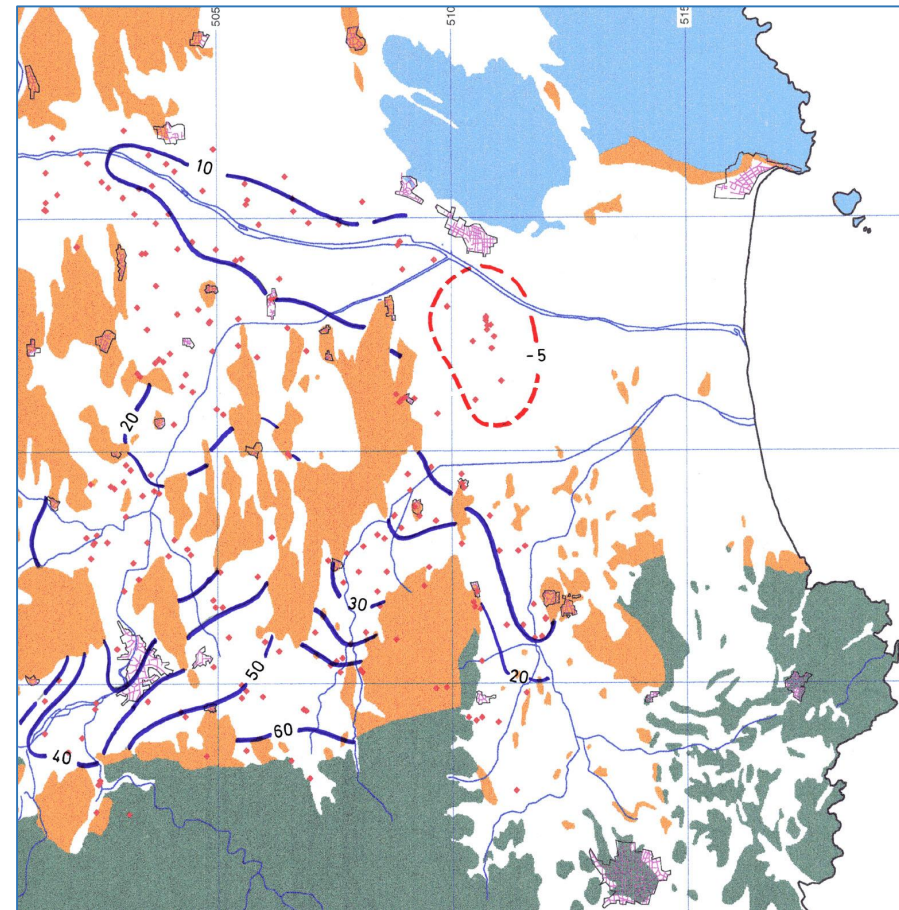
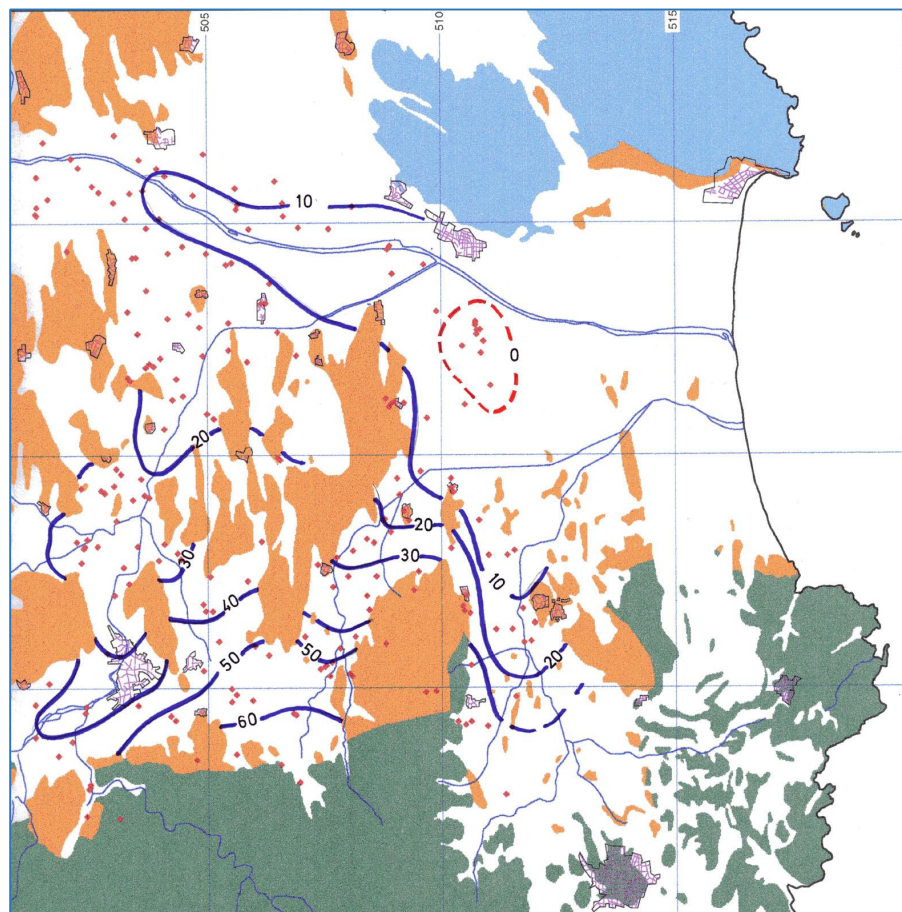


Photo: J M-P



# 7. Examples

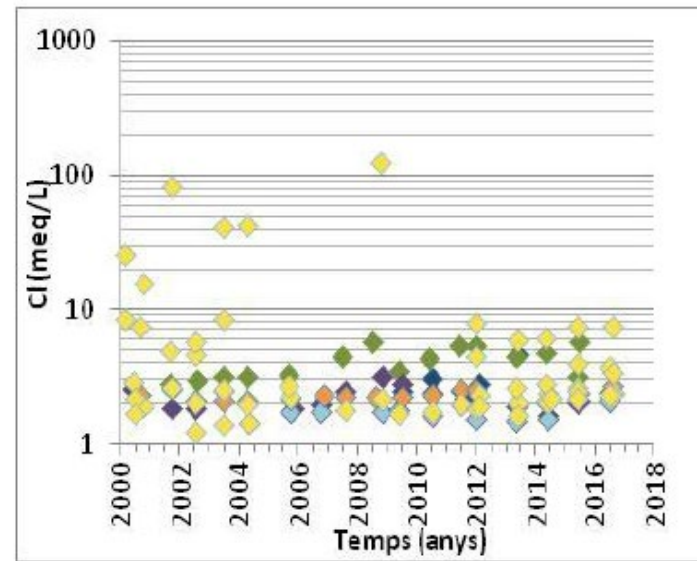
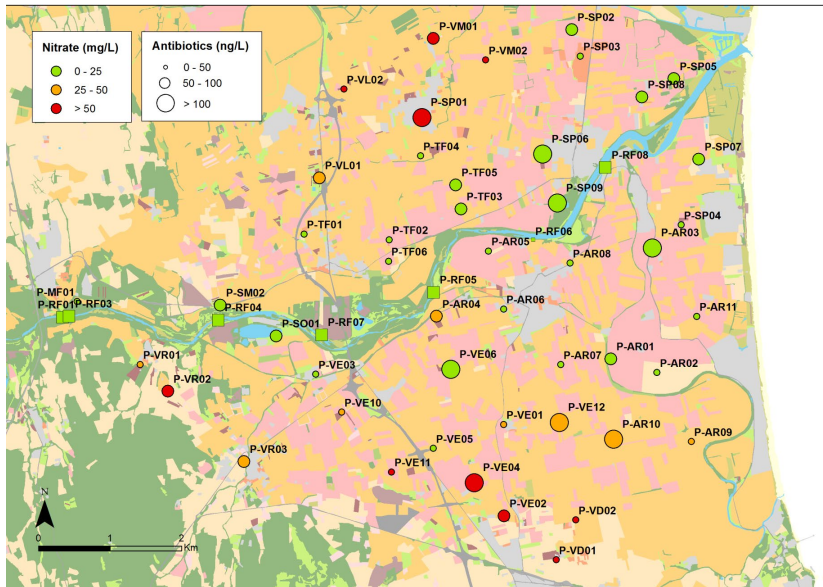
## GW withdrawal: point pressure



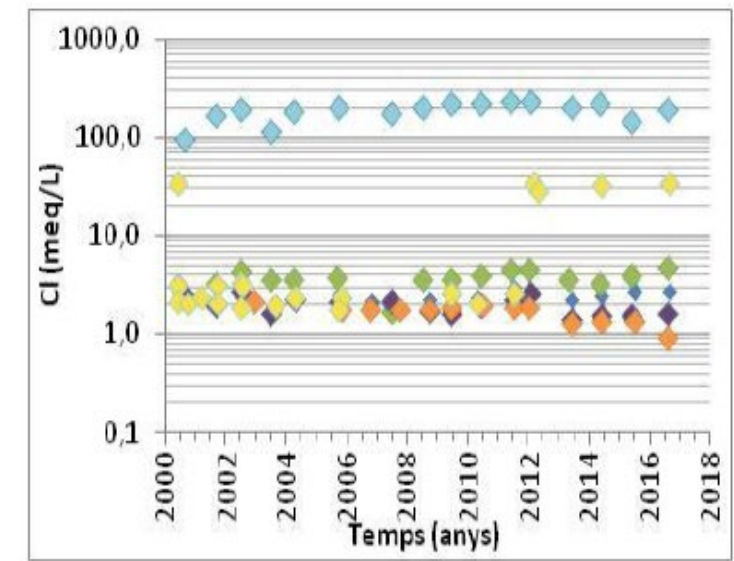
Source: Mas-Pla, J, unpublished

# 8. So ... what must monitoring consider?

1. Characterize background head/concentration
2. Identify the type, extend and magnitude of the impact
3. Identify trends on the impact progress



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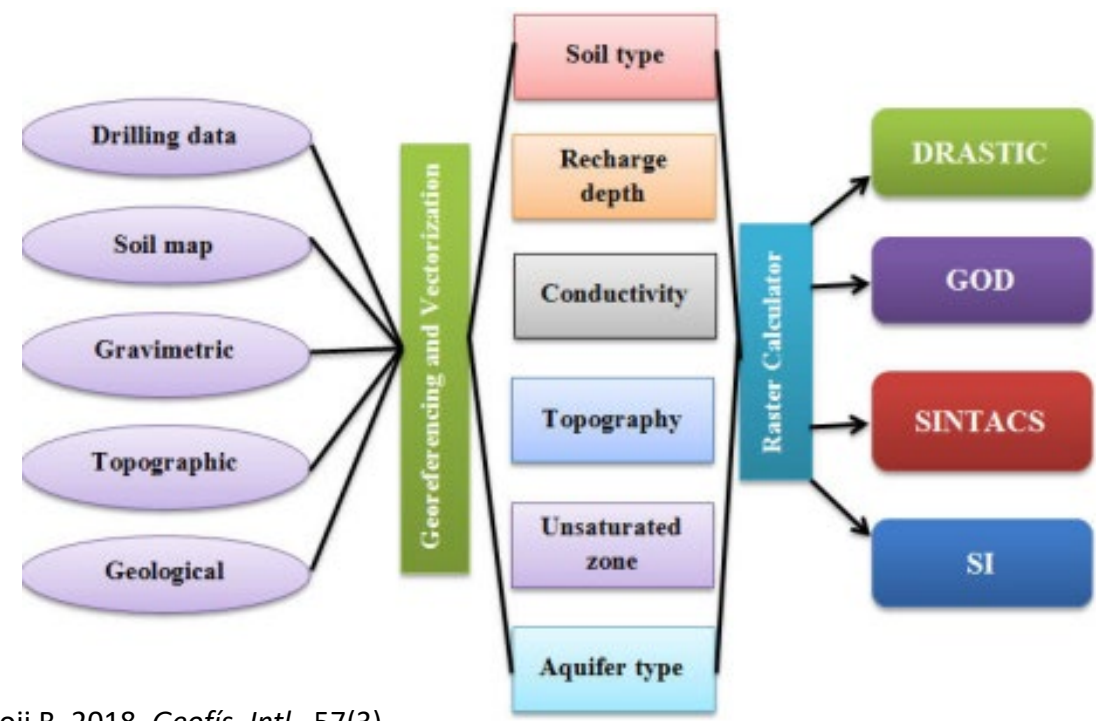
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Source: Mas-Pla, J, unpublished

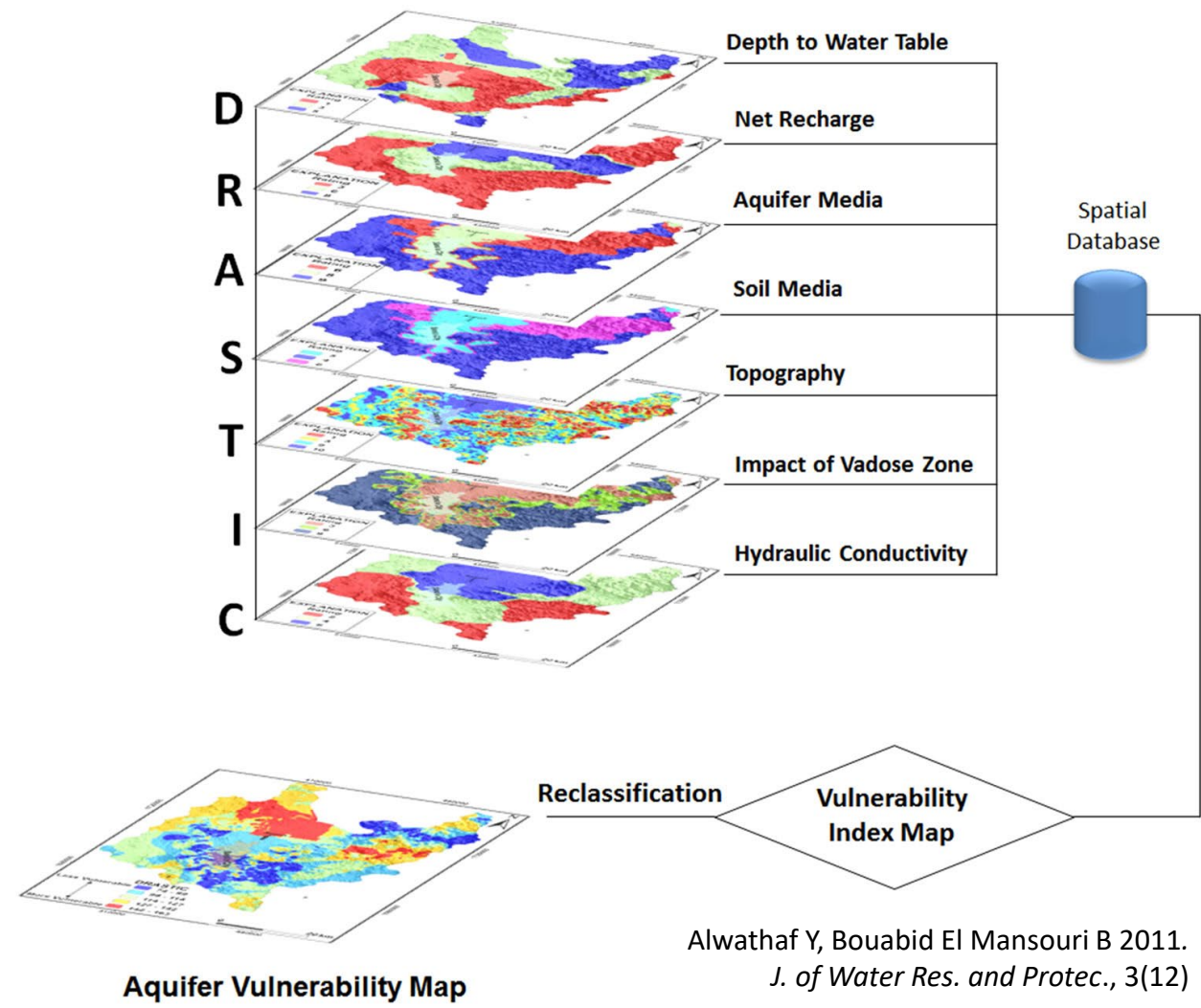


# 9. Tools to detect impacts

## GW vulnerability maps



Oroji B. 2018, *Geofis. Intl.*, 57(3)



Alwathaf Y, Bouabid El Mansouri B 2011.  
*J. of Water Res. and Protec.*, 3(12)

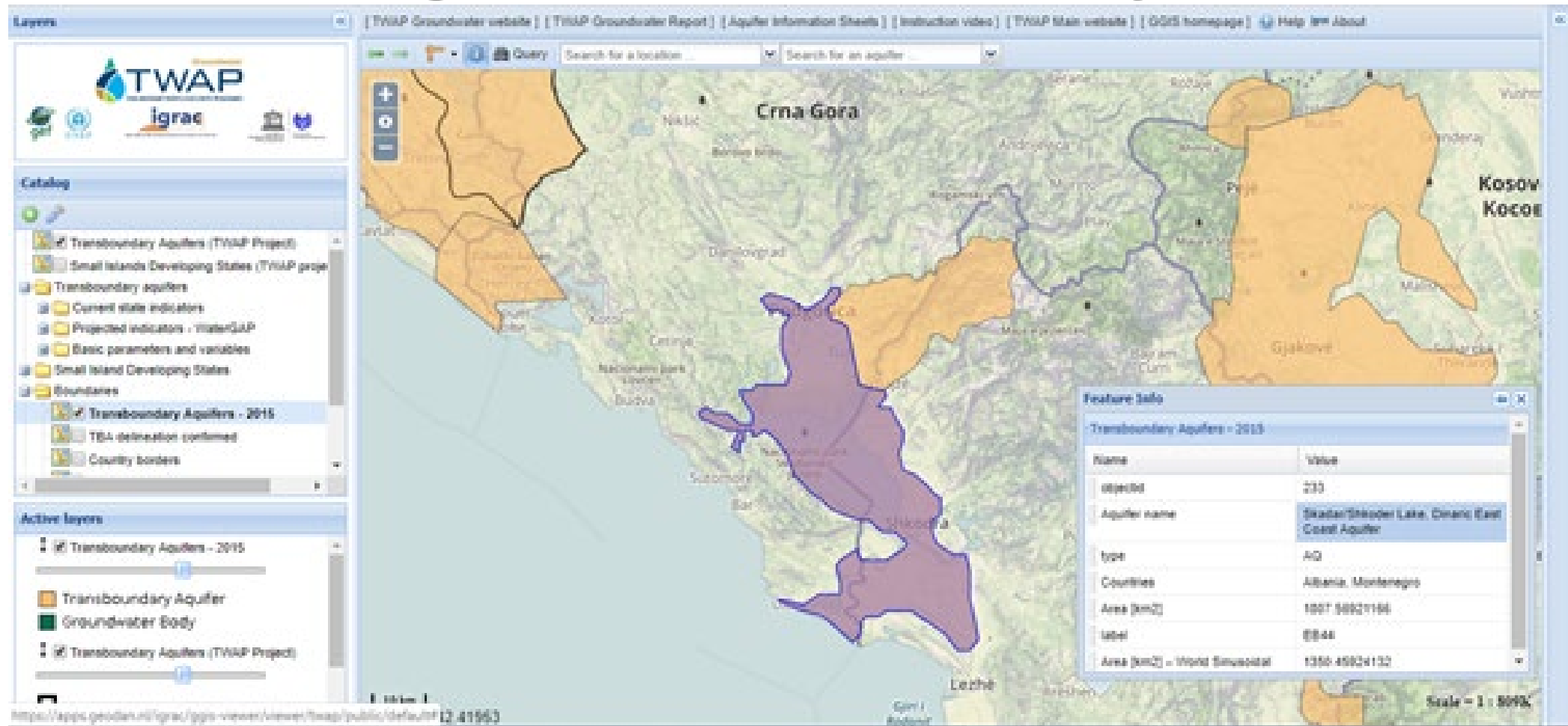
# 10. Monitoring in transboundary zones

The goal on transboundary zones is to define a **rational monitoring network and program** for selected aquifers where conflicts may come out. Such networks will permit both countries attaining the WFD goals by obtaining the **necessary data to support management plans**.

These plans must be actually focused to **solve the main pressures** and impacts that presently affect these hydrogeological areas and obstruct the achievement of the WFD environmental objectives.



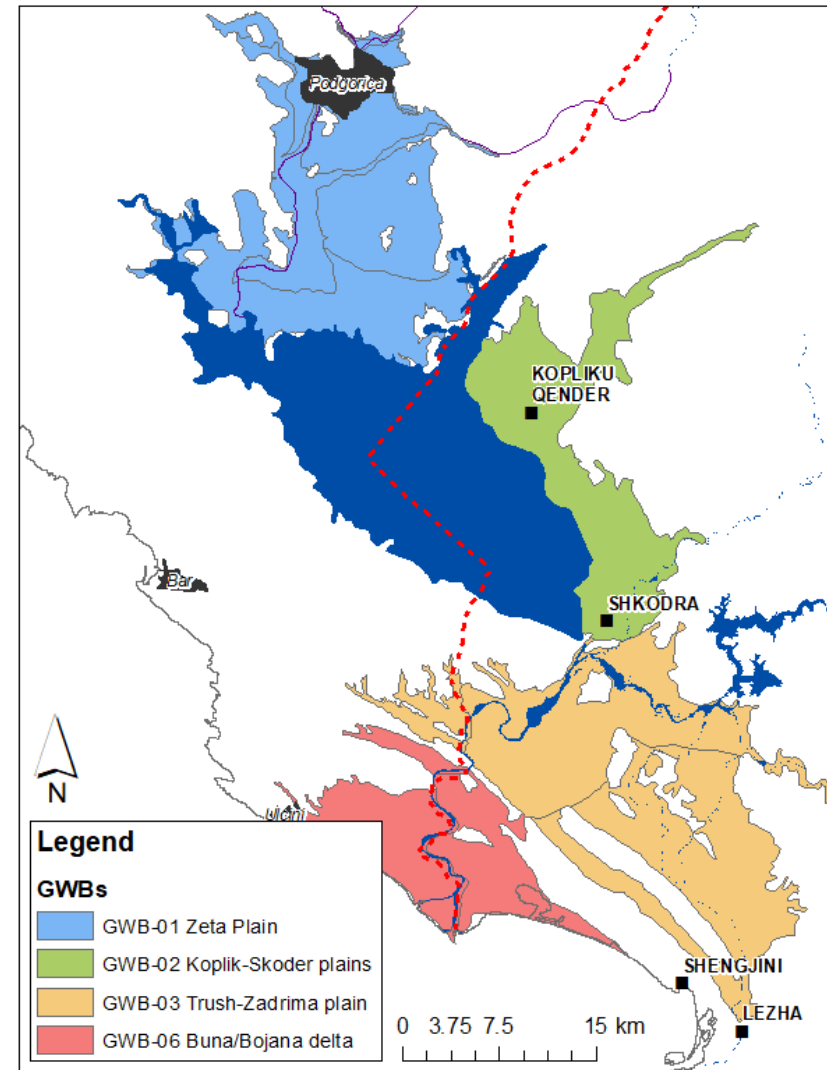
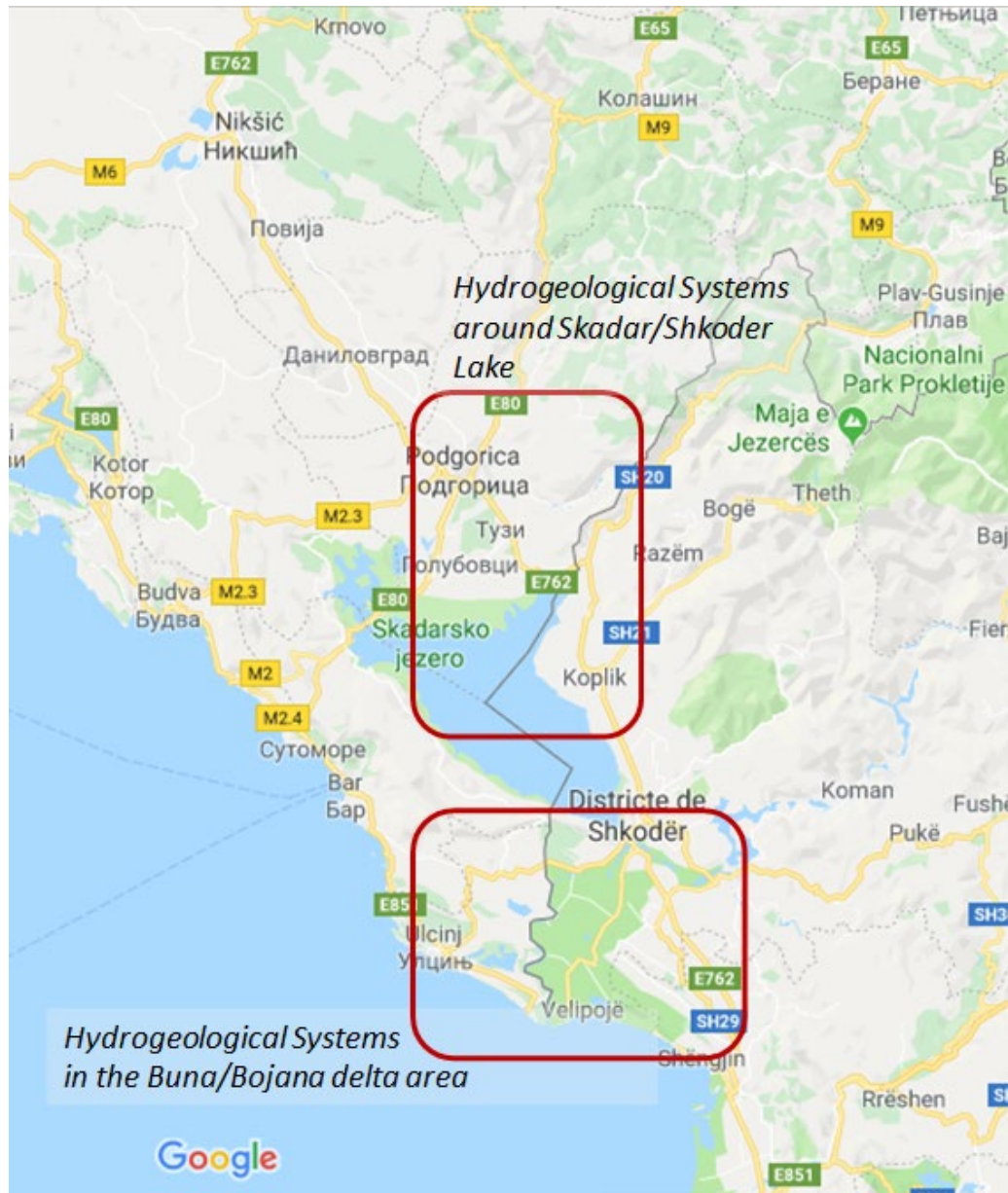
# 10. Monitoring in transboundary zones



<https://www.un-igrac.org/special-project/twap-groundwater>

## 11. Real case

# The case of the Skadar/Shkoder - Buna/Bojana transboundary aquifer



Del Val L, Mas-Pla J, 2019. Drin Project. UNESCO

Area	Point source pollution	Diffuse pollution	Change in water levels due to abstraction
<b>Skadar Lake area:</b>			
<b>Zeta Plain (MTN)</b>	<ul style="list-style-type: none"> <li>✓ Aluminium production facility.</li> <li>✓ Food-processing and plastic industries as potential pollution focuses.</li> <li>✓ Gravel mining along Morača River.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Fertilization (nutrients and pesticides) in cereal and forage crops using slurries and manures (not in vineyards).</li> <li>✓ Stream recharge due to well capture zones, depending on the Morača River quality potentially affected by wastewater dumping (urban drainage) and leaking septic systems.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Water abstraction in Podgorica urban area (MTN).</li> <li>✓ Water abstraction due to agricultural activity (MTN).</li> </ul>
<b>Koplik-Shkodër Plain (ALB)</b>		<ul style="list-style-type: none"> <li>✓ Fertilization in cereal and forage crops using slurries and manures</li> </ul>	
<b>Buna/Bojana River area:</b>			
<b>Trush – Zadrima Basin (ALB, MTN)</b>	<ul style="list-style-type: none"> <li>✓ Landfill near Shkjezë (ALB).</li> <li>✓ Saski Lake has been reported to show high heavy metal concentrations.</li> <li>✓ Gravel mining along the Drin River left-bank, near Ashtë (ALB).</li> <li>✓ Pollution from septic systems and network (where existing).</li> </ul>	<ul style="list-style-type: none"> <li>✓ Fertilization in cereal and forage crops using slurries and manures (ALB, MTN).</li> </ul>	<ul style="list-style-type: none"> <li>✓ Well field near Fshati i Ri for urban supply (ALB).</li> <li>✓ Overpumping for agricultural demand (ALB).</li> </ul>
<b>Buna/Bojana delta area (ALB, MTN)</b>	<ul style="list-style-type: none"> <li>✓ Leakage from salt production ponds (ALB, MTN).</li> </ul>	<ul style="list-style-type: none"> <li>✓ Fertilization (nutrients, especially P, and pesticides) in cereal and forage crops using slurries and manures (ALB, MTN).</li> <li>✓ Stream recharge due to well capture zones affected by wastewater dumping (urban drainage).</li> <li>✓ Non-farmed stock breeding (ALB).</li> </ul>	<ul style="list-style-type: none"> <li>✓ Domestic and agriculture wells near the coastline in Velipojë (ALB) and Doni Štoj (MTN): effects on wetlands and lagoons due to head level decline, and drivers of seawater intrusion.</li> <li>✓ Saline water in karstic springs (Gac spring).</li> <li>✓ River salinization.</li> </ul>

Del Val L, Mas-Pla J, 2019. Drin Project. UNESCO



# Thank you!

Enabling  
& Transboundary Cooperation  
Integrated Water Resources Management  
in the extended **DRIN RIVER BASIN**



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