

# Team 05 Presentation 3

## Presentation 3: Results of 2<sup>nd</sup> Week



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# Aims & Objectives

***“Modeling the effect of accidental water pollution in the lower Var during a storm”***

## Objectives

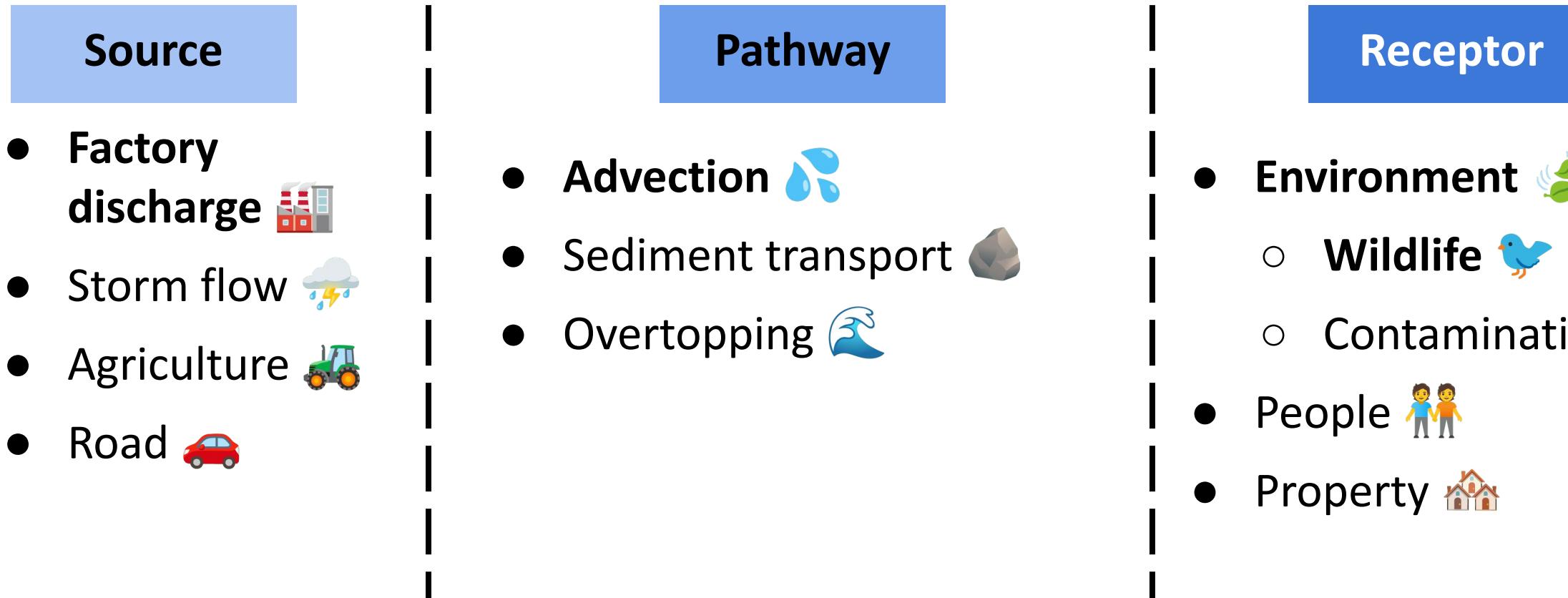
- Identify Source-Pathway-Receptor
- Model the pathway
- Quantify impacts on Receptors



# Source-Pathway-Receptor



# Source-Pathway-Receptor



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Var Catchment

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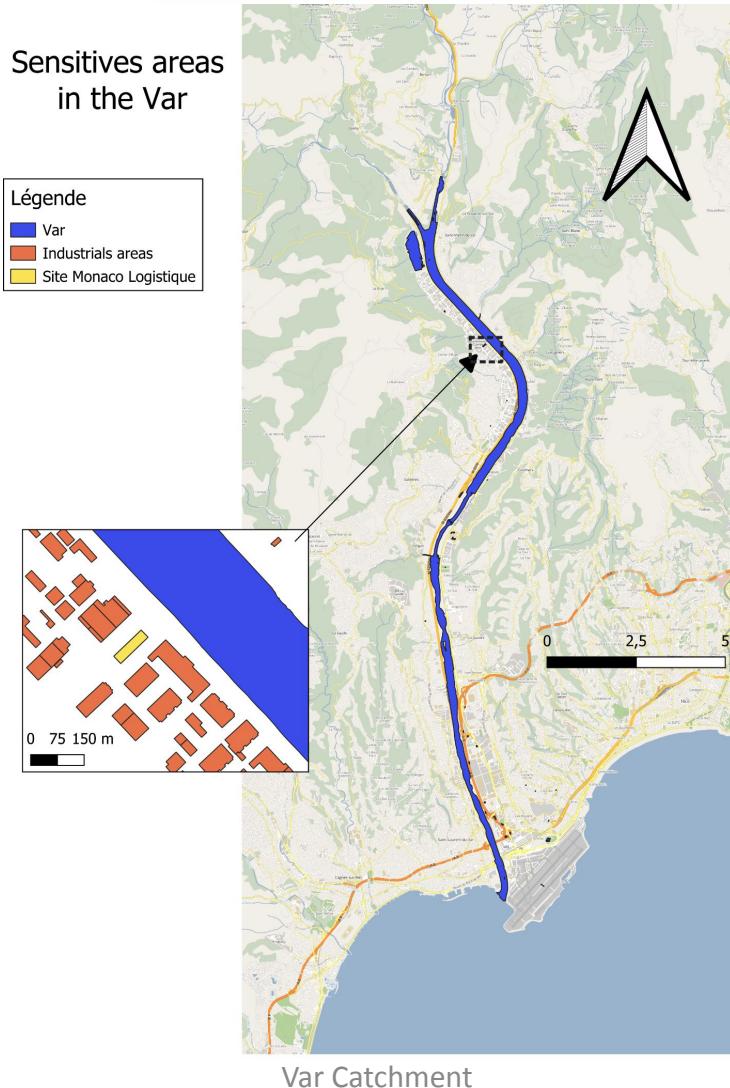
# Source



Sensitives areas  
in the Var

Légende

- Var
- Industrials areas
- Site Monaco Logistique



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# Source



NO	Pollutant Name	Chemical Name	Concentration	Total Approximation
1	Nutrients & Agricultural Pollutants	Nitrate (NO <sub>3</sub> <sup>-</sup> )	50.0 mg/L	50 mg/L
2	Organic Pollutants (Chemical Oxygen Demand Components)			125 mg/L
3	Hydrocarbons			1 mg/L
4	Heavy Metals	Lead (Pb)	0.1 mg/L	2 mg/L
5	Other Industrial & Wastewater Pollutants			11 mg/L

Pollutant	Discharge Limit	Source
Suspended Solid (SS)	20 mg/L	Decree of July 15, 2015
Nitrates (NO <sub>3</sub> <sup>-</sup> )	15 mg/L	Directive 98/93 and Decree of July 15, 2015
Nitrite (NO <sub>2</sub> <sup>-</sup> )	0.5 mg/L	Directive 98/93
Silver (Ag)	0.1 µg/L	Directive 98/93
Lead (Pb)	10 µg/L	Directive 98/93



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# Pathway

- Direct Infiltration

- Stormwater Runoff

- Retention in Subsoil

- Transport Networks

- Old Industrial Sites

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# Receptor

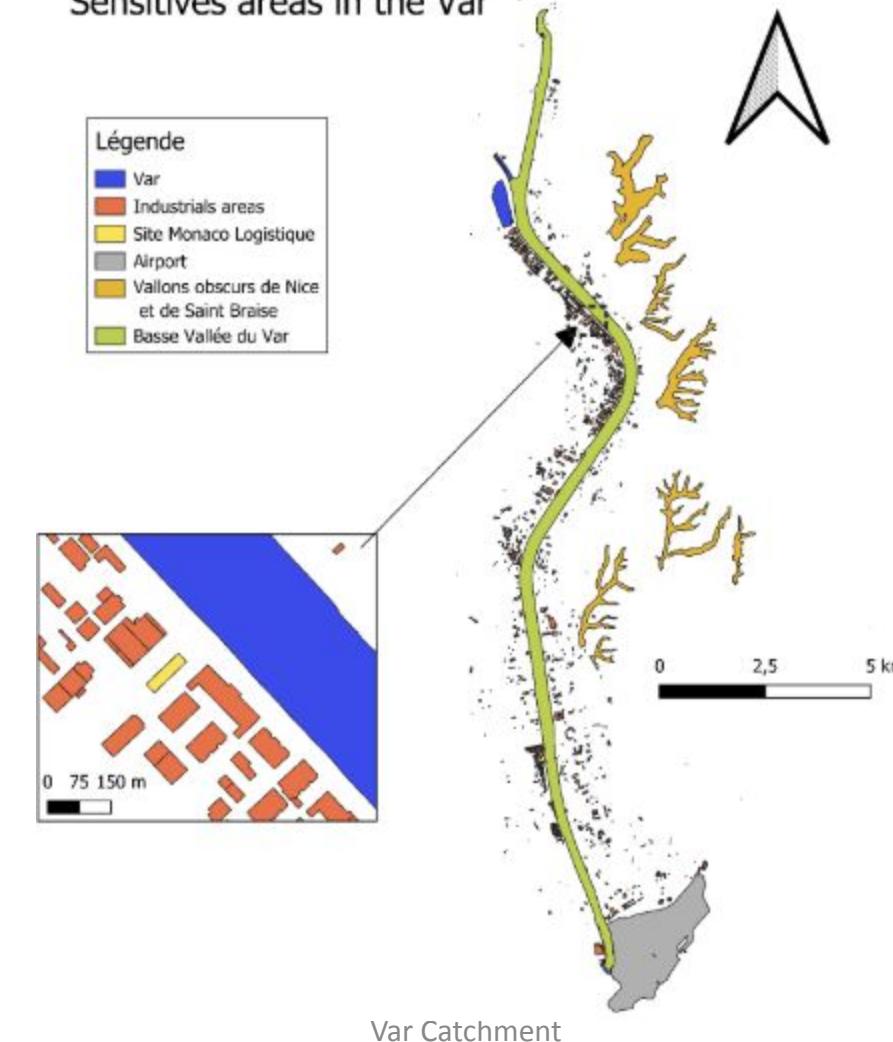


The EU Natura 2000 identifies 2 sites:

1. “Basse Vallée du Var”
2. “Vallons obscurs de Nice et de Saint Braise”

- Nearly **200** bird species.
- A vital stopover, nesting, and wintering site for waterfowl, raptors, and migratory birds.

Sensitives areas in the Var



- The Vallons Obscurs of Nice and Saint-Braise are steep, urban-adjacent areas hosting rich biodiversity and sensitive **wetland** habitats.
- Approximately **350,000 people** live downstream from the plant.
- **1740** different industrial buildings are near to the Var



# Modelling

## Scenarios

*Historical events*

*Future climate impacts*

*“Business as usual”*

## Pathway modelling

*Coupled HEC-RAS  
1D+2D*

*Telemac 2D*

*Pollutant extent*

*Pollutant duration*

## Impacts

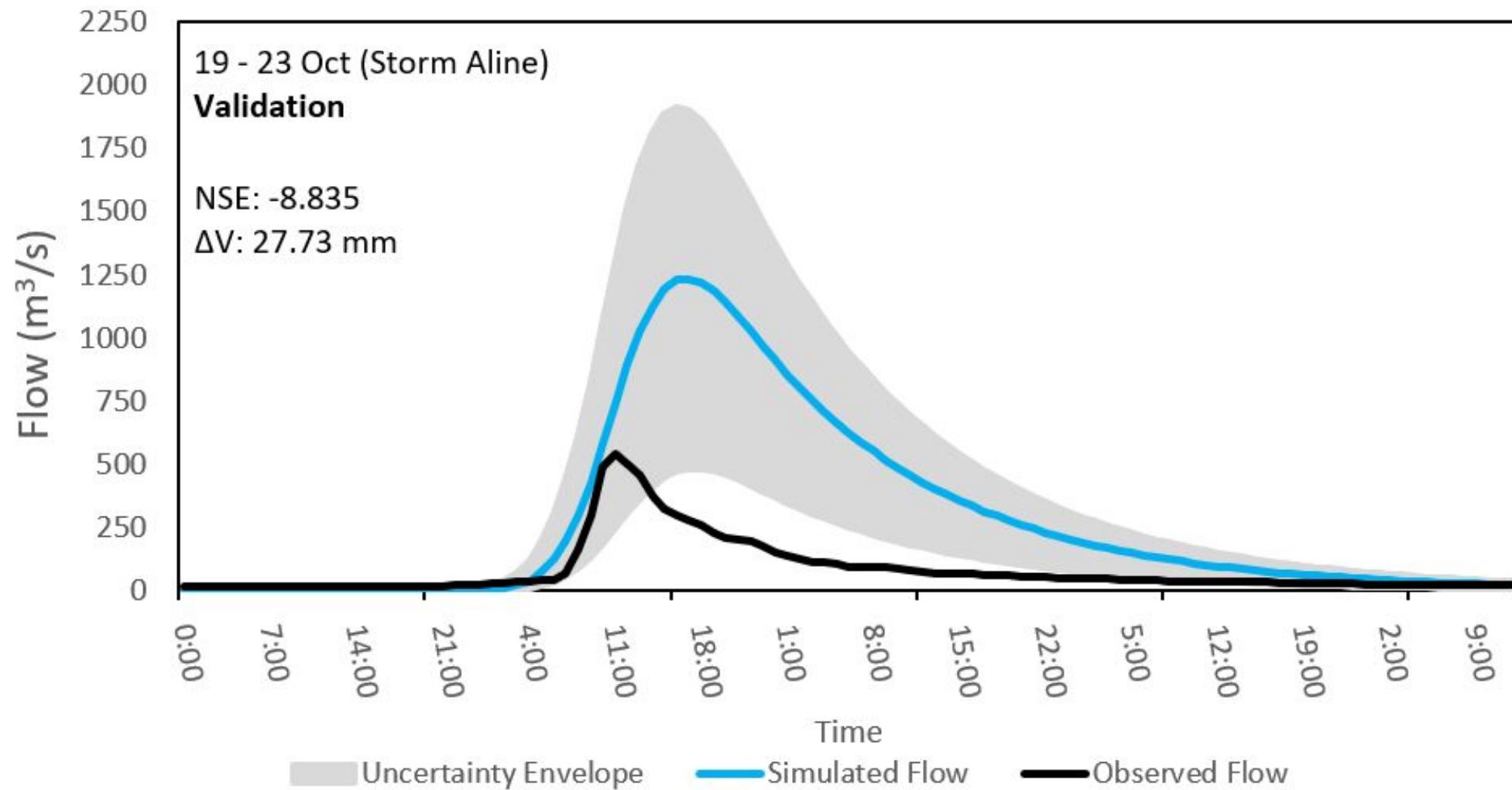
*Property damage*

*NATURA 2000*

*Karst contamination*

# HEC-HMS

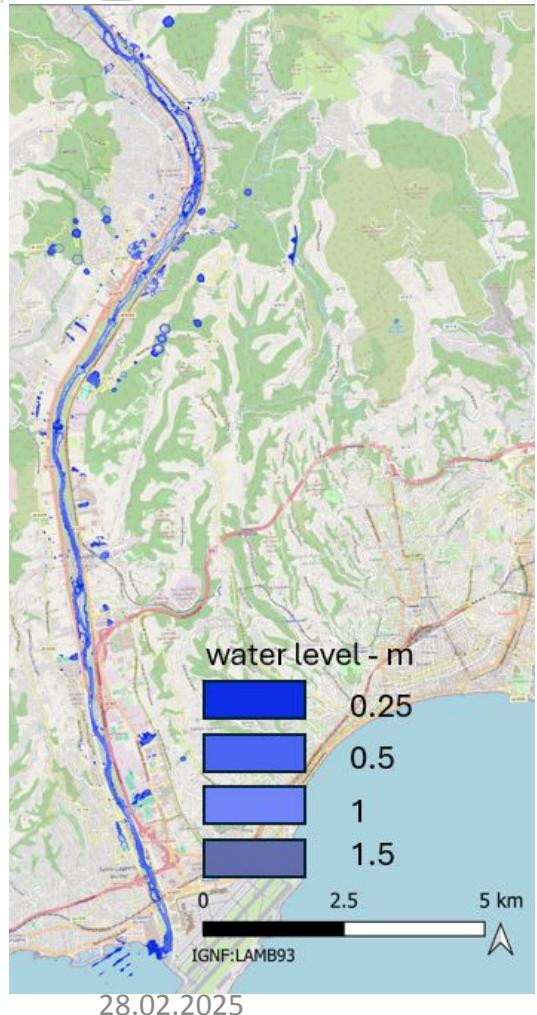
## Napoleon-III Station Flow Simulation - Gridded-CN Subbasins





# Telemac results

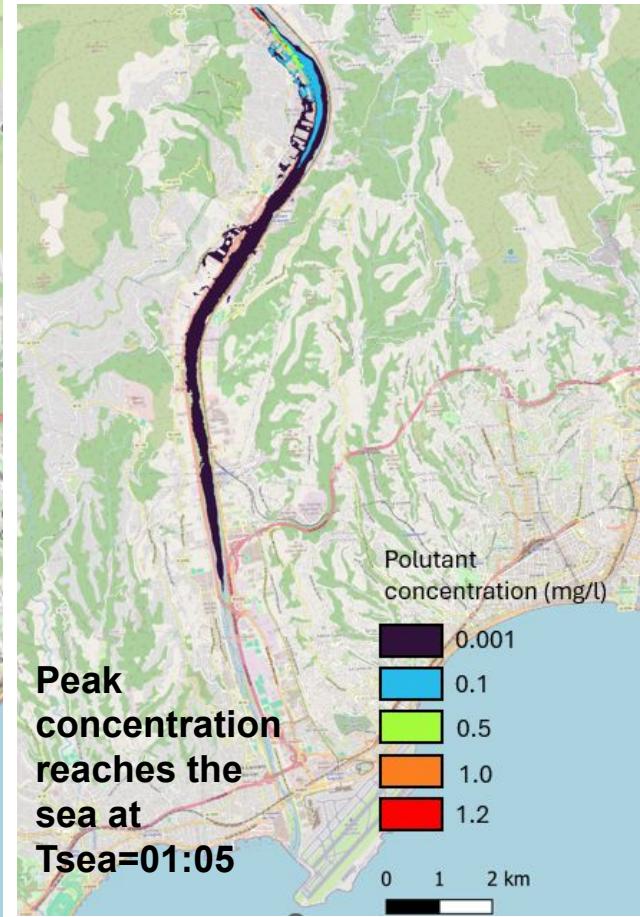
Steady case

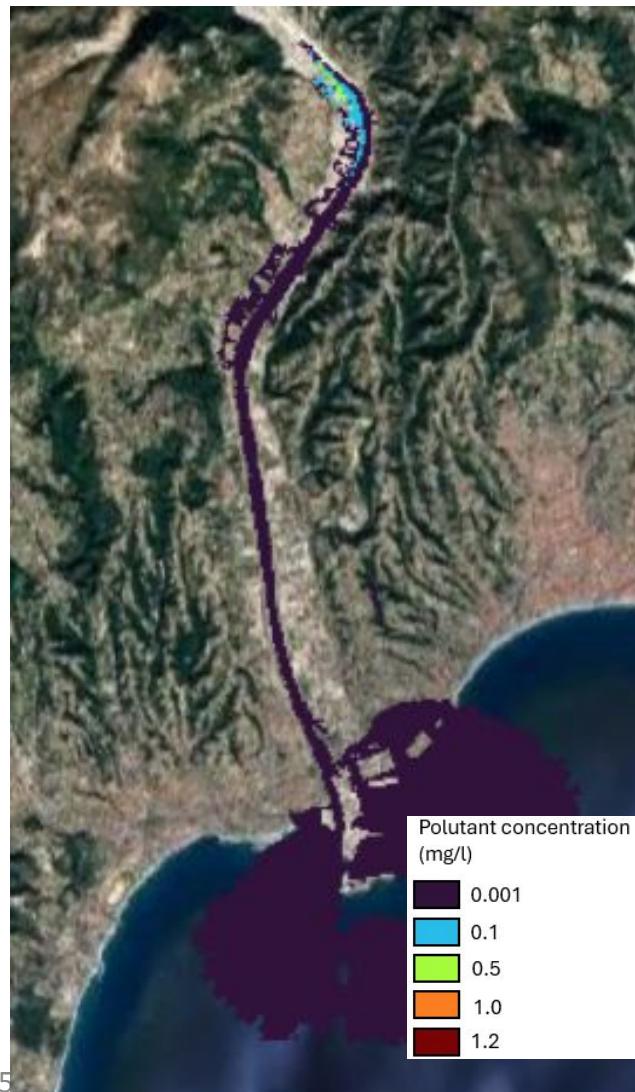


25m resolution

Pollutant concentration 500 mg/L at 0.3m<sup>3</sup>/s

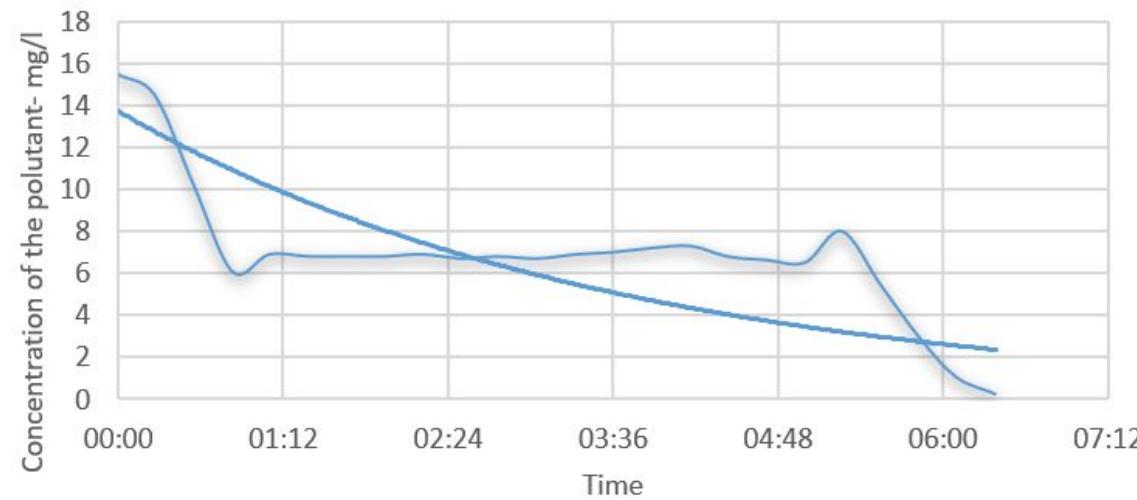
Unsteady 2020 case (flood peak)





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## Change in pollutant concentration as a function of time



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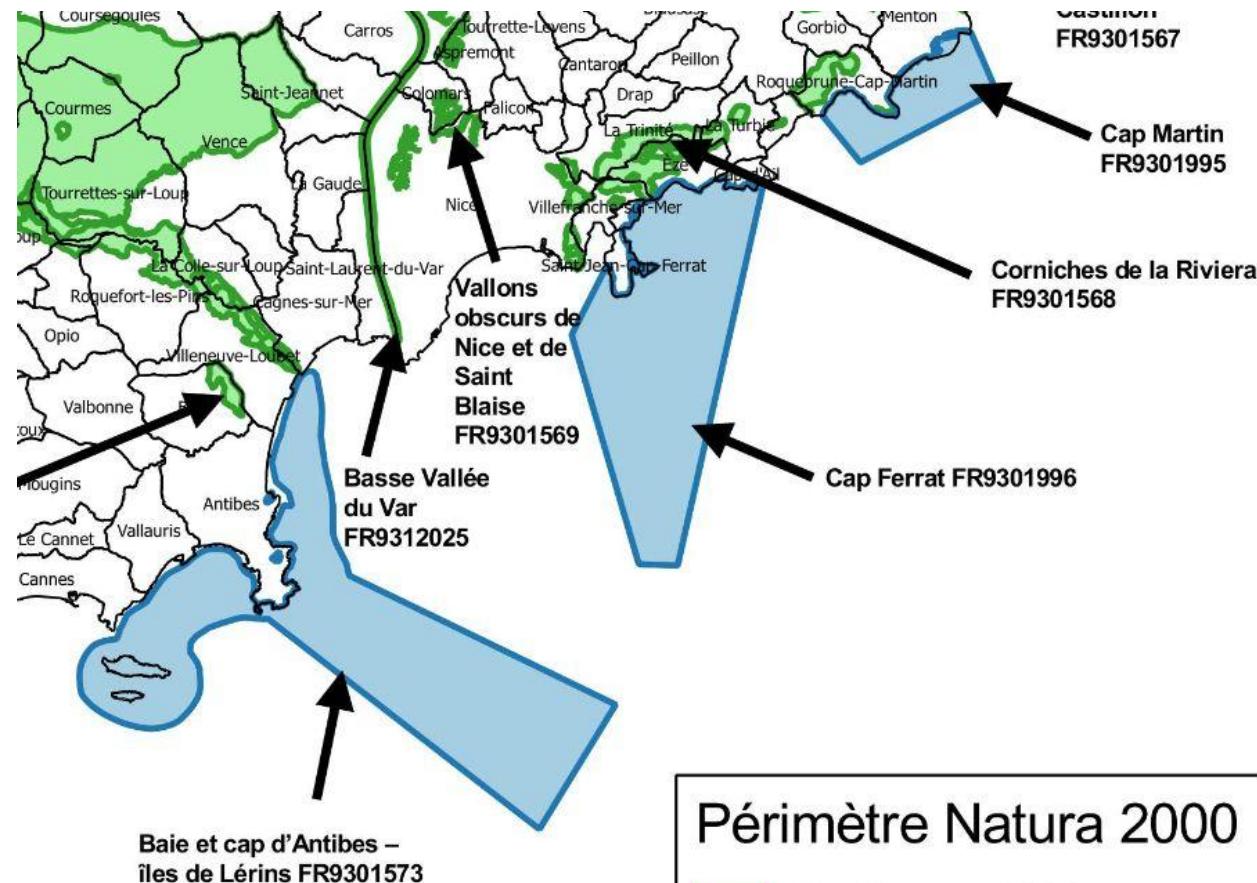
Newcastle  
University



Brandenburgische  
Technische Universität  
Cottbus - Senftenberg



# Environmental impacts



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# Legal setting regarding pollution

## European Level:

- **WFD (2000):** Ensures 'good ecological status' of water through management plans and monitoring.
- **Urban Waste Water Directive (1991):** Controls wastewater discharge to protect the environment.
- **Habitats Directive (1992):** Protects natural habitats and species via the Natura 2000 network.
- **REACH Regulation (2006):** Controls chemicals' use to protect water quality.

## France Level:

- **LEMA Law (2006):** Introduces taxes to limit pollution and strengthens water control.
- **Environmental Code:** Regulates industrial/agricultural water discharges.
- **Classified Installations Law (1976):** Controls risky industrial activities.
- **ICPE Regulation:** Monitors activities with environmental risks.
- **2015 Decree:** Sets wastewater discharge limits

## Regional Level:

- **SDAGE Plan (Rhône-Mediterranean):** Strategy for water quality and sustainable management.
- **SAGE Plans:** Local measures for water management.

## Departmental Level:

- **Alpes-Maritimes Regulation:** Sets drinking water quality standards (lead, nitrates, pesticides).
- **Air Quality Plan (PACA, 2025):** Reduces air pollutants to improve water quality.
- **Rhône-Méditerranée Water Agency:** Works to improve water quality in the region.

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# Possible solutions

## Constructed Wetlands

Removes  $\text{NH}_4^+$ ,  $\text{NO}_2^-$ ,  $\text{NO}_3^-$ ,  $\text{PO}_4^{3-}$ , heavy metals



## Riparian Buffer Zones and Vegetation Strips

Retains  $\text{NH}_4^+$ ,  $\text{NO}_2^-$ ,  $\text{NO}_3^-$ ,  $\text{PO}_4^{3-}$



## Green Filters & Bioactive Barriers

Removes  $\text{NO}_3^-$ ,  $\text{PO}_4^{3-}$ , heavy metals

## Biofiltration Systems combined with SuDS

Captures  $\text{NO}_2^-$ ,  $\text{NO}_3^-$ ,  $\text{PO}_4^{3-}$ , heavy metal



## Incorporate lateral water catchment areas into planned flood zone



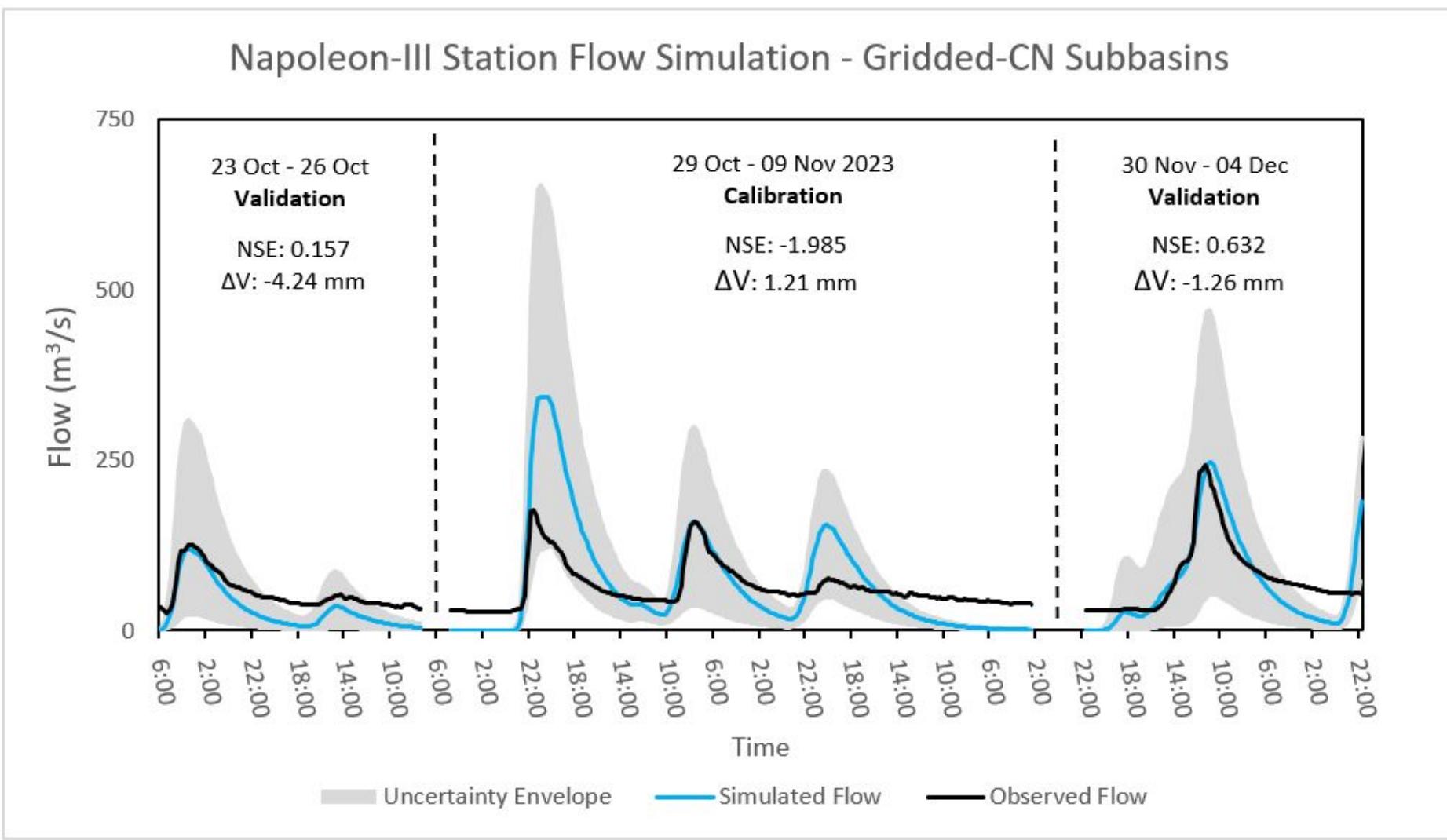
Var Catchment

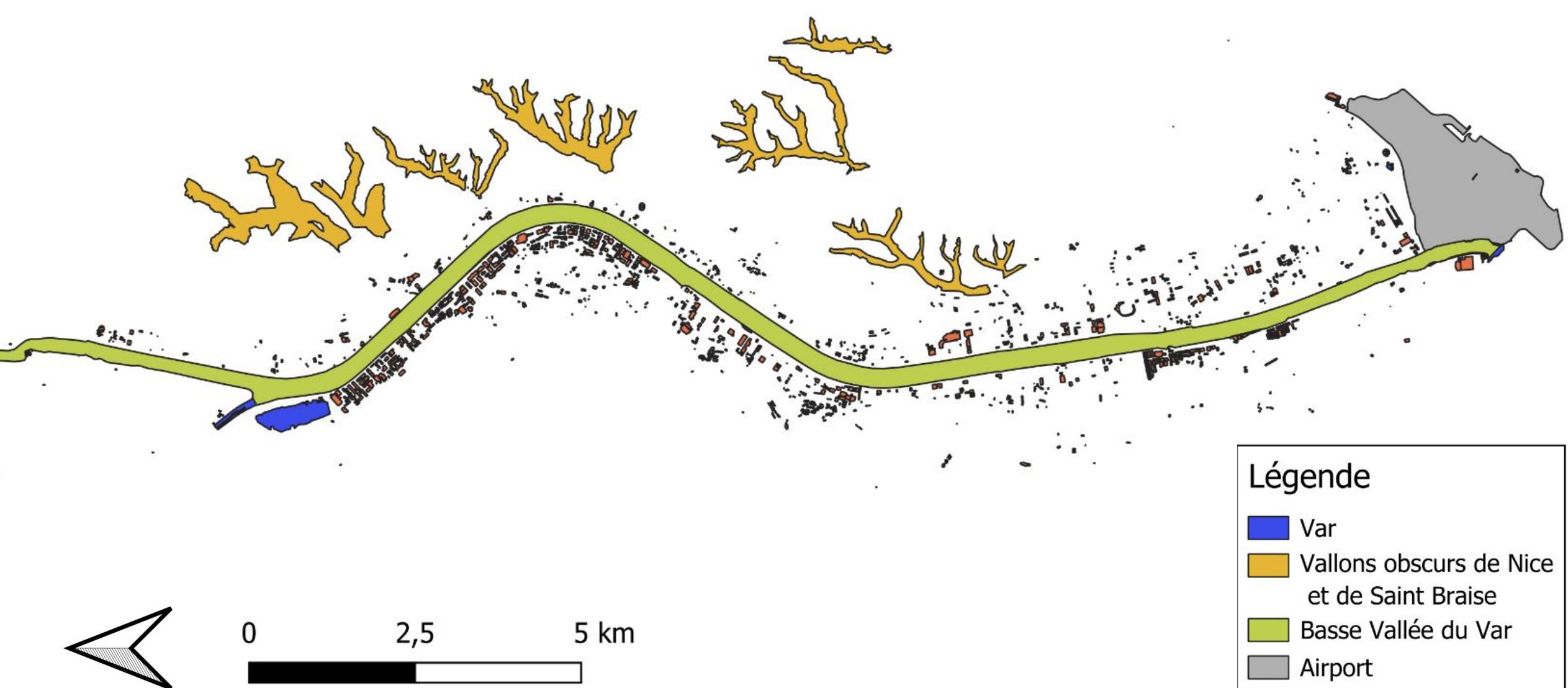
## Incorporate bioadsorbents in bed layers (biochar or zeolite)





# Appendix: HEC-HMS Validation





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