



LO STUDIO PILOTA SUI BACINI DE NOCE E DEL BRENTA

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Smart Hydrogeological Solutions Srl

OUTLINE

- Introduction to Orientgate
- Modelling chain
 - Hydrologic Model
 - Geotransf
 - Model Outputs
- Methodology

Local Aims:

Assess water resources exploitation in a climate change scenario with particular focus on hydroelectric water use

Output:

A set of tools and guidelines to support sustainable and optimized water management policies

Activities:

1. Data recovery for 2 study sites:

- Noce River Basin
- Brenta River Basin

2. Model application:

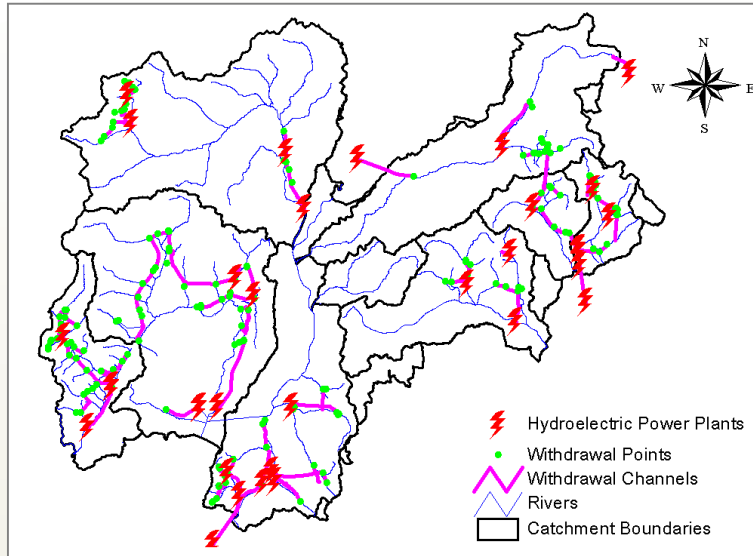
- Calibration/Validation (1980-2010)
- Climate Scenario (2020-2050; 2040-2070)



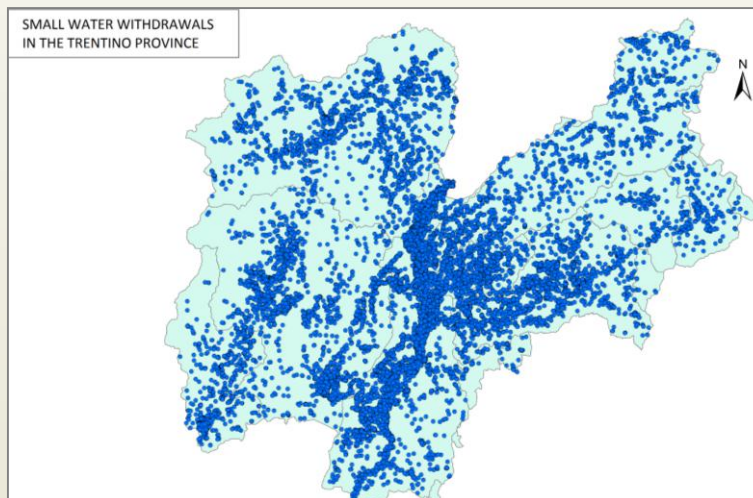
Study Area:

Trentino - Autonomous Province of Trento

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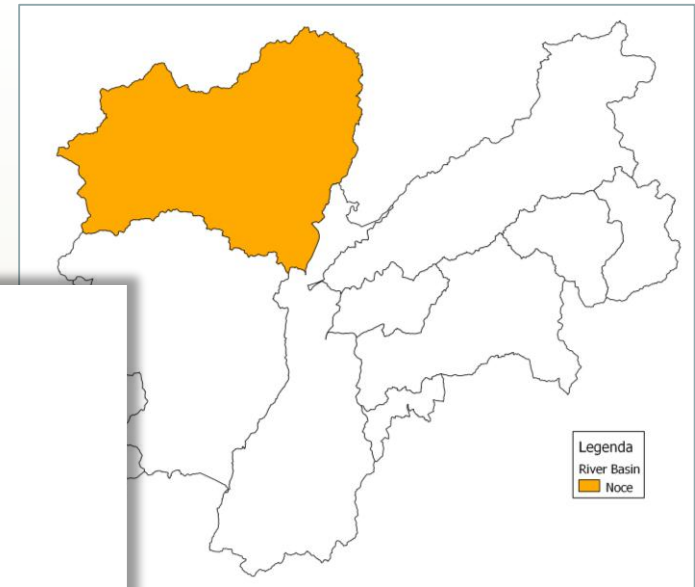
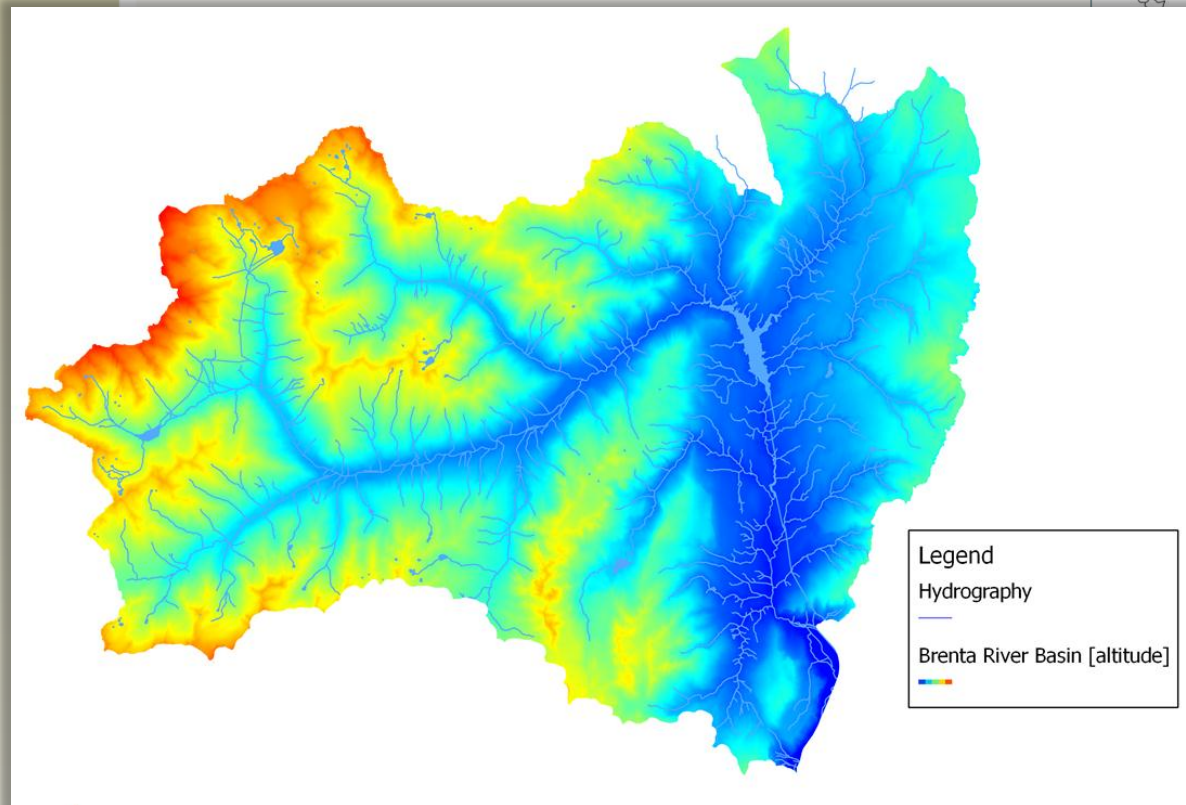
Large Hydroelectric
Withdrawals



Small Water Withdrawals

Data Recovery:

1. Study site: NOCE



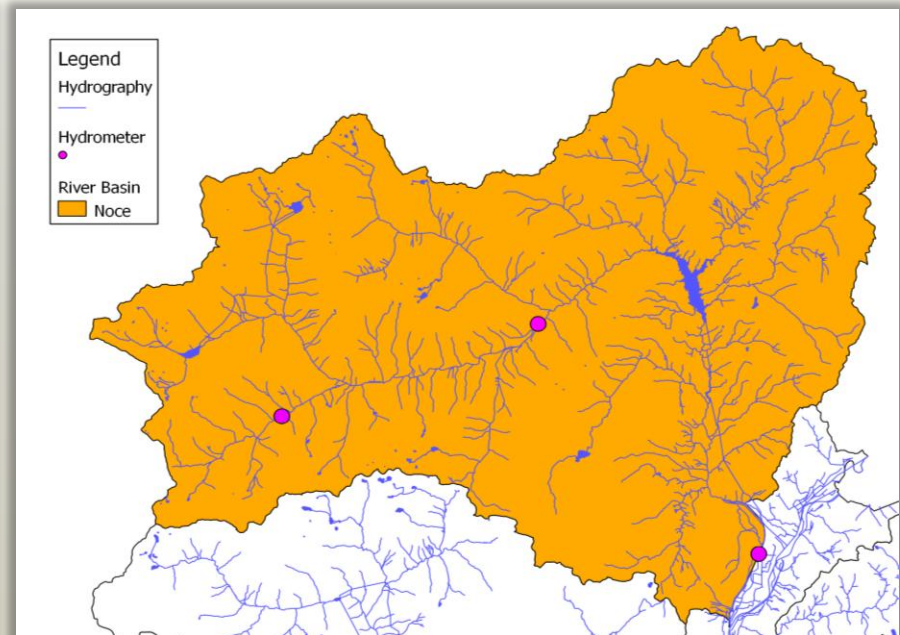
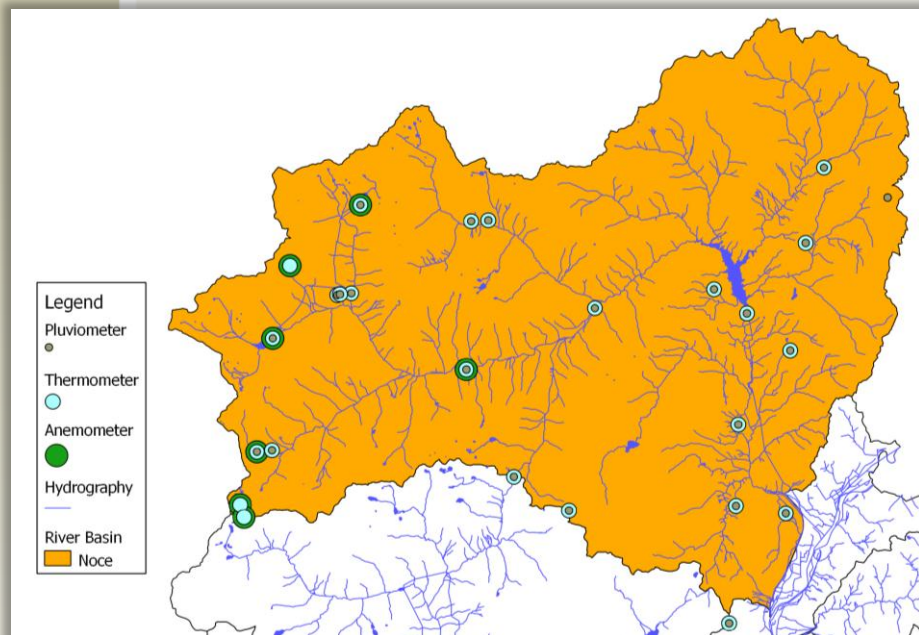
Area: 1367 km² (22% PAT)
Elevation: 3759 – 199 m
a.s.l

2 glacier area

Data Recovery:

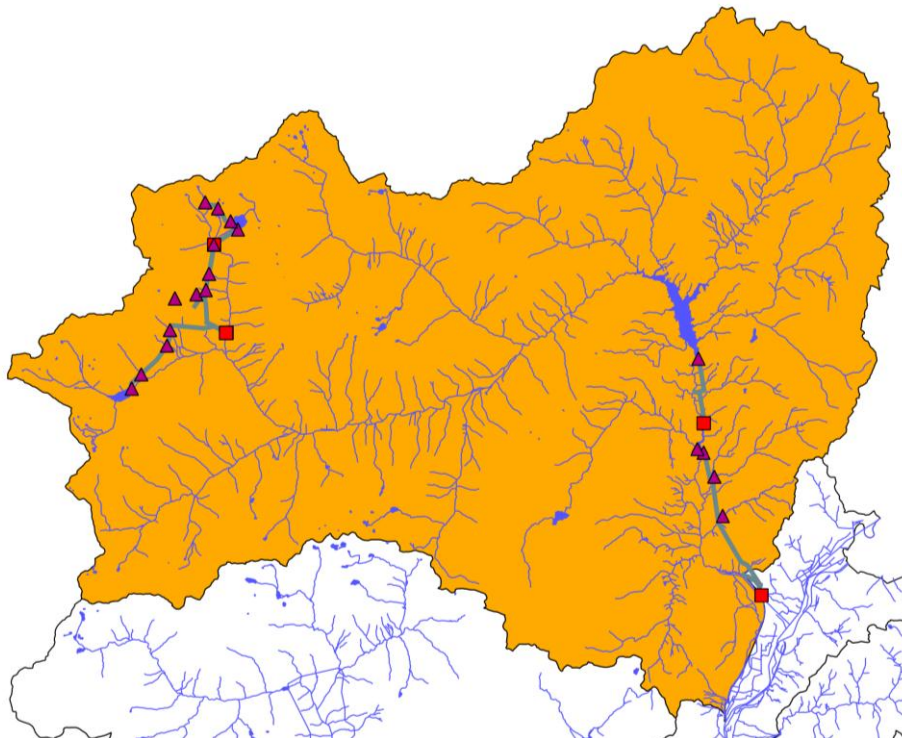
1. Study site: NOCE

Noce river basin		
Gauge	Number of site	% missing data
Pluviometer	10 + 14 (24)	24.3 %
Thermometer	9 + 17 (26)	35.9 %
Anemometer	6	85 %
Hydrometer	3	67.67 %



Data Recovery:

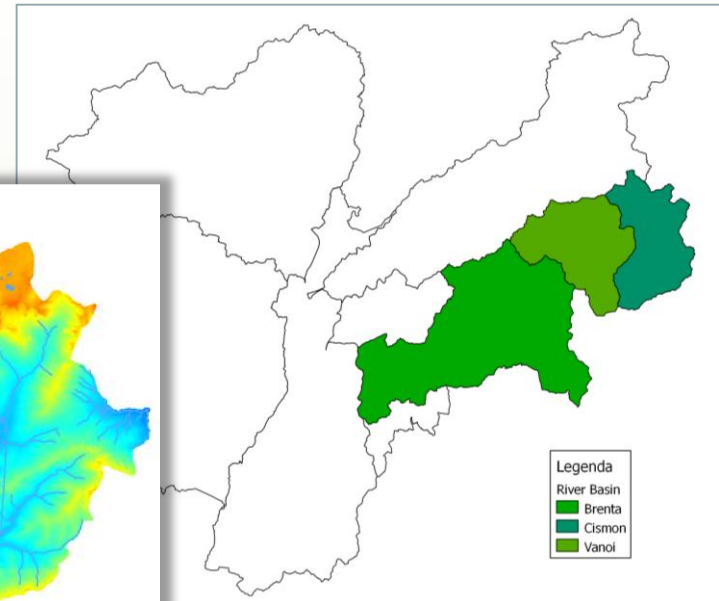
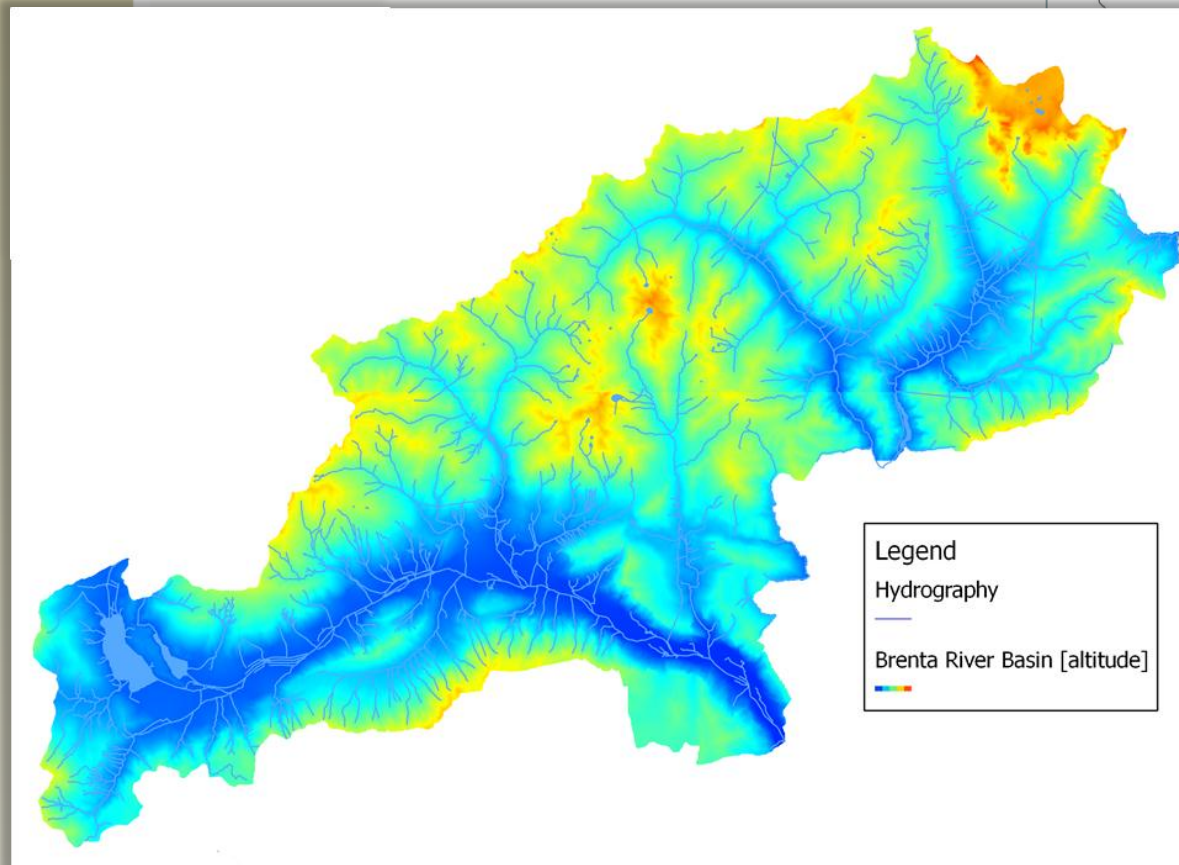
1. Study site: NOCE



Large Hydroelectric Withdrawals:

- Hydroelectric Power Plants: **4**
- Withdrawals Points: **18**
- Basin: **5**

2. Study site: BRENTA



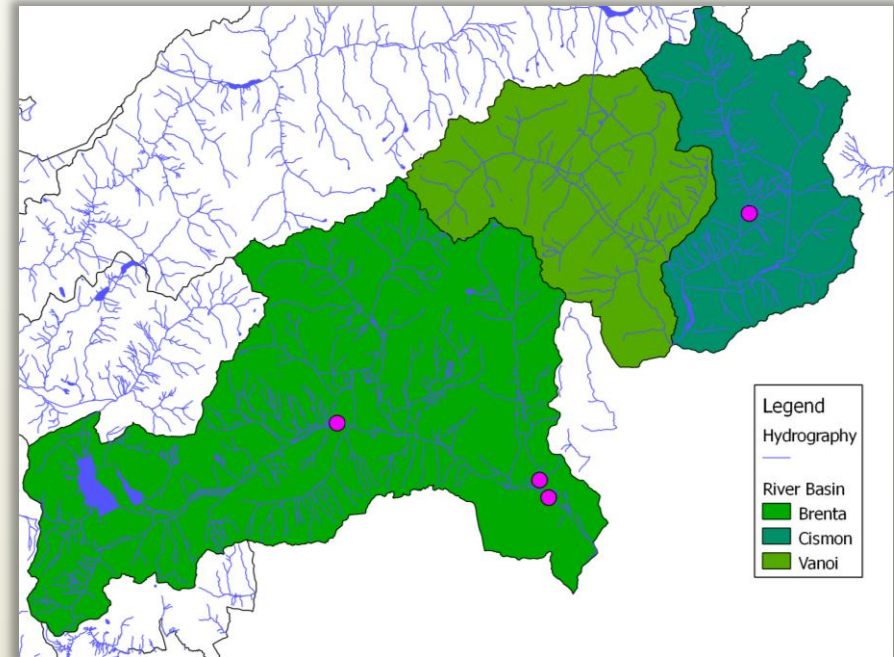
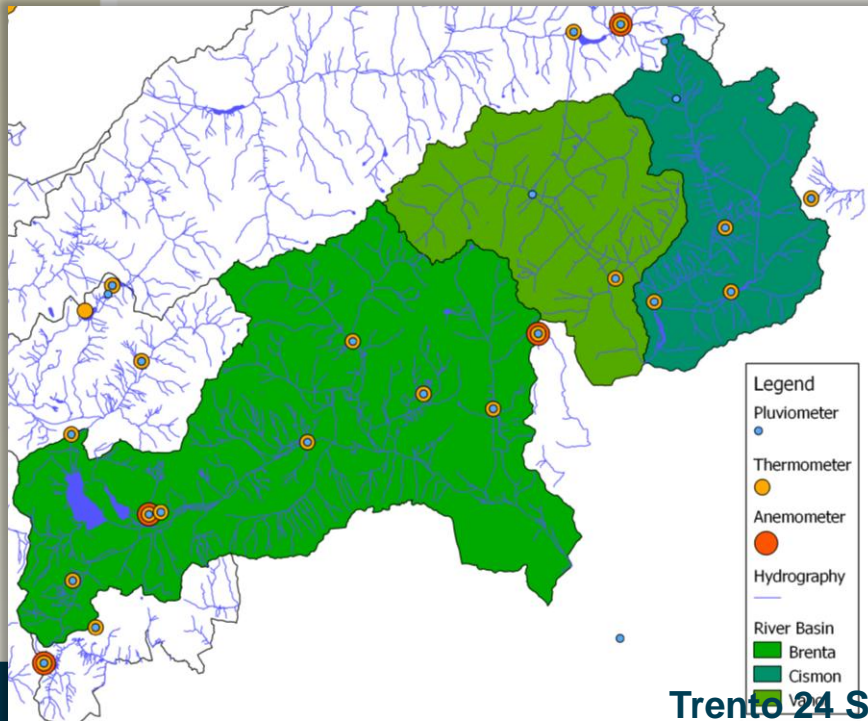
Area: 1133 km² (18% PAT)
Elevation: 3035-200 m a.s.l
No significant glacier areas

Data Recovery:

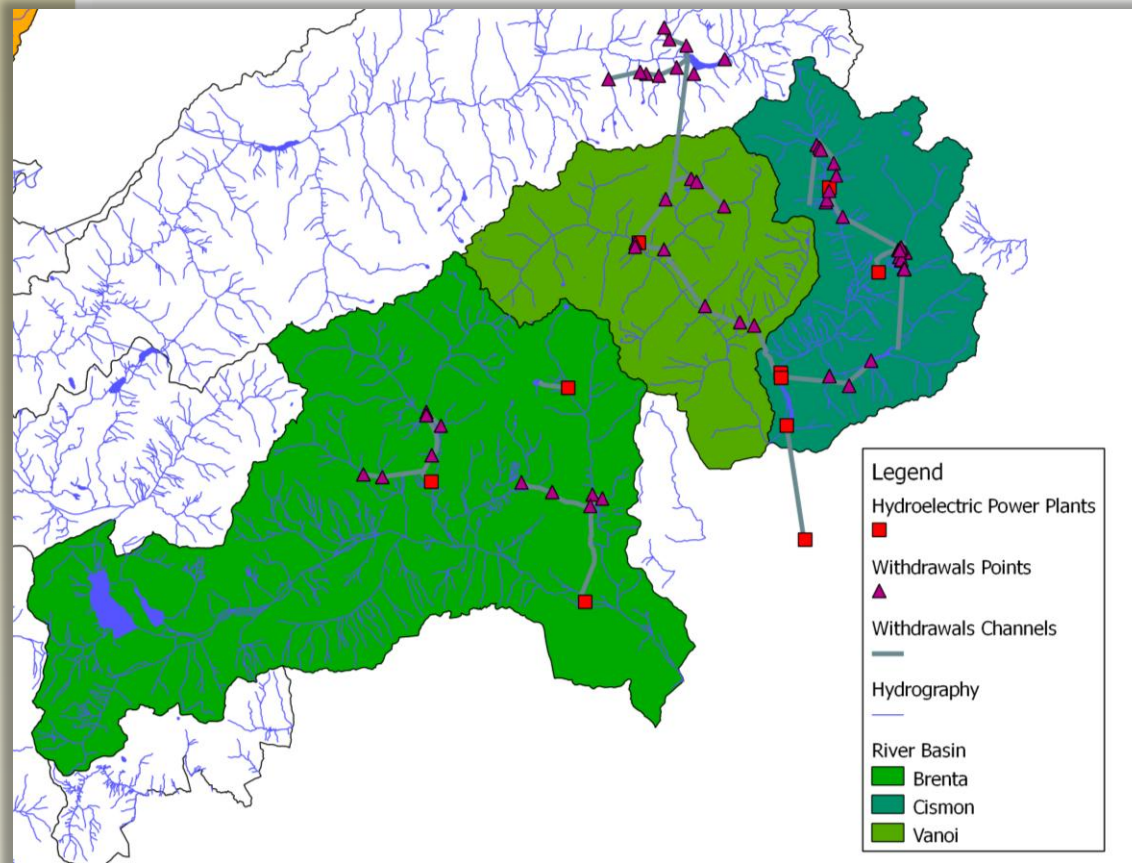
2. Study site: BRENTA

Brenta-Cismon-Vanoi River Basin

Gauge	Number of station	% missing data
Pluviometer	10 + 17 (27)	32.6 %
Thermometer	8 + 14 (22)	30.4 %
Anemometer	5	83.33 %
Hydrometer	5	65.33 %



1. Study site: BRENTA



Large Hydroelectric Withdrawals:

- Hydroelectric Power Plants: **10**
- Withdrawals Points: **46**
- Basin: **6**

MODELLING STEPS:

1. CLIMATE MODEL: Future Scenario (mid and long terms)



CMCC

2. HYDROLOGIC MODEL (GeoTransf)




DICAM and SHS Srl

3. HYDROLOGIC INDICATORS to assess water availability under climate change

CLIMATE MODEL - CMCC

EMISSION SCENARIOS:

RCP4.5  Radiative forcing 4.5 Watt/m²

RCP8.5  High greenhouse gas emission

TIME SLICE: 2021 – 2050 e 2041 – 2070

BIAS CORRECTION FACTORS derived for 1971 – 2005

DAILY OBSERVED DATASETS:

Temperature

Precipitation

GEOTRANSF HYDROLOGIC MODEL

DICAM e SHS Srl

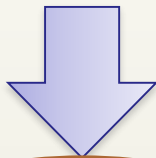
- Continuous Hydrologic Modelling
- Rainfall Runoff Processes
- Anthropogenic Impacts
- Daily computational timestep
- Long term simulations

MODEL BENEFITS

TO SIMULATE DECISIONAL PROCESSES:

HYDROLOGIC MODEL

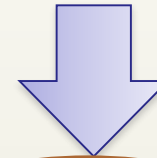
Precipitation, temperature,
evapotranspiration, land use and
SNOW/ICE MELT



NATURAL
COMPONENT

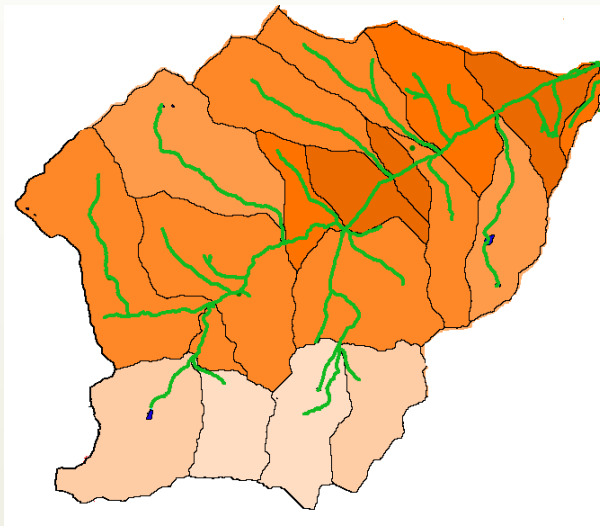
WATER WITHDRAWALS

And
MINIMUM ENVIRONMENTAL FLOW
CONSTRAINTS

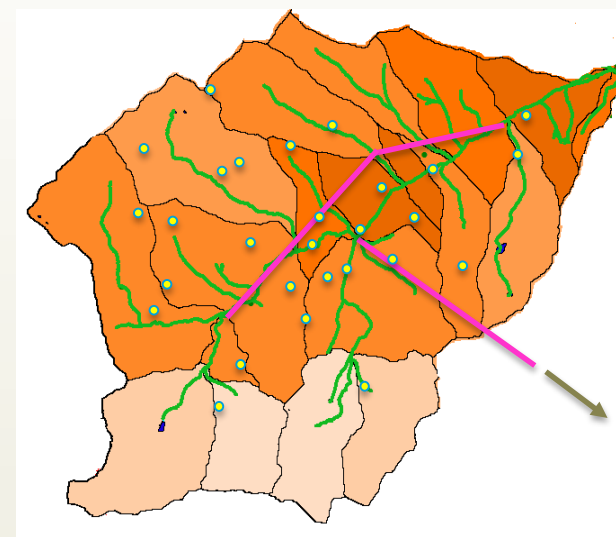


ANTHROPIC
COMPONENT

GEOMORPHOLOGIC STRUCTURE



NATURAL DRAINAGE NETWORK

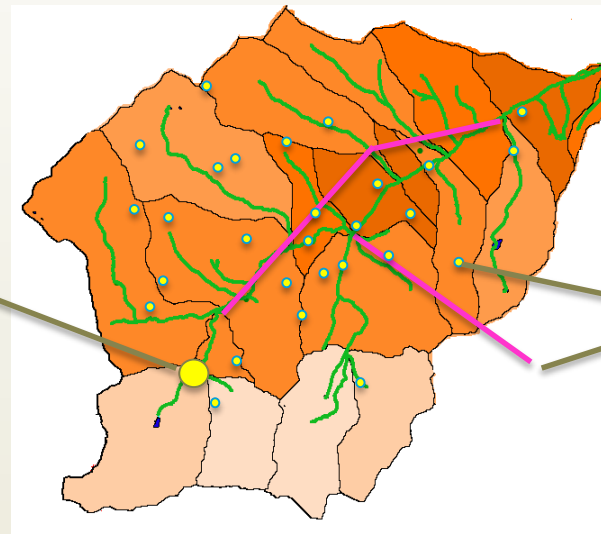
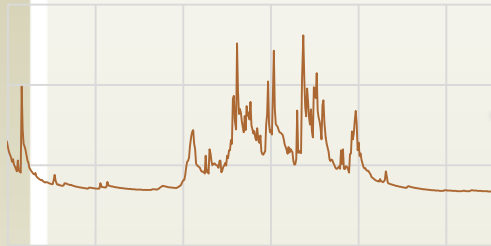


ANTHROPIC EFFECTS

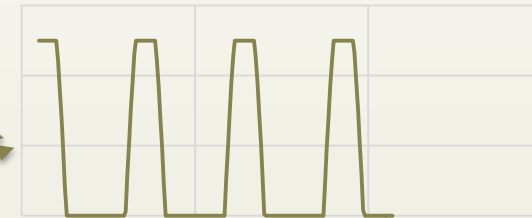
Flow Discharge at
control sections

Withdrawn Volumes
from licensed water
uptakes

PORTATA IN ALVEO



ATTINGIMENTO



METHODOLOGY

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1-CALIBRATION: ACTUAL SCENARIO (2001-2010)

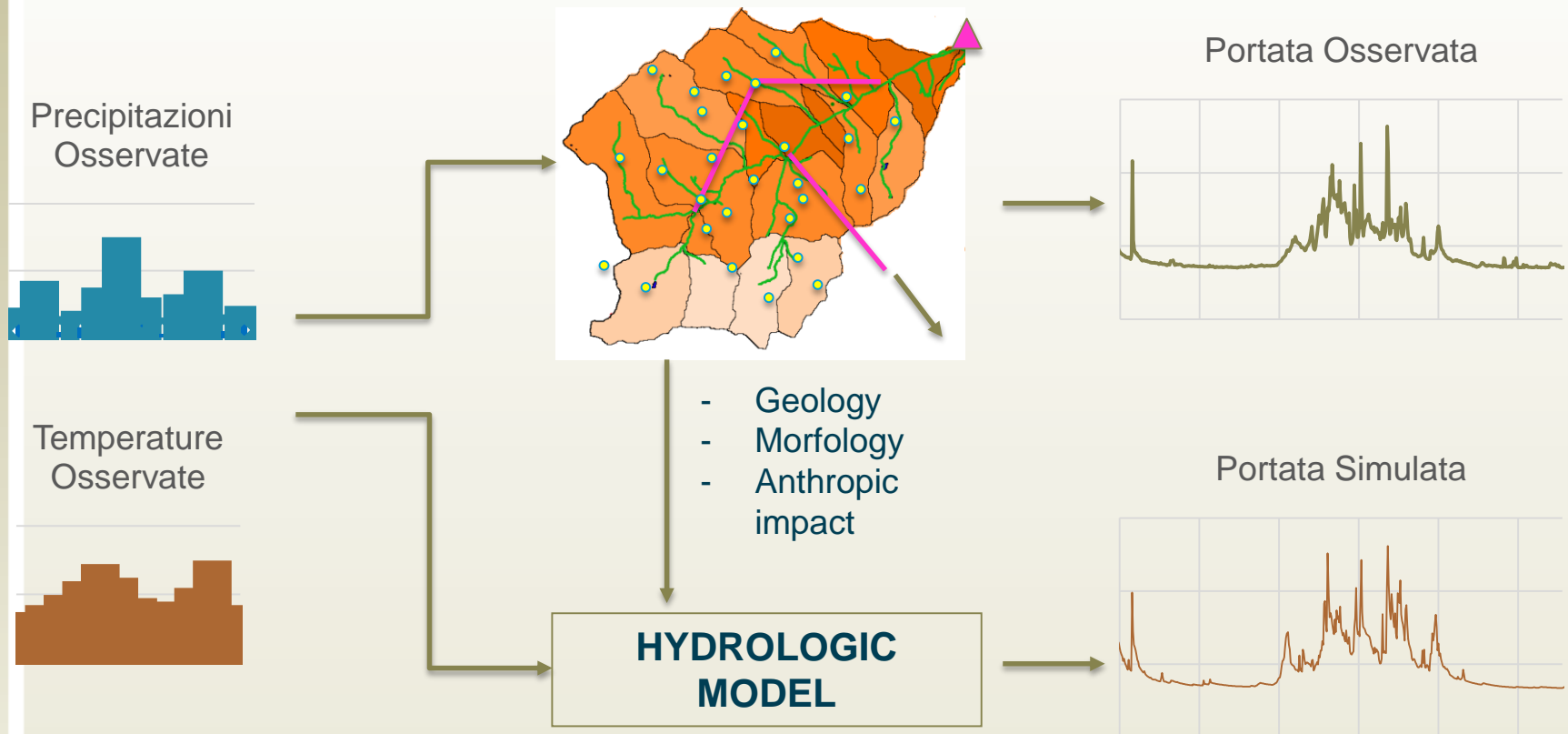
2-VALIDATION: ACTUAL SCENARIO (1981-2000)

3-CLIMATE CHANGE SCENARIOS

- 1981-2010 (Actual)
- 2021-2050
- 2041-2070

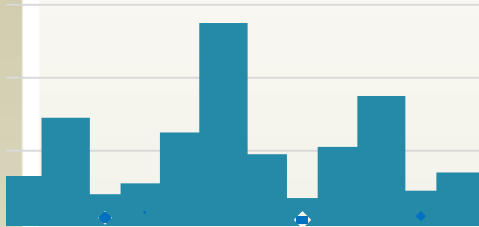
MODEL APPLICATION (1/5)

ACTUAL SCENARIO CALIBRATION (2001-2010)

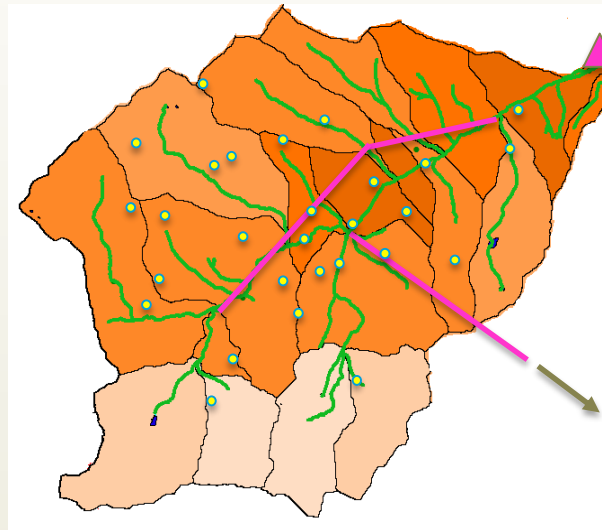


ACTUAL SCENARIO VALIDATION (1981-2000)

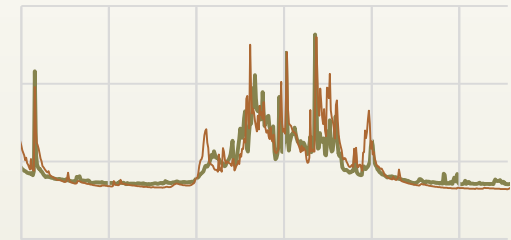
Precipitazioni Osservate



Temperature Osservate



Confronto periodo
Validazione



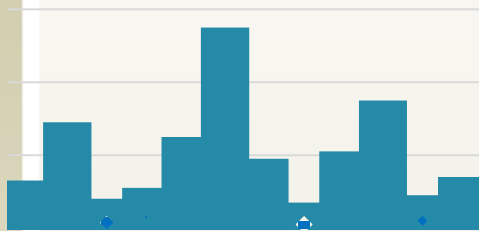
ANTHROPIC EFFECTS ACTIVATED

MODEL APPLICATION (3/5)

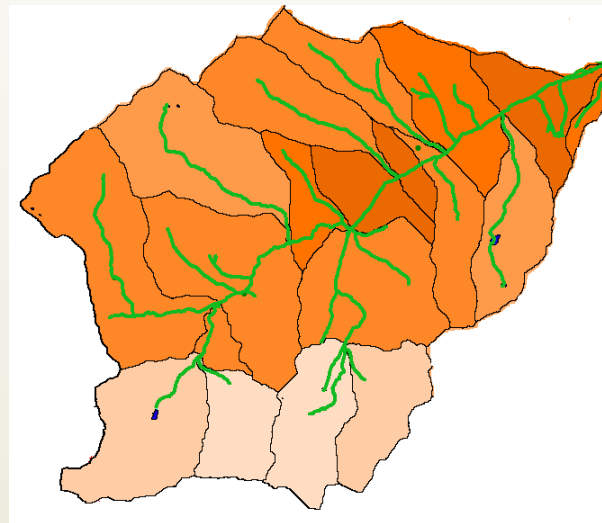
CLIMATE CHANGE SCENARIO NATURAL

(1981-2010) Vs (2021-2050) Vs (2041-2070)

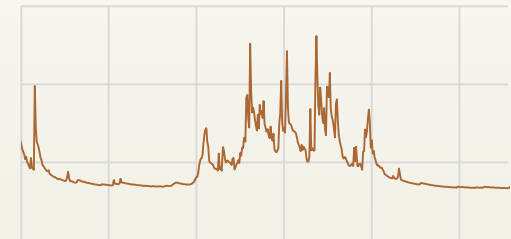
Precipitazioni Stimate



Temperature Stimate



Previsione Deflussi
Futuri



ANTHROPIC EFFECTS DISACTIVATED

ANTHROPIC IMPACT UNDER CC

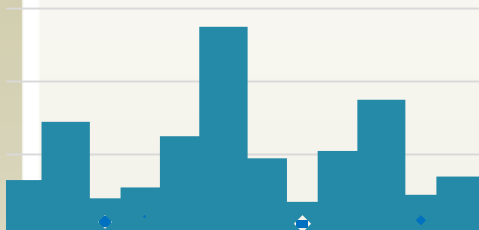
1. NO INCREASE OF
 - POPULATION
 - WITHDRAWALS
 - HYDROELECTRIC PLANTS
2. ACTUAL LEVEL OF MINIMUM ENVIRONMENTAL FLOW
3. WITHDRAWALS MAINTAINS THE ACTUAL LICENSED CHARACTERISTICS

MODEL APPLICATION (5/5)

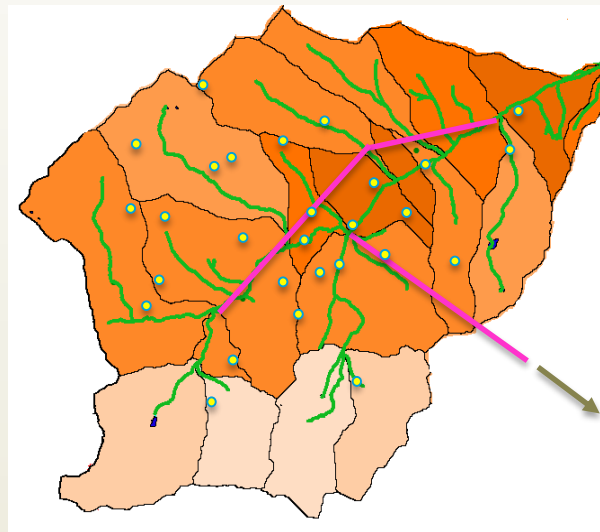
CLIMATE CHANGE SCENARIO Anthropic

(1981-2010) Vs (2021-2050) Vs (2041-2070)

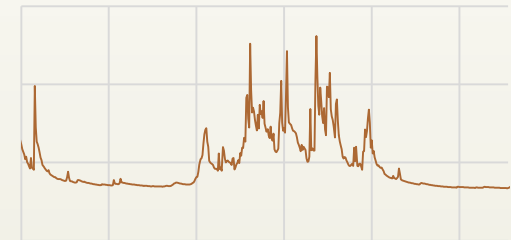
Precipitazioni Stimate



Temperature Stimate



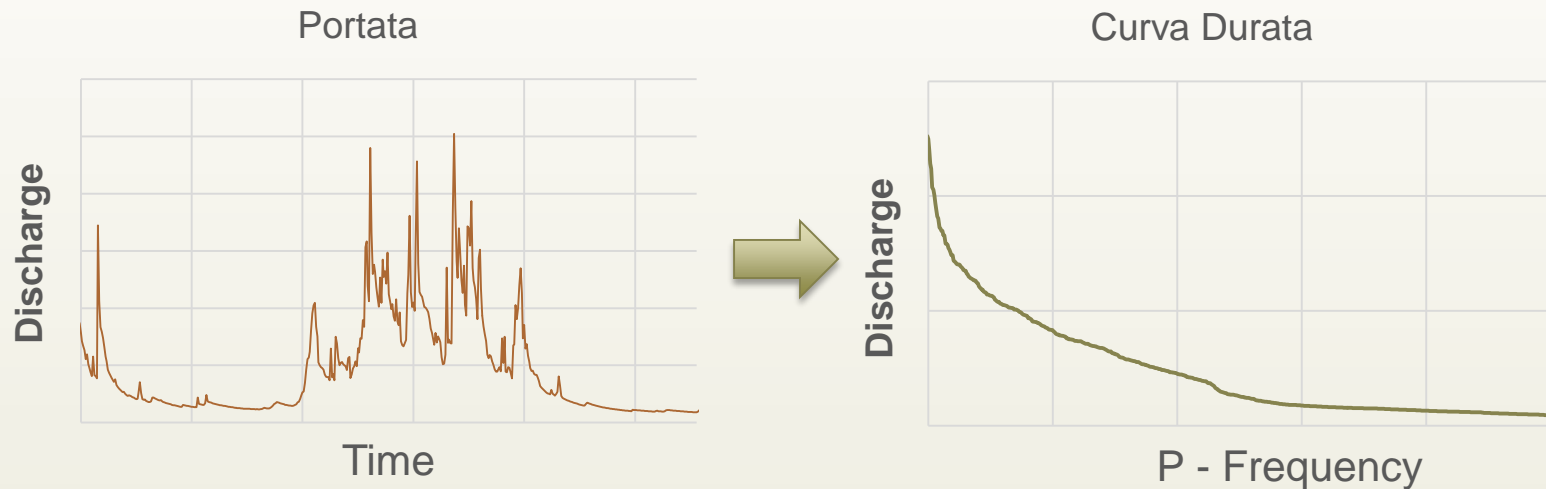
Previsione Deflussi
Futuri



ANTHROPIC EFFECTS RE-ACTIVATED

DURATION CURVES

**DC EVALUATED IN MORE THAN 2000
POINTS OVER THE TWO STUDY SITES**



**All scenario results have been translated into duration
curves in order to allow CC indicators evaluation**

Grazie per l'attenzione