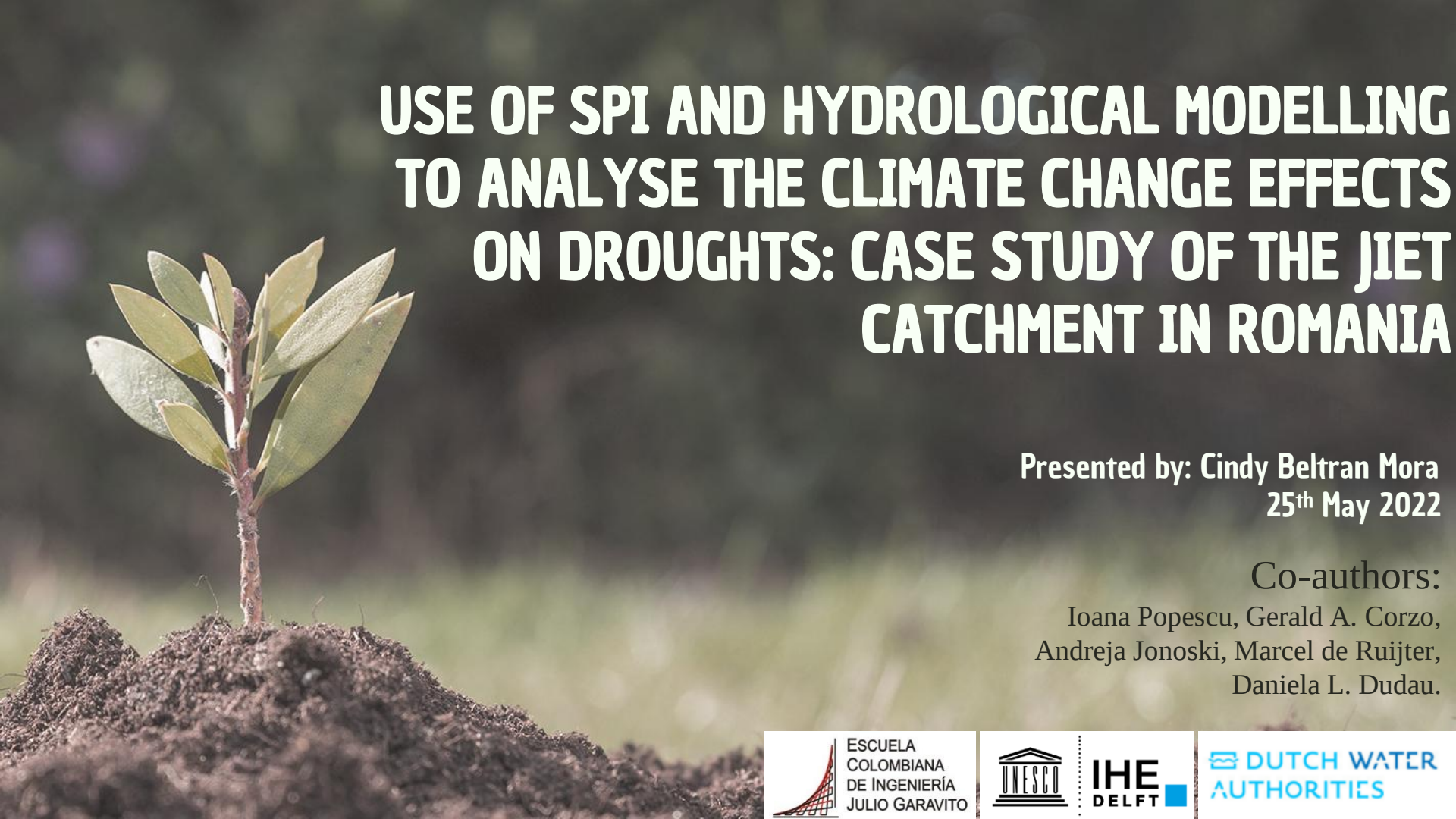

USE OF SPI AND HYDROLOGICAL MODELLING TO ANALYSE THE CLIMATE CHANGE EFFECTS ON DROUGHTS: CASE STUDY OF THE JIET CATCHMENT IN ROMANIA

Presented by: Cindy Beltran Mora

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DUTCH WATER AUTHORITIES

RESEARCH OBJETIVES

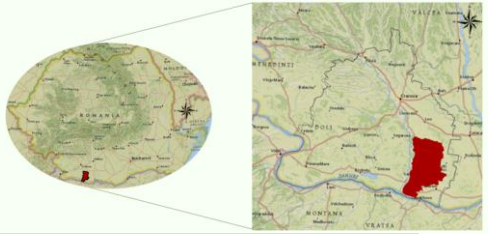
❖ Analysis of droughts due to climate change in the Jiet catchment using SPI and hydrological modelling HEC-HMS.

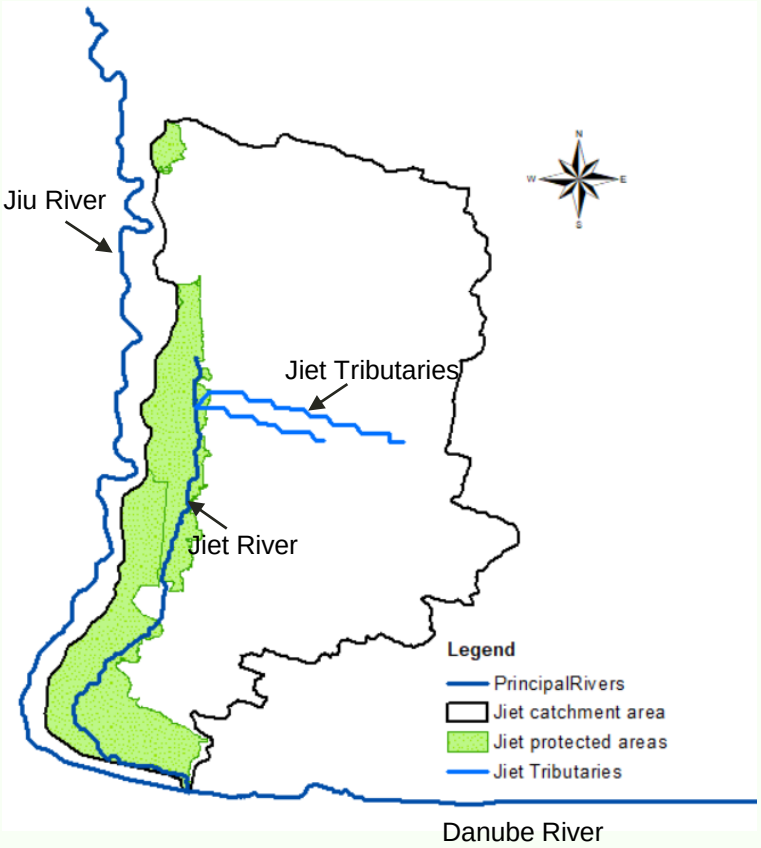
❖ To assess all types of droughts using SPI.

❖ To assess droughts by building a hydrological model in HEC-HMS to analyse hydrological droughts.

❖ To generate knowledge about droughts as well as the impacts within the catchment due to climate change for future scenarios based on historical analysis and projected data

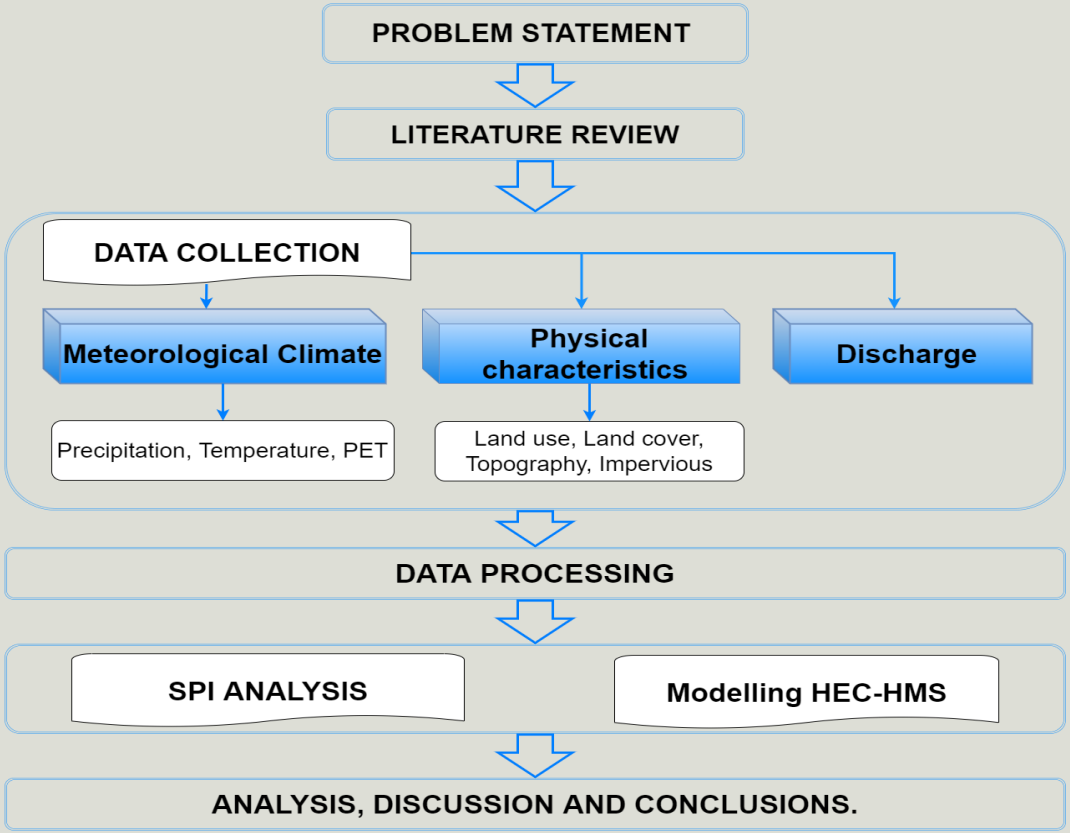
CASE STUDY DESCRPTION/JIET CATCHMENT





- Area of 633 km^2
- Old Jiu/Left tributary to Danube river at Bechet.
- Total length 52km.
- Tributaries: Gerosel and Valea Predeștilor.
- Protected areas of 255 km^2
- Agricultural activities

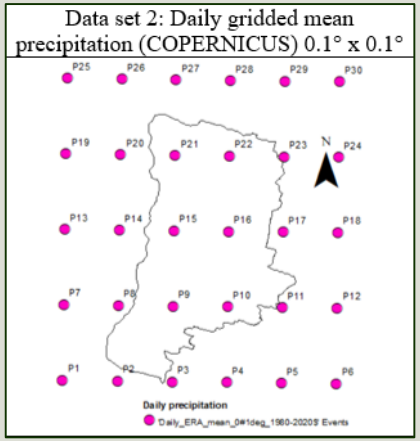
METHODOLOGY

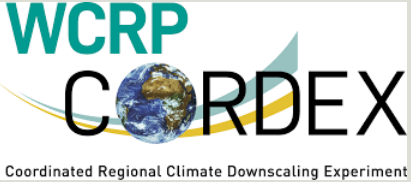


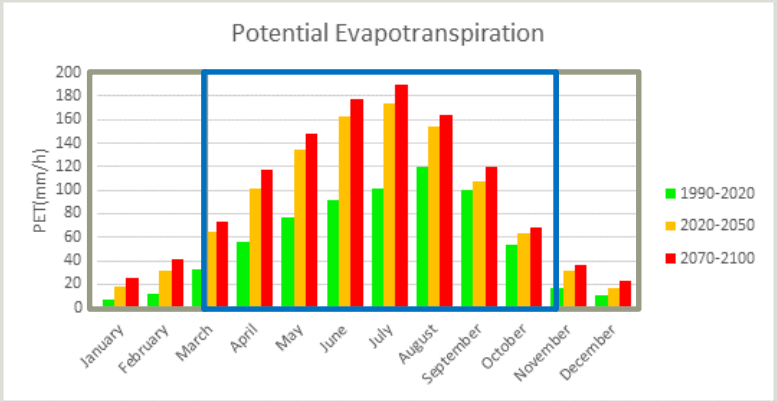
Data for 3 scenarios (every 30 years).

- Past, 1990-2020
- Mid-century scenario, 2020-2050
- End-century scenario, 2070-2100

DATA COLLECTION / METEOROLOGICAL DATA





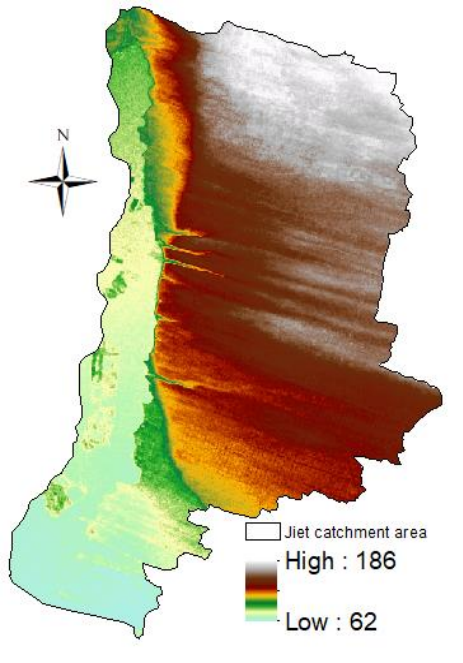


EURO-CORDEX

- Representative concentration Pathways (RCPs) 8.5.
- Coupled Model Intercomparison Project (CMIP5)
- GCM=MPI-M-MPI-ESM-LR
- RCM=KNMI-RACMO22E

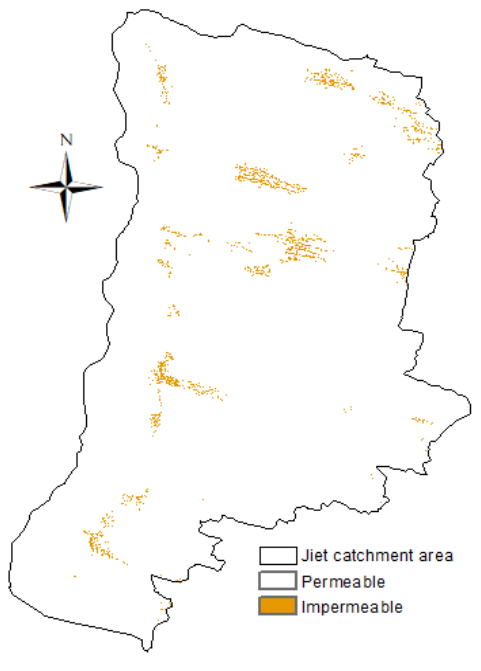
DATA COLLECTION / PHYSICAL CHARACTERISTICS

DEM : Resolution 12.5m*12.5m



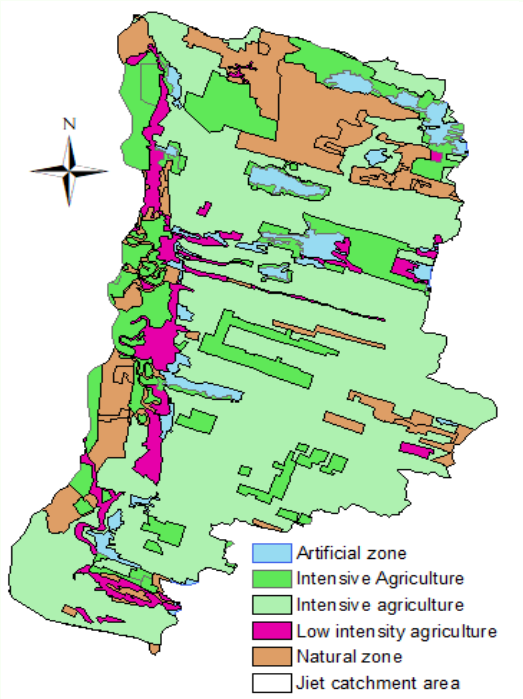
Slope 0.33%

Impervious : Resolution 10m*10m

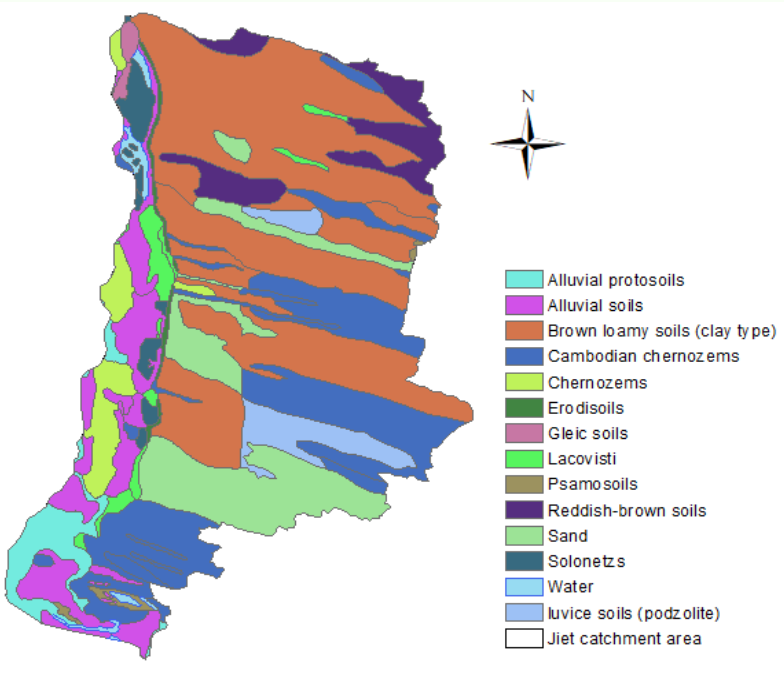


DATA COLLECTION / PHYSICAL CHARACTERISTICS

Corine Land Cover (2018)



Soil map

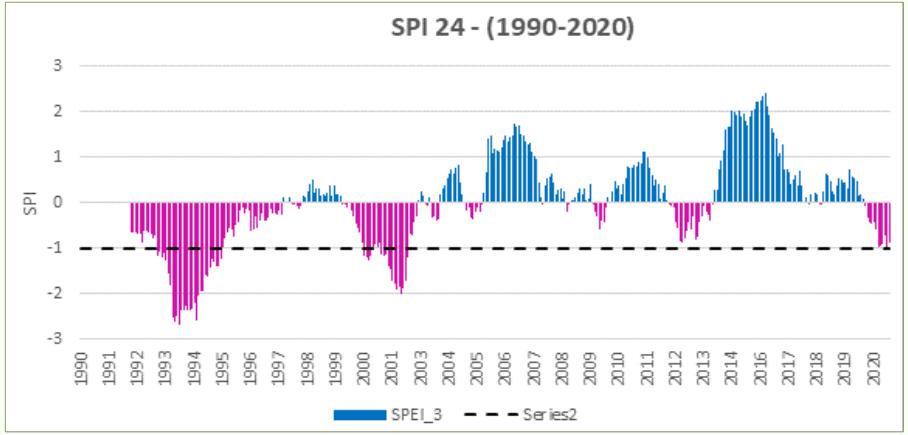


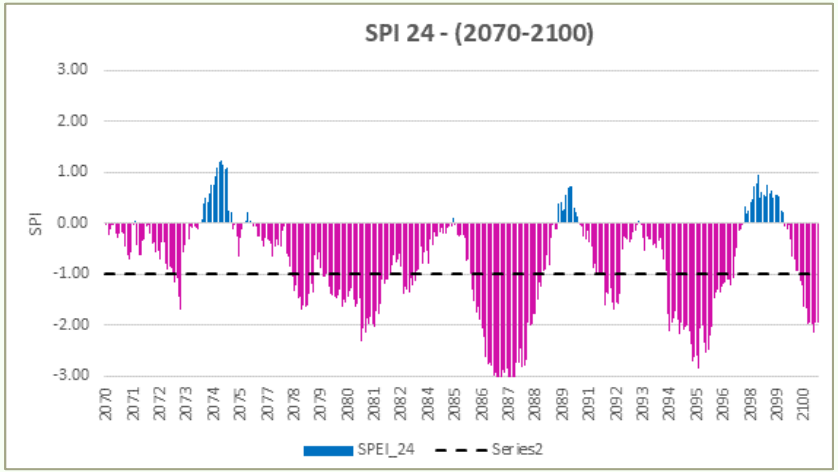
- Agriculture: Around 53%
- Sands and clays
- Aridization process

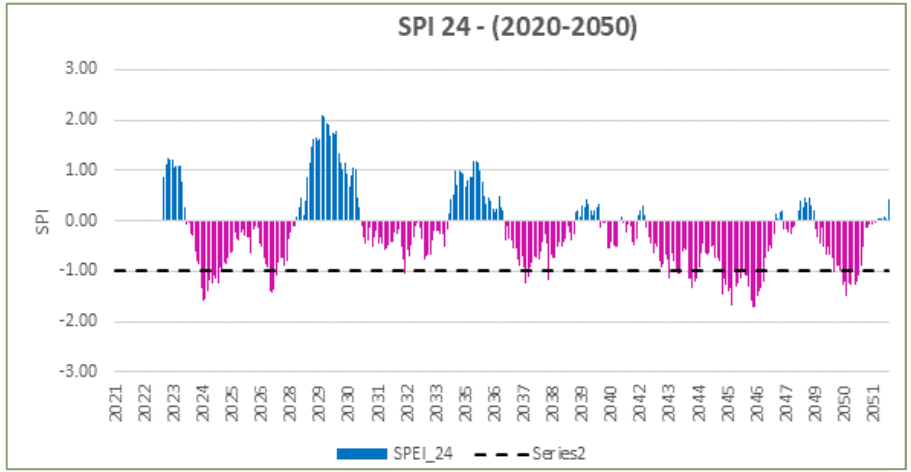
SPI ANALYSIS RESULTS

- Threshold -1 for drought events and -2 for extreme droughts. (Diaz, Corzo et al. 2020), (McKee, Doesken et al. 1993).

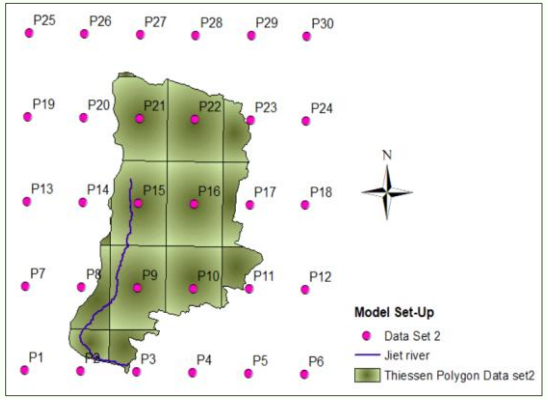
SPI - Time scale	Drought
1-3 Months	Meteorological
1-6 Months	Agricultural
6-24 Months	Hydrological

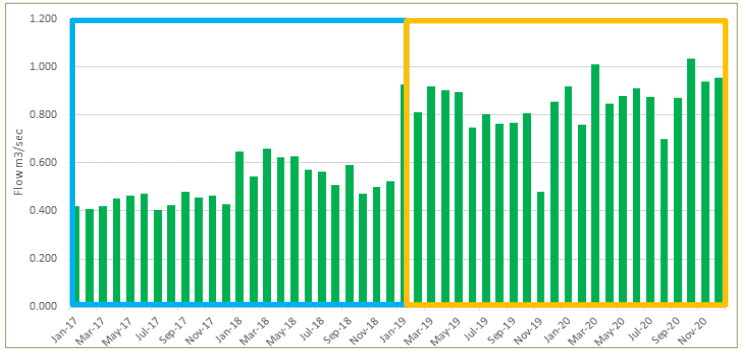






HEC – HMS MODELLING / MODEL SET-UP



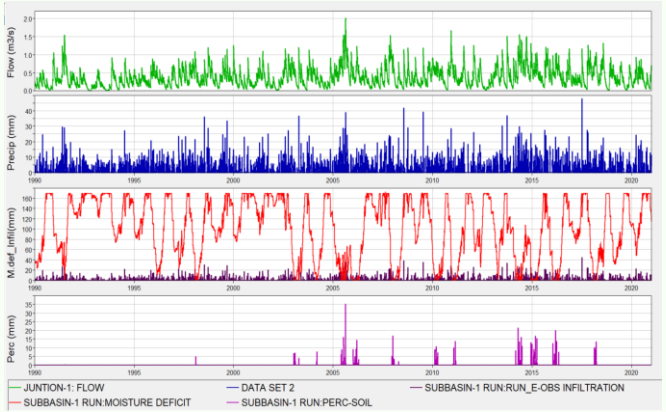


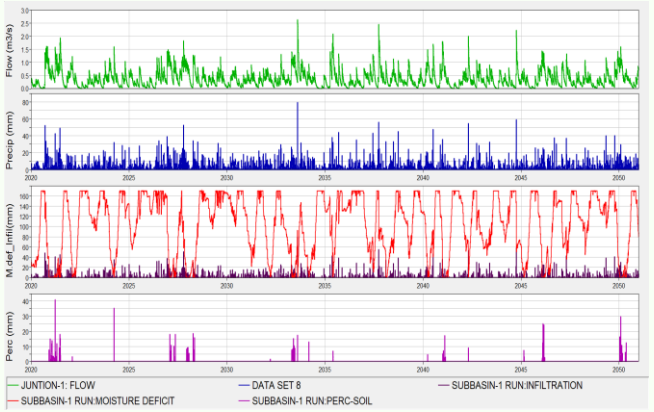
- Lumped model.
- Simple canopy
- Loss method: Deficit and constant
- Transform method: Clark Unit hydrograph
- Baseflow: Constant monthly - Recession
- Discharge data from a station in confluence with the Danube for a period of 4 years used for calibration.
- Precipitation: Thiessen polygons – Gage weights.
- Evapotranspiration: Monthly average

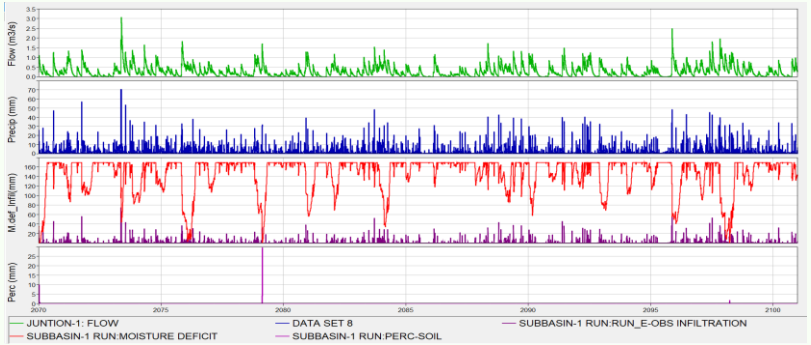
MODELLING / CALIBRATION AND VALIDATION

- Manual calibration

Parameter	Value
Loss method	
Initial deficit(mm)	33.8
Maximum deficit (mm)	169.3
Constant rate(mm/h)	29.9
Impervious (%)	0.7
Baseflow method	
Initial discharge (m3/s)	0.26
Recession constant	0.95
Ratio	0.99



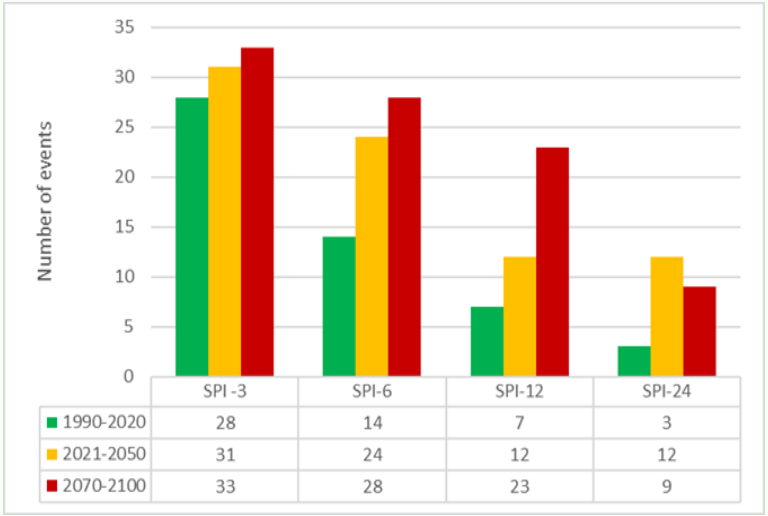




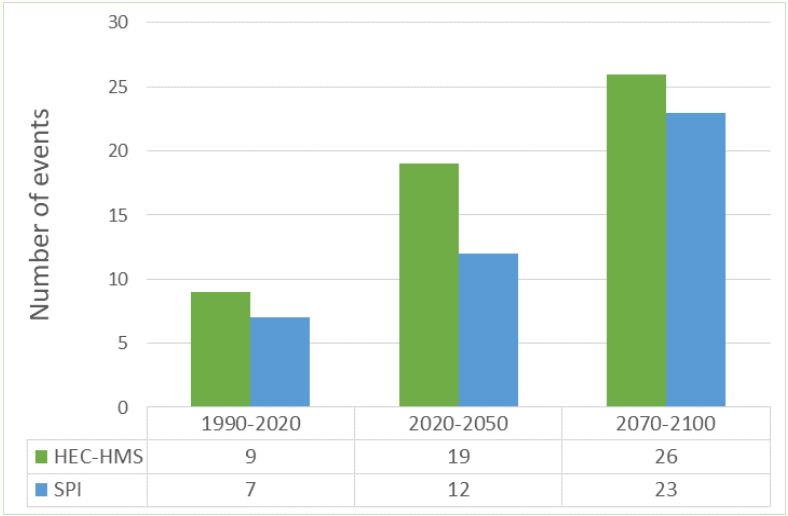
Periods with low values of precipitation, infiltration, discharge and percolation equal zero for 4 or more months. Identified years 1992-1994; 2000-2002; and years 2007, 2012, 2017 and 2020.

CONCLUSIONS

- Identified droughts in all scenarios with SPI analysis tend to increase.



- Differences between the number of droughts identified with both methodologies are not too high, still model has to be improved.



SPI	HEC-HMS
	1990
1992	1992
1993	1993
1994	1994
2000	2000
2001	2001
2002	2002
	2003
	2004
	2008
	2011
2012	2012
	2017
2019	
2020	2020

CONCLUSIONS AND RECOMENDATIONS

Analysis of droughts due to climate change in the Jiet catchment using SPI and hydrological modelling HEC-HMS.

- Future scenarios present a higher density of droughts, with longer duration and intensity due to the effects of climate change such as temperature rising and deficit of precipitation.
- Both models work well when analyzing and assessing droughts.
- Meteorological data is very important when calculating and analysing droughts.
- This HEC-HMS model is a gross model that has to be considered as the first step for a deeper analysis in the future.
- Results derived from this study can be used to generate knowledge about the coming drought scenario in the Jiet. These results also can be the base of future mitigation and action plans against droughts in the Jiet.

THANK YOU

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