



THE INTERFACE OF HYDROPOWER / FLOOD MANAGEMENT IN THE DRIN BASIN

14 Dec 2020

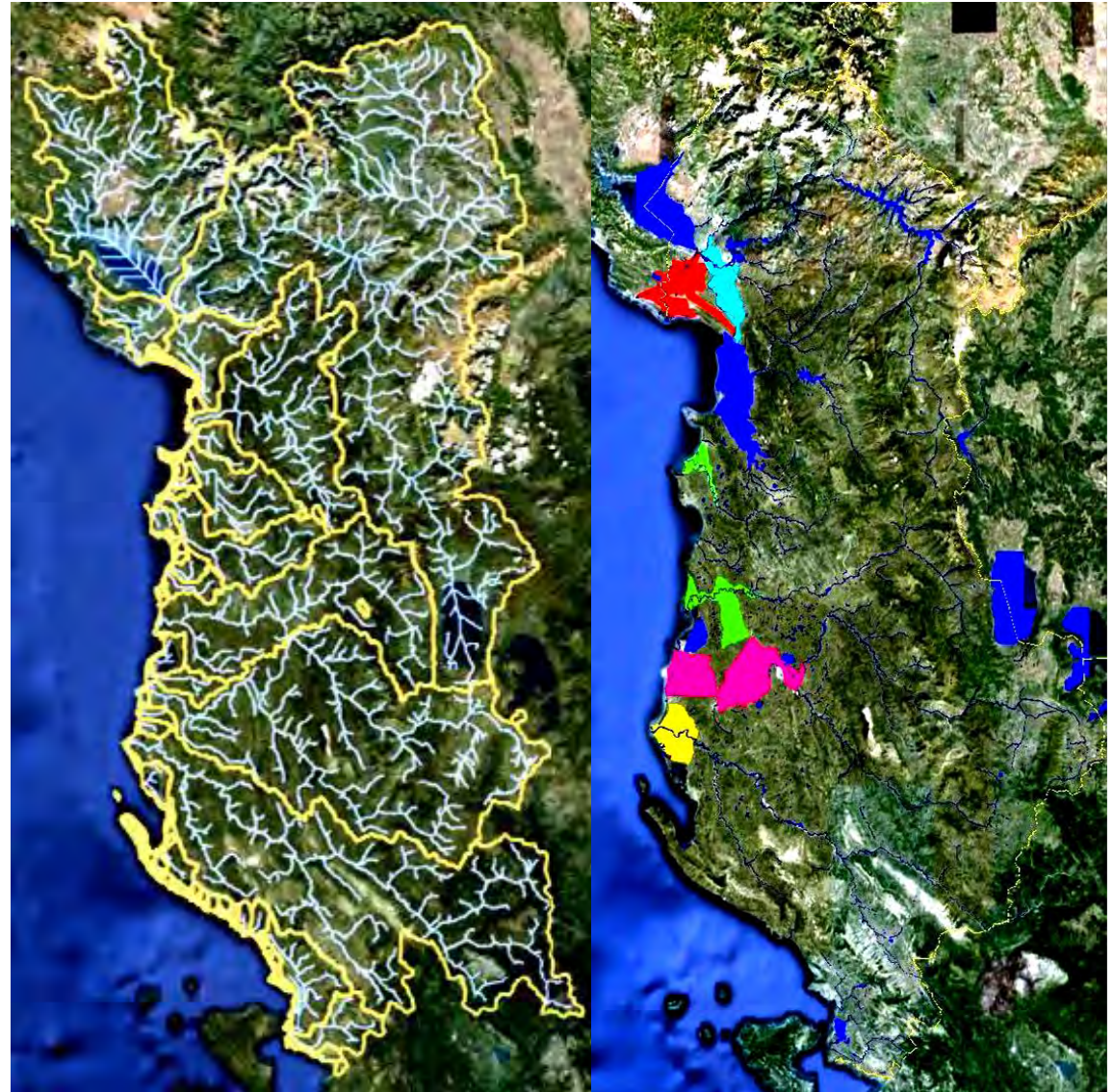
Polytechnic University of Tirana
Institute of Geosciences, Energy, Water and
Environment

Klodian Zaimi

Floods from Albanian Rivers

- In Albania, the rivers constitute the highest flood risk, whose effects extended to 130 000 hectares of land.
- The floods are generally of pluvial origin and are occurring in the period of November – March, when the country receives about 80-85 % of annual precipitations.

The largest floods have appeared in the low western area of the country but small rivers and the torrents cause Flash Flooding too. As the urban development of the floodplain increased, the damage caused by flooding also increased. The conception of the flood-protection measures has been derived from an analysis of floods in the area of these rivers since 1962-1963. After the flood of these years, protection structures were constructed in some rivers. These structures were constructed with an average return period of 1%.



In January and December 2010 the flood caused major damage and disruption over a wide area.

The flooding of January 2010 in the district of Shkodra was at the time considered the biggest emergency event.

Some 10,400 ha of land was inundated and about 2500 houses and 4800 people were evacuated.

After being forced to release water, the discharge increased to 2450 cubic metres per second while the maximum capacity of Buna River is only 1600 cubic metres per second.

Another similar situation was in march 2018 in Buna River.

Historical Floods from Buna River

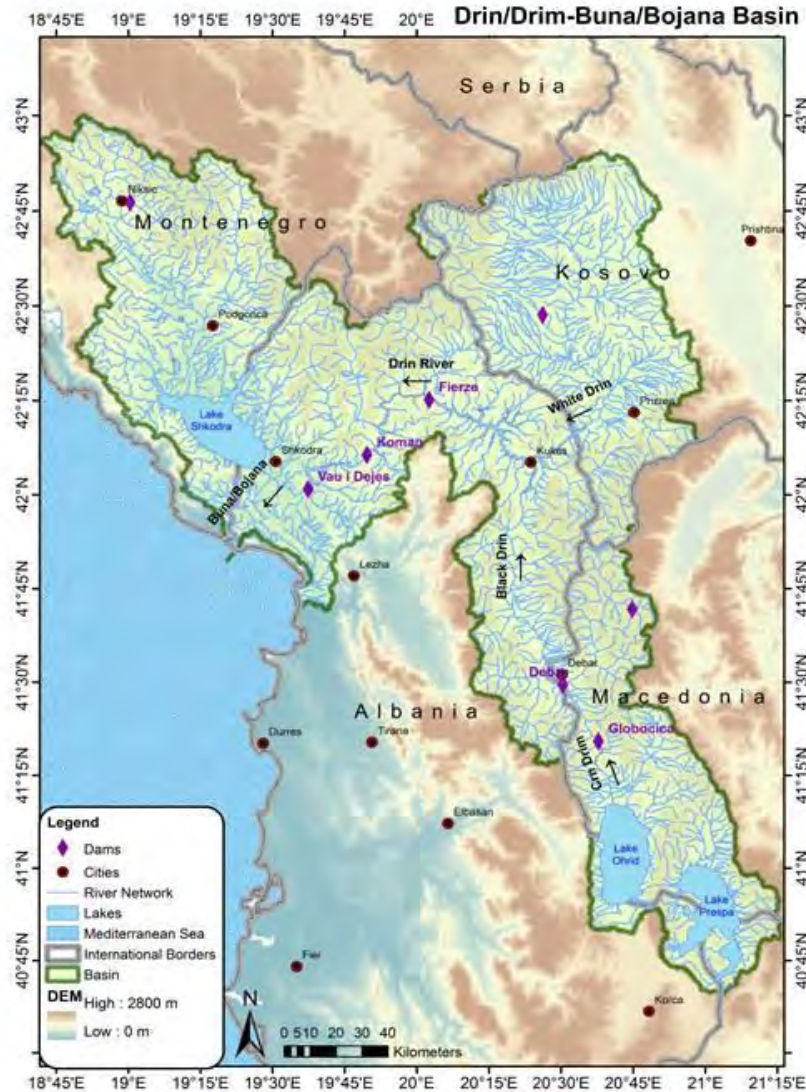


Drin deviation to Buna River

Flood of January 2010

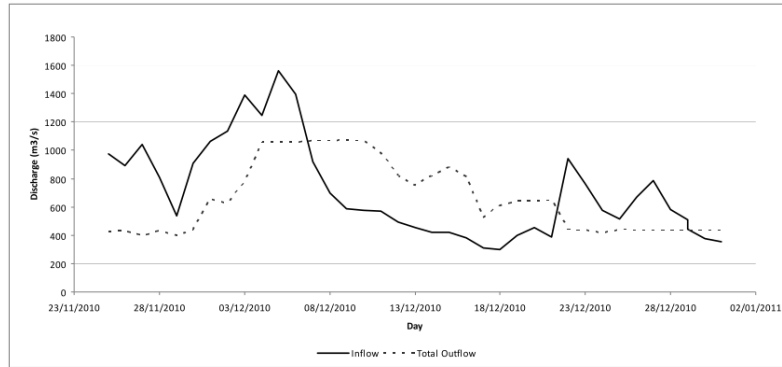


DRINI-BUNA CATCHMENT AND ITS RIVER-DAM SYSTEM



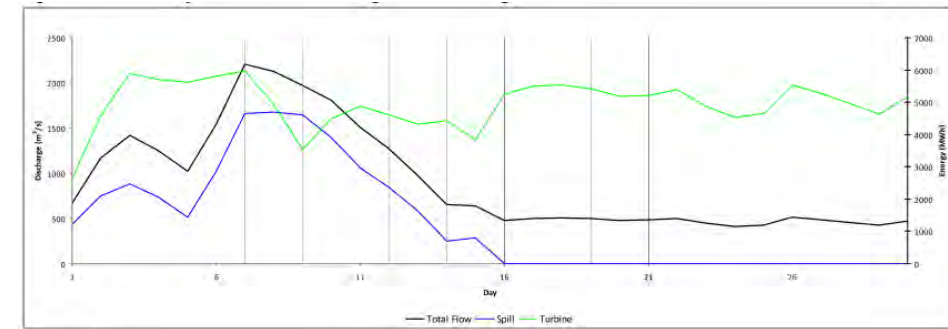
Study / Source	Fierze HPP		Komani HPP		Vau-i-Dejes HPP		
	WL (masl)	mio. m ³	WL (masl)	mio. m ³	WL (masl)	mio. m ³	
KESH document on regulation rules of Drini cascade (1988)	Dam crest	312	n.a.	185	650	79	700
	Max OWL	295	2620	175	530	76	560
	Min OWL	240	n.a.	170	435	74	540
	Active storage		2300		62,3		44

The Inflow and Outflow for Fierza Reservoir during December 2010



Source: KESH

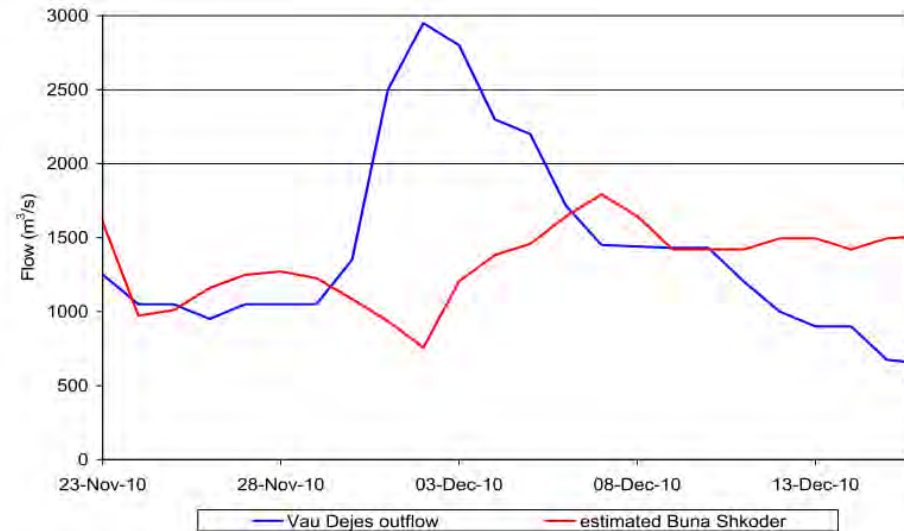
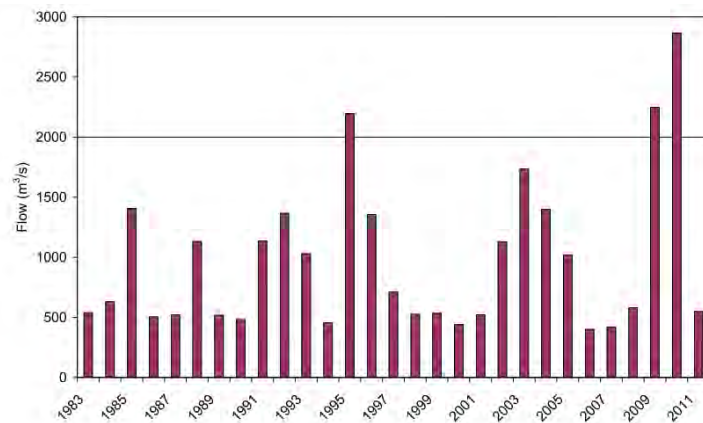
Vau Dejes Outflow and Power generation during December 2010



Source: KESH

(Source: Mott MacDonald)

Annual Maximum Flows from Vau Dejes Reservoir



Discharge for Drini and Buna Rivers and impact from the dams

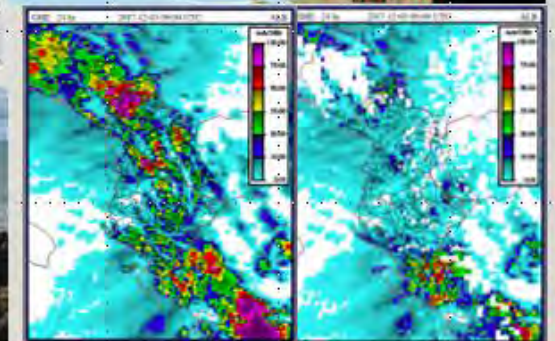
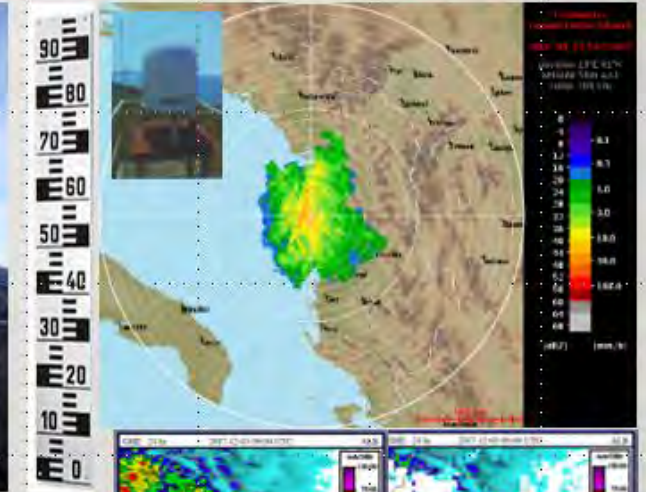


Introduction to the Institute of GeoSciences, Energy, Water and Environment



NATIONAL CENTRE FOR FORECAST AND MONITORING OF NATURAL RISKS (IGEWU)

- Radar and Satellite data
- Manual stations (more than 200)
 - Meteorological
 - Hydrological
- Automatic stations (49)
 - Meteorological
 - Hydrological
 - Sea
 - Agro-climatic



Albanian observation network



Buletins for early warnings

Published 365 days a year at 12:00 p.m. in IGEWE web page, Facebook and sent by email.

BULETINI MBI RREZIQËT NATYRORE
Bulletin on Natural Hazards

Qendra Kombëtare për Parashikimin dhe Monitorimin e Rreziqeve Natyrore
Facebook page : Instituti i Gjeoshkencave, Energjisë, Ujit dhe Mjedisit, IGEWE | www.ige.edu.al

Buletini Nr. 64 / 2016, 23-03-2016 | I vlefshëm nga: 23-03-2016, ora 12:00 deri më 24-03-2016, ora 23:00

Për rreziqe të tjera meteorologjike ON-LINE, klikoni në: www.atmosfera.al

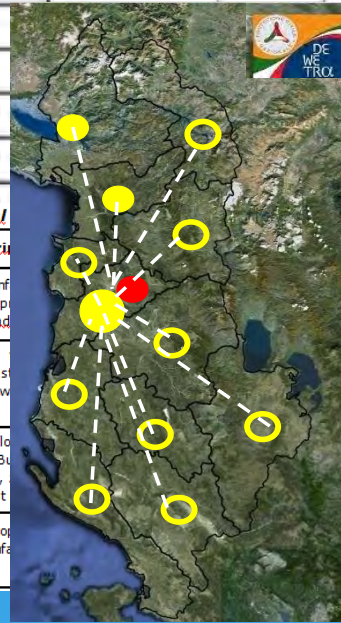
Qarku	Ngjarje meteorologjike			Ngjarje Hidrologjike	
	Reshje	Rrufe	Shtrëngata	Përmbytje urbane ose nga përrrenjtë dhe lumenjtë e vegjël	Përmbytje nga lumenjtë mesëm dhe të mëdha
Lezhë	mesatare lokalisht, intensive	⚡	☁		
Durrës	mesatare	⚡	☁		
Tiranë	mesatare lokalisht, intensive	⚡	☁		
Elbasan	mesatare lokalisht, sh. intensive	⚡	☁		
Fier	mesatare	⚡	☁		
Berat	mesatare lokalisht, intensive	⚡	☁		
Korçë	mesatare lokalisht, sh. intensive	⚡	☁		
Vlorë	intensive lokalisht, sh. intensive	⚡	☁		

LEGJEND 1: Meteorological Risks

Type of Risk	Description
NO RISK	Low precipitation from 0 to 15 mm in 24 hours is forecast (0-15mm/24h). No severe meteorological events are expected.
LOW RISK	Average precipitation from 15 to 45 mm in 24 hours is forecast (15-45mm/24h). Low probability of severe meteorological events is expected.
MODERATE RISK	Intensive precipitation from 45 to 90 mm in 24 hours is forecast (45-90mm/24h). Moderate probability of severe meteorological events is expected.
HIGH RISK	Very intense precipitation higher than 90mm in 24 hours is forecast (>90mm/24h). High probability of severe meteorological events is expected.

LEGJEND 2: Hydrological

Type of Risk	Symbol	Description
Thunderstorms	☁⚡	high intensity rainfall 20 mm/3 hours which can create problems depending on the type of landcover and soil type
Flash floods	🌊	fast occurring floods in small catchments or streams or urban areas. The event will last less than 12 hours
River floods	🌊	slow occurring floods in big rivers such as Drini, Buna, Mati, Ishëm, Erzen, Shkumbin, Seman and Vjosa. The event will last more than one day
Surface landslide susceptibility	⚠️	surface terrain slope movement only related to rainfall intensity and duration



BULLETIN ON NATURAL HAZARDS
National Center for the Prediction and Monitoring of Natural Hazards
Facebook page : Institute of GeoSciences, Energy, Water and Environment, Webpage: www.ige.edu.al

Bulletin Nr. 216 / 2017, 03-11-2017 | Bulletin : from 03-11-2017, 12:00 h to 04-11-2017, 23:59 h

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LEGJEND 3: Forest Fires Risk

Type of Risk	Description
NO RISK	very low probability of fire ignition. The possible fires are easily controllable, and fire spread velocity is low. In forest areas with dried covered floor fire spread velocity can be medium
LOW RISK	low probability of fire ignition. The possible fires are controllable however fire spread velocity can be medium in all areas. In forest areas with dried covered floor fire spread velocity can be high
MODERATE RISK	medium probability of fire ignition. The possible fires are difficult to control, and fire spread velocity can be high in all areas. In forest areas with dried floor and crown fire spread velocity can be very high
HIGH RISK	high probability of fire ignition. The possible fires are very difficult to control, and fire spread velocity can be very high in all areas. In forest areas with dried floor and crown fire spread velocity can be extreme

Highest Risk in Prefectures for today and tomorrow, day. 03 - 04

Institute of GeoSciences, Energy, Water and Environment – IGEWE

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GIZ and NEXUS PROJECTS:

1) Hydrological model

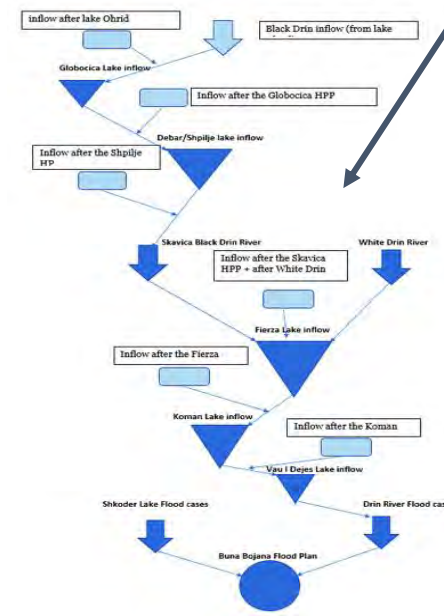
- Application of the hydrological model in around 20 000 km².
- So far: Average year, Wet year, Dry year: monthly water flow for either the period (1980-1990) or the period (2000-2010).
- The model outputs are: rainfall(mm) distribution, ETP(mm), Volume(m³), Average discharge(m³/s)
- Next run of the model: hourly discharge, flood events, HPP optimisation for energy and floods, different scenarios including Skavica HPP and climate change impacts on water resources..

The number of hydrometeorological stations with available data in the tables below:

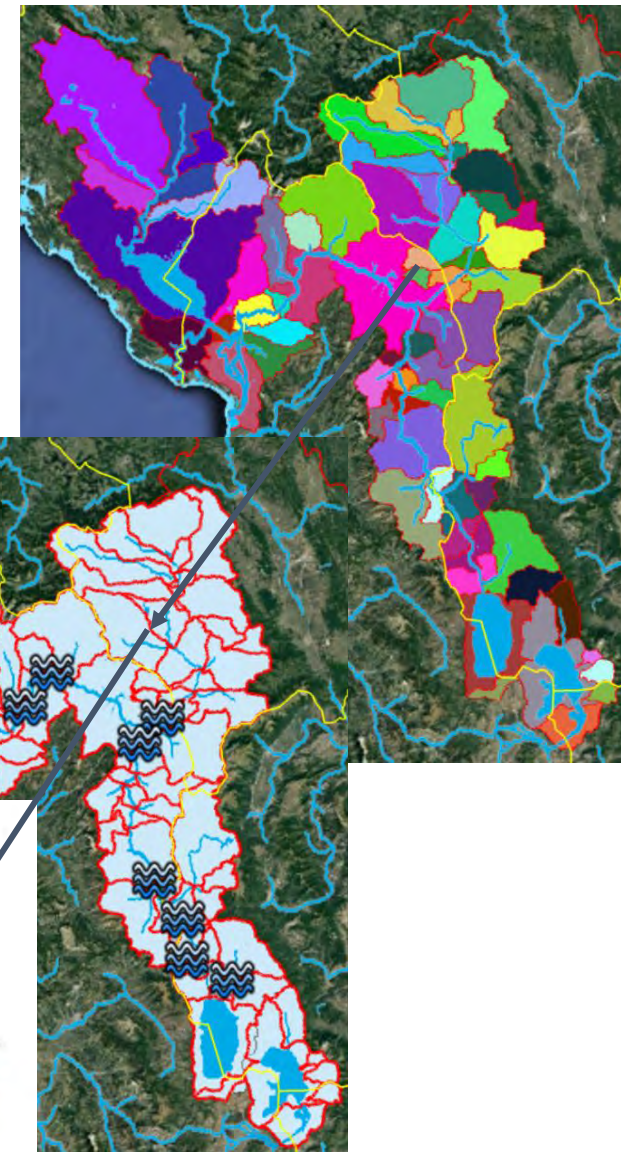
Sub-basin	Discharge	Water level	Storage elevation curve	Cross-sections	Rating curve
Albania	15	12	1	n.a.	n.a.
Montenegro	5	9	n.a.	n.a.	n.a.
Macedonia	6	6	2	5	n.a.
Kosovo	15	17	n.a.	11	n.a.

Sub-basin	Precipitation	Air temperature	Snow	Sunshine duration	Global radiation	Relative humidity	Wind
Albania	31	28	1	4	1	n.a.	n.a.
Montenegro	11	2	1	2	2	2	2
Macedonia	10	4	10	3	n.a.	3	4
Kosovo	2	3	1	n.a.	n.a.	3	3

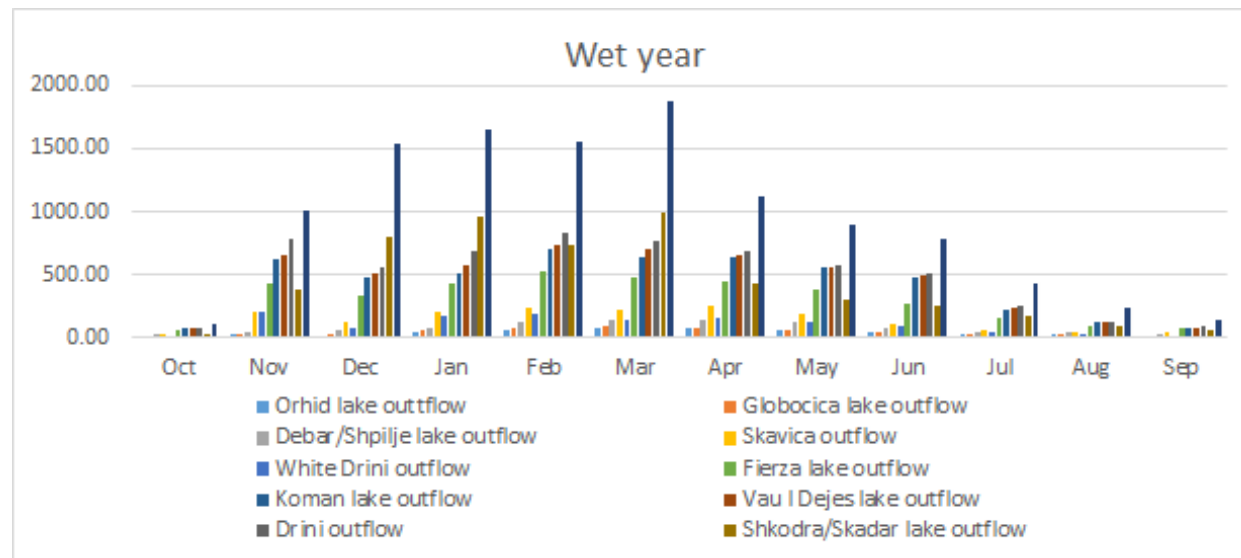
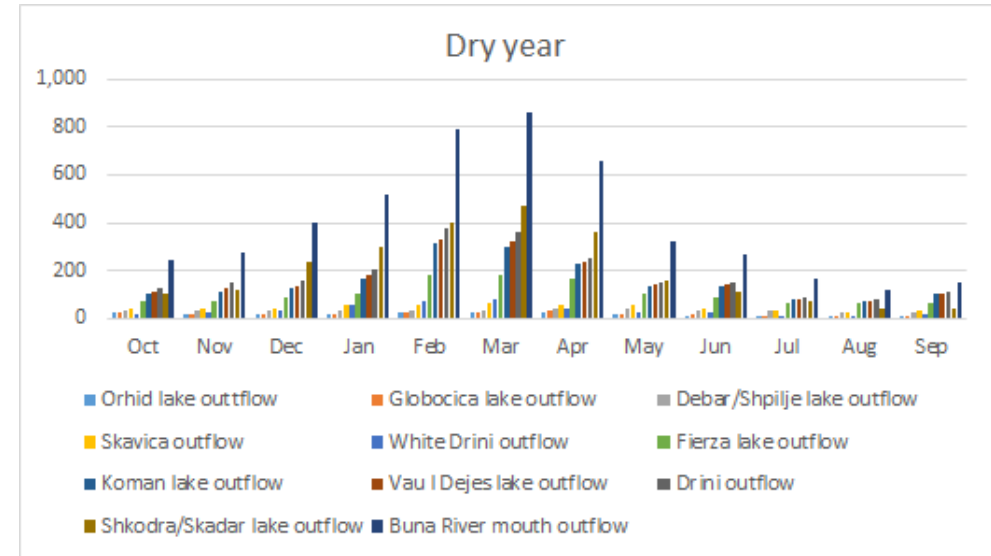
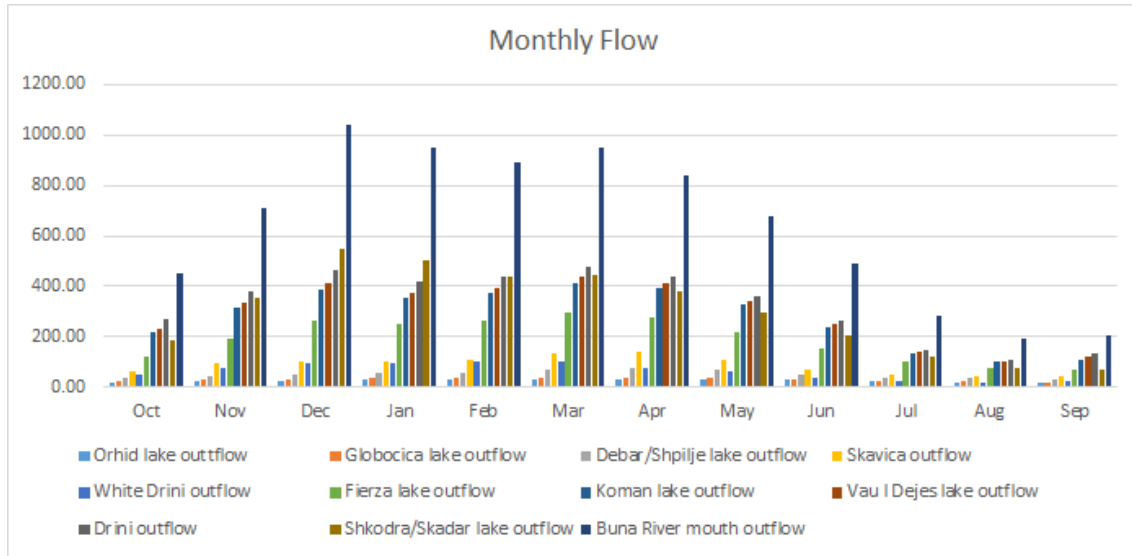
n.a. time series data are not available.



Simplified Hydrological model from the previous version

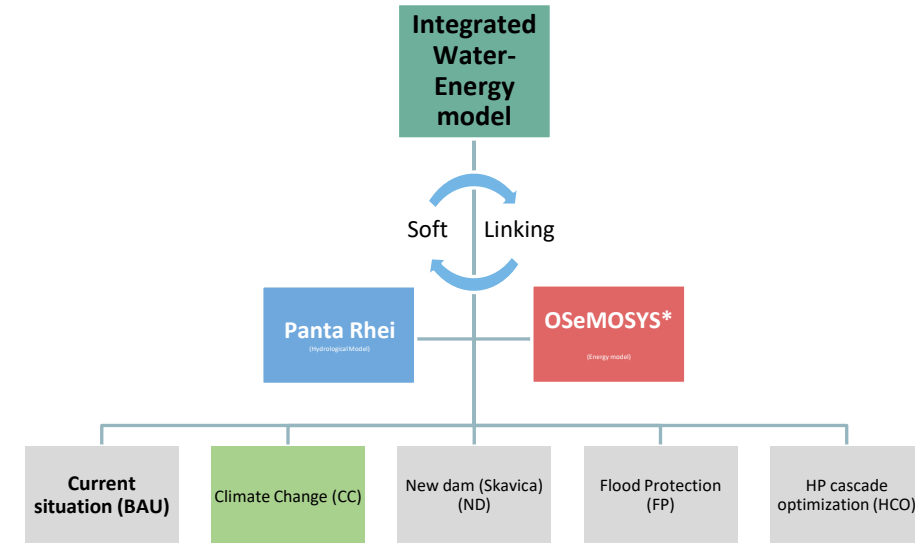


Results from hydrological modeling in some important locations

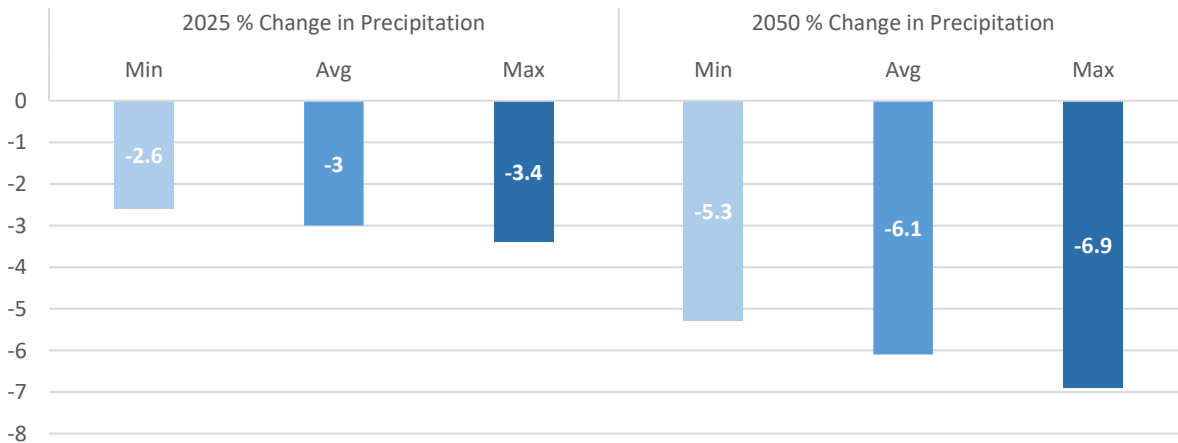


Climate Change scenario (CC):

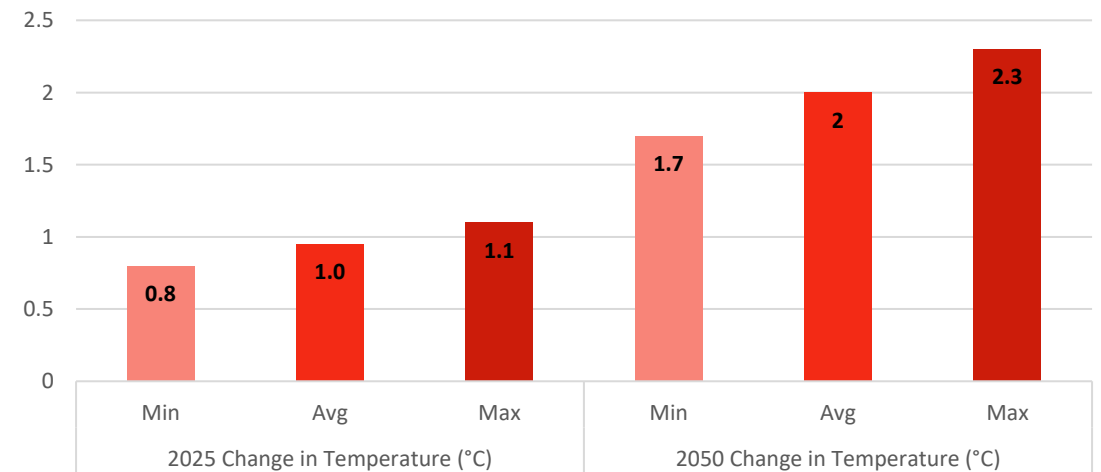
- ❖ Flow: based on two sets of projections:
 - ❖ 2025: with avg (-3%) change in precipitation.
 - ❖ 2050: with avg (-6%) change in precipitation.
 - ❖ linear decline in water flow assumed between (2021-2025) and (2026-2050).



Climate Change projections - change in Precipitation

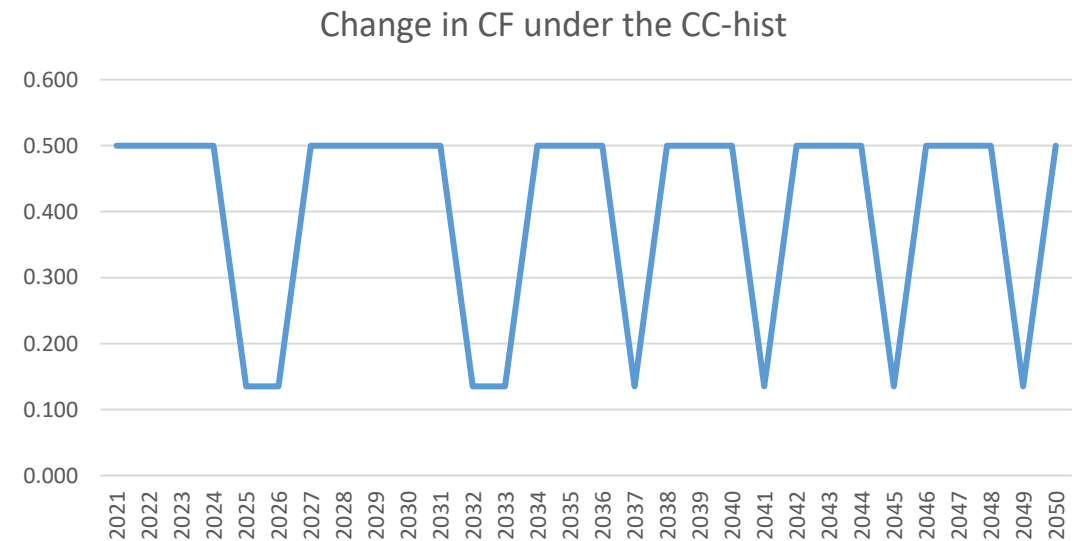


Climate Change projections - change in Temperature



Climate Change scenario - historical dry year (CC-Hist):

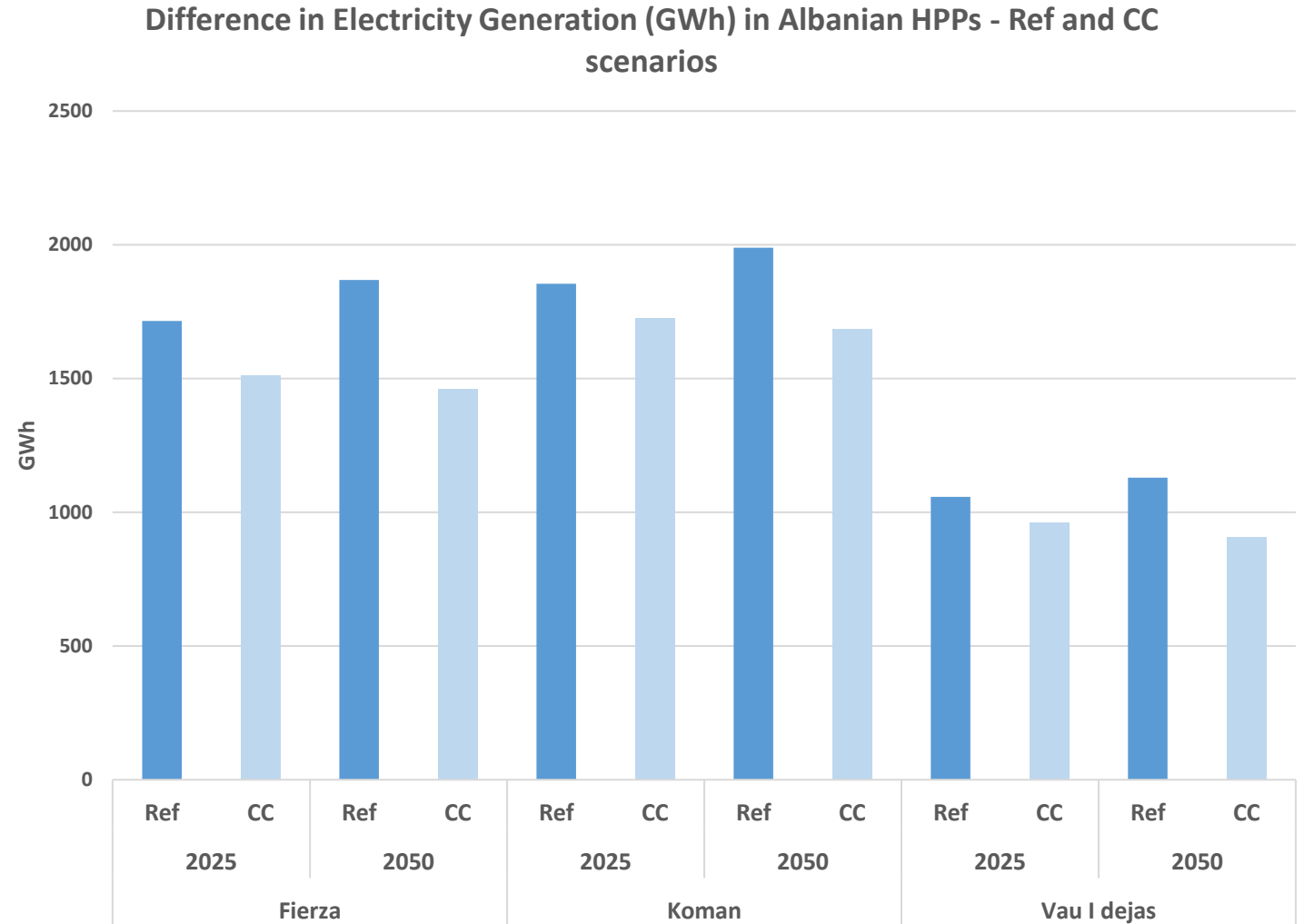
- ❖ Flow: based on historical data from 2001-2010:
 - ❖ The year with the lowest cumulative water flow was selected (2002).
 - ❖ The weekly flow in the dry year (2002) was taken for each location of interest.
 - ❖ Random frequency of dry years assumed between 2021-2050 to get a series of normal and dry flow.



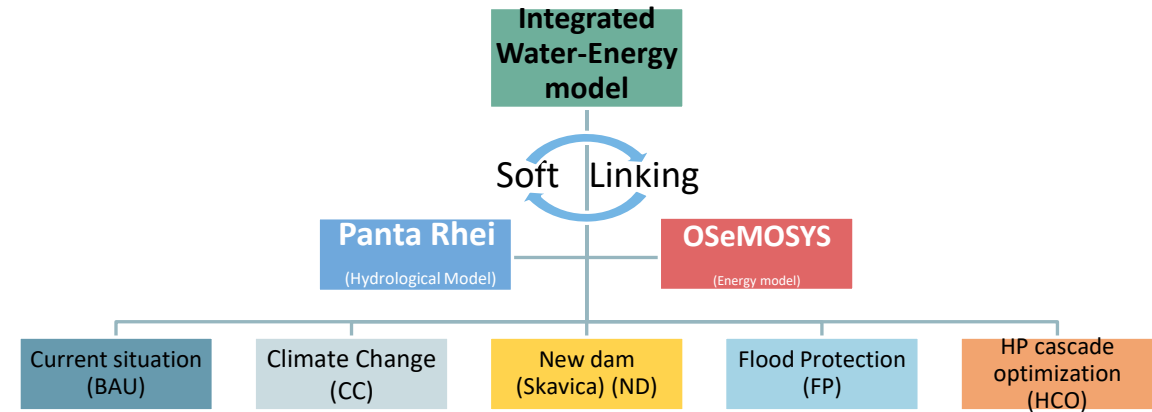
SELECTED INSIGHTS: Climate change scenario (CC)

Change in Electricity generation under the Climate Change scenario (compared to reference scenario):

- **Fierza: (-12% , -22%)**
- **Koman: (-7% , -15%)**
- **Vau I dejas: (-9% , -20%)**

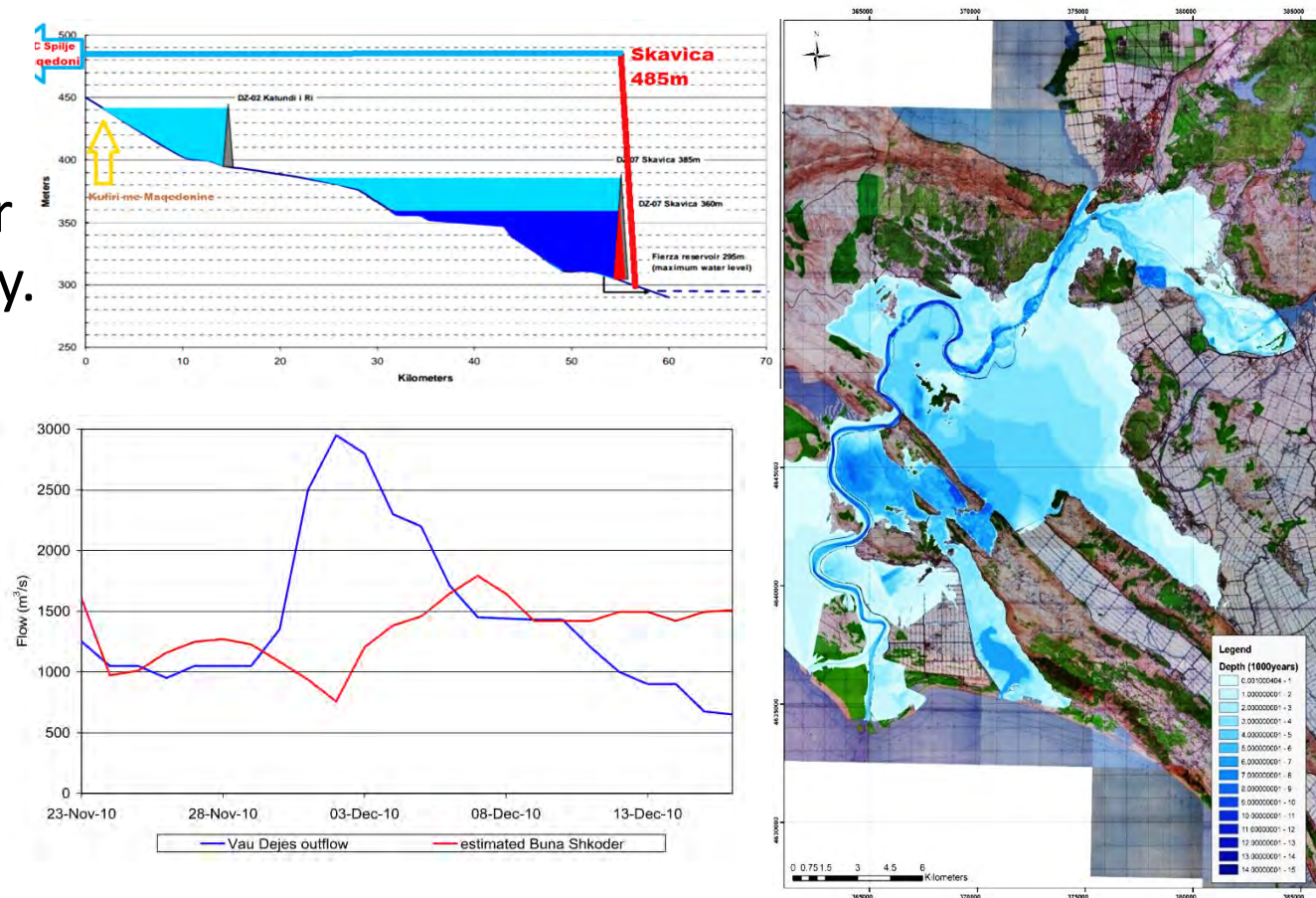


NEXT STEPS



1. Developing scenarios:
 - a. **Skavica:** Impact on the floods downstream and water regime.
 - b. **Flood Protection:** increasing buffer zone, impacts on floods and energy.
 - c. **HPP cascade optimization:** coordinated operation for decreasing flood inundation.

2. Improve the granularity of the model (electricity trade, etc..)





**Thank you
for your
attention!**

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