Team 07 Presentation 3

HYDROEUROPE

Presentation 3: Analysis of IPCC scenarios in the Skawa catchment

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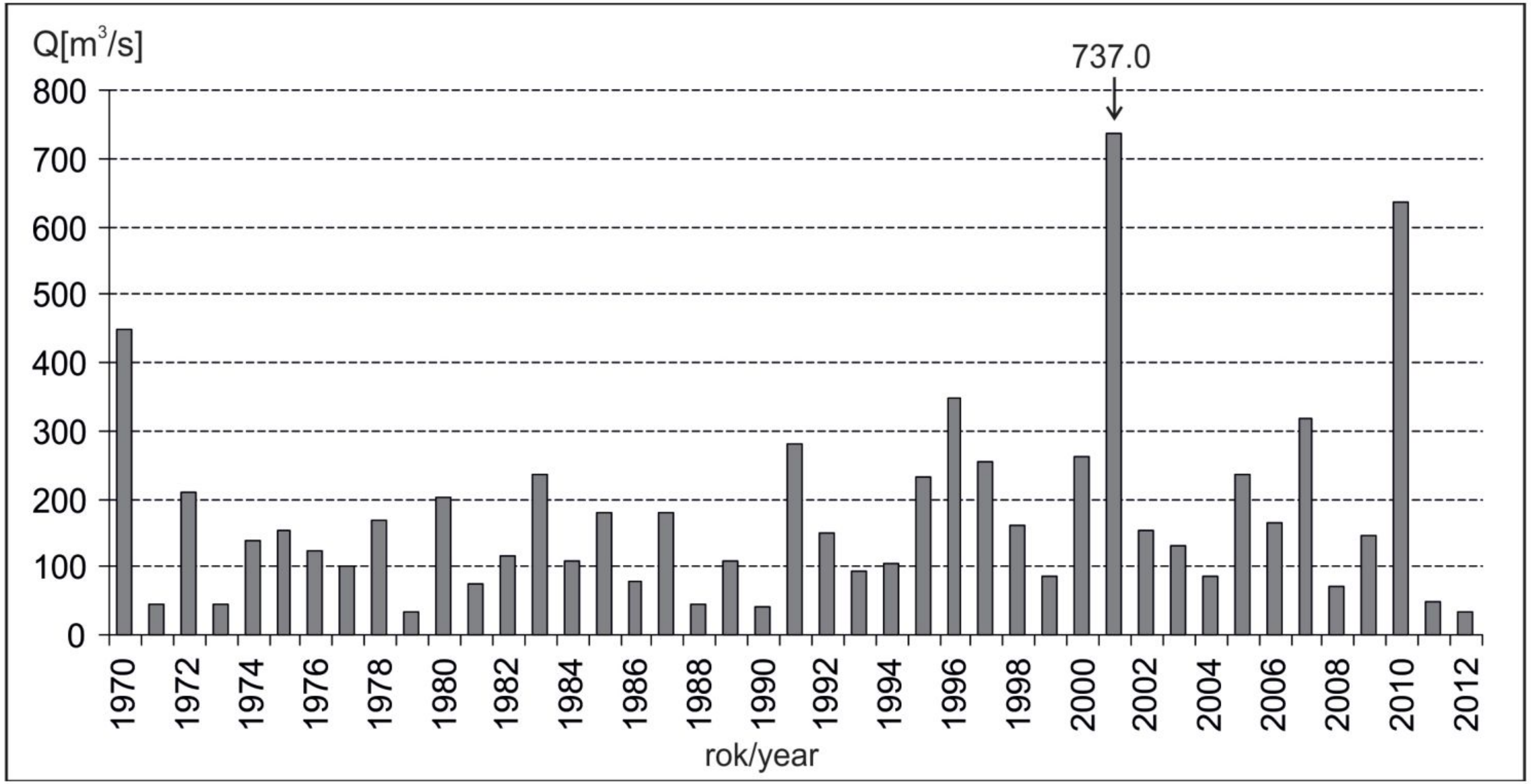
Introduction - Skawa catchment



The maximum outflow unit from the catchment of the Skawa on 1970–2012 (Franczak, 2020).

Maków Podhalański during the flood in 2001 (Franczak, 2020)

Introduction

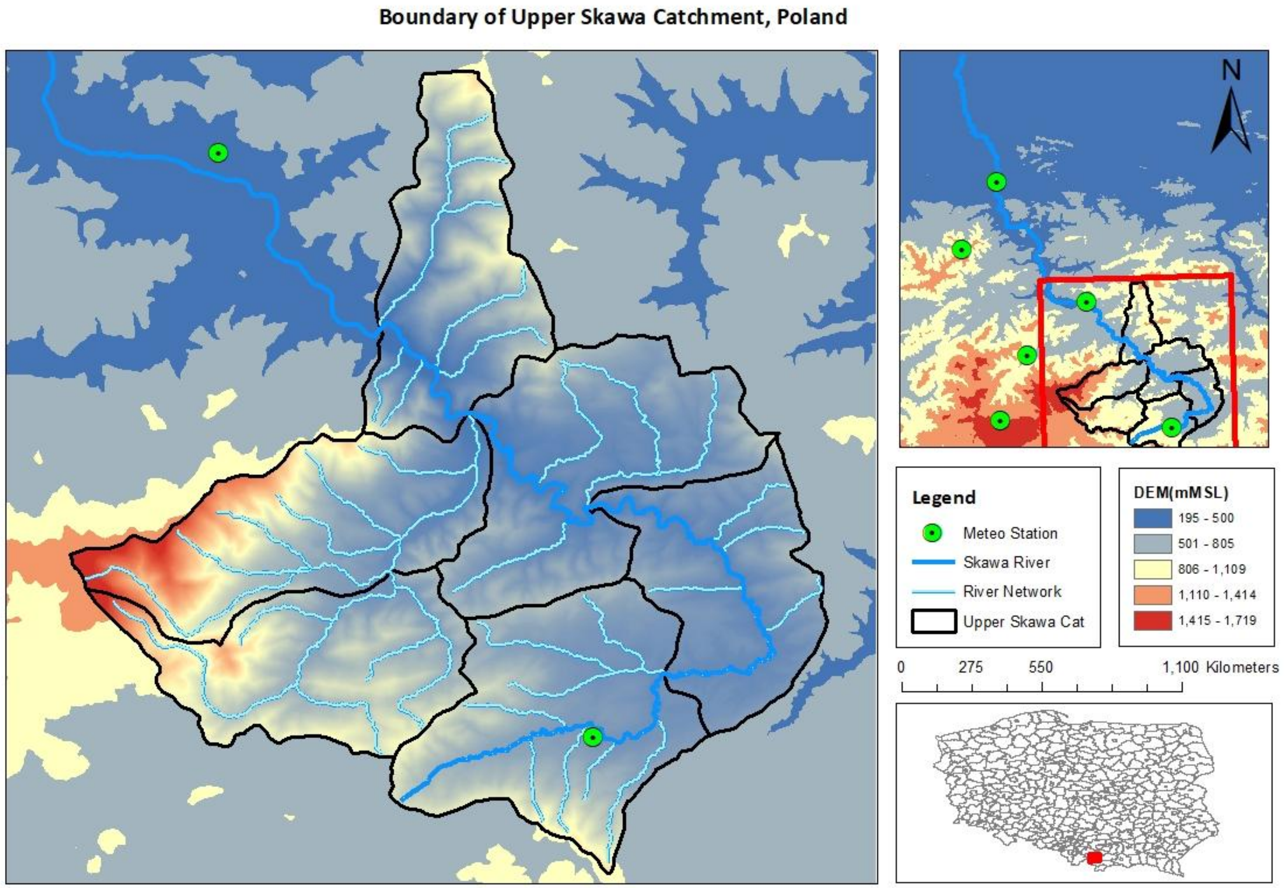


Figure 01 Study Area

Workflow

- ➔ Calibration of the model for 3 different flood events (2014-2015)
- ➔ Validation of the model for 3 events
- ➔ Implementation of IPCC RCP4.5 and RCP8.5 scenarios → influence of the change of precipitation on the model in our case study

Calibration of the model for 3 different flood events (2014-2015)

Table 01 Calibration results based on 3 events.

Results	Event 01	Event 02	Event 03
	May-14	Sep-14	May-15
Peak Flow (m^3/s)	197.4	9.1	26.9
Total Volume (m^3)	25152.9	2899.8	6961.3
NSE	0.268	0.913	0.794
Date of Peak Discharge	15 May 2014 22:00	29 Sep 2014 21:00	26 May 2015 22:00
Date of Peak Discharge (Obs)	15 May 2014 17:00	29 Sep 2014 16:00	26 May 2015 21:00

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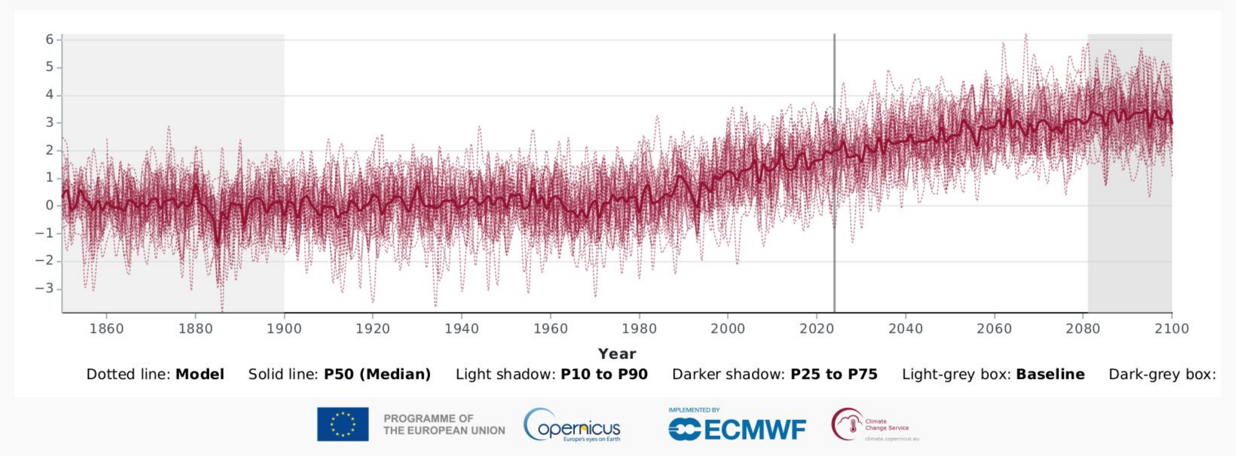
IPCC scenarios analysis

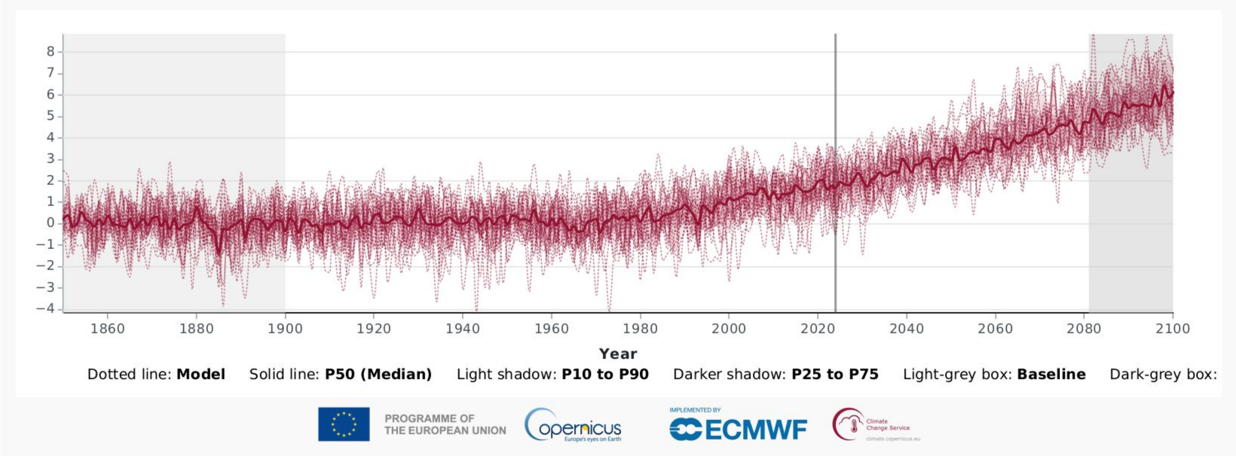
2 studied scenarios

- ➔ RCP 4.5
- ➔ Average temperature increase of 1.97°C by 2100

- ➔ RCP 8.5
- ➔ Average temperature increase of 4.46°C by 2100



Mean temperature change in Poland for the RCP 4.5 scenario from 1850 to 2100 (https://atlas.climate.copernicus.eu).



Mean temperature change in Poland for the RCP 8.5 scenario from 1850 to 2100 (https://atlas.climate.copernicus.eu).

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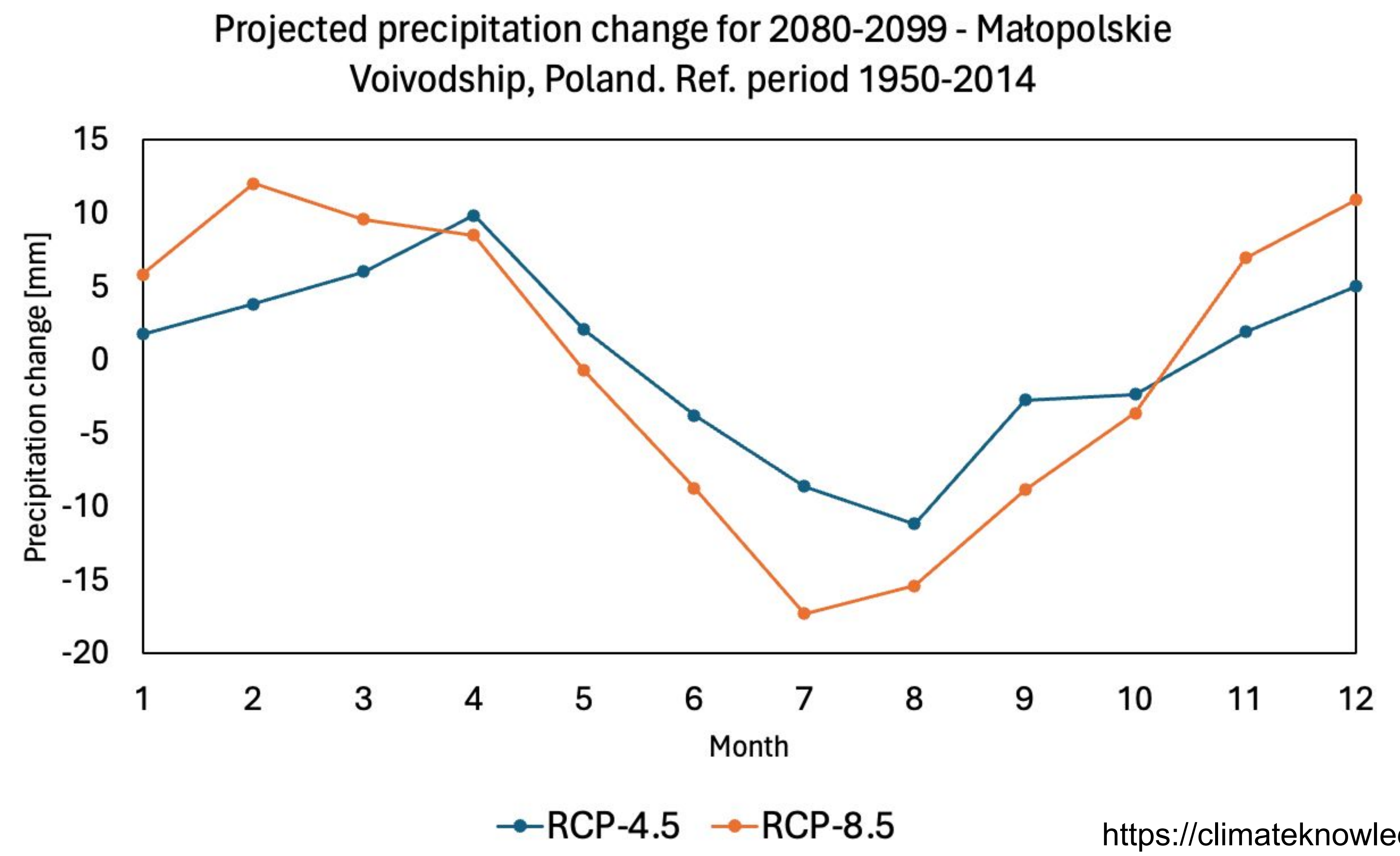
IPCC scenarios analysis



https://climateknowledgeportal.worldbank.org/

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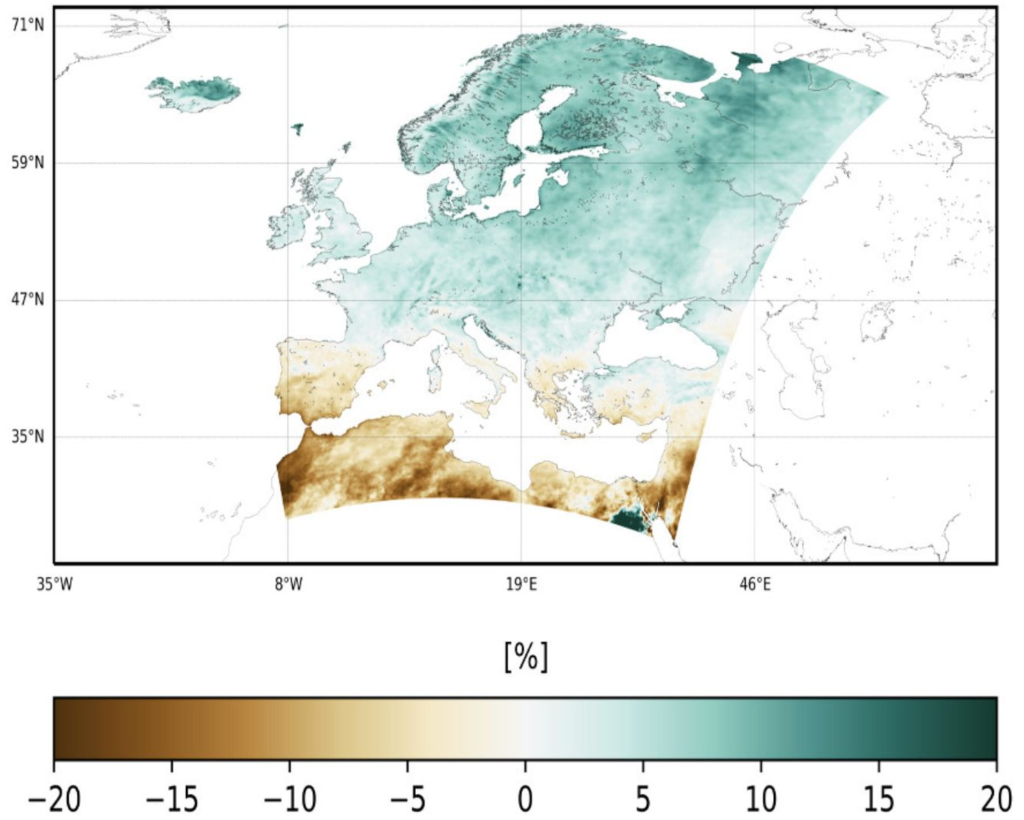
IPCC scenarios analysis

Change in precipitation in different scenarios in %

Month	RCP 4.5			RCP 8.5	
	NT-1	NT-2	LT	NT-2	LT
April	5	5	10	10	20
May	5	5	10	10	20
June	-10	-10	-15	-10	-20
July	-10	-10	-15	-10	-20
August	-10	-10	-15	-10	-20
September	5	5	10	10	25
October	10	15	20	10	35

NT-1 → 2016 - 2035; NT-2 → 2046 - 2065; LT → 2081 - 2100

Relative change of annual mean precipitation (2011-2040 vs 1971-2000)



https://cds.climate.copernicus.eu/

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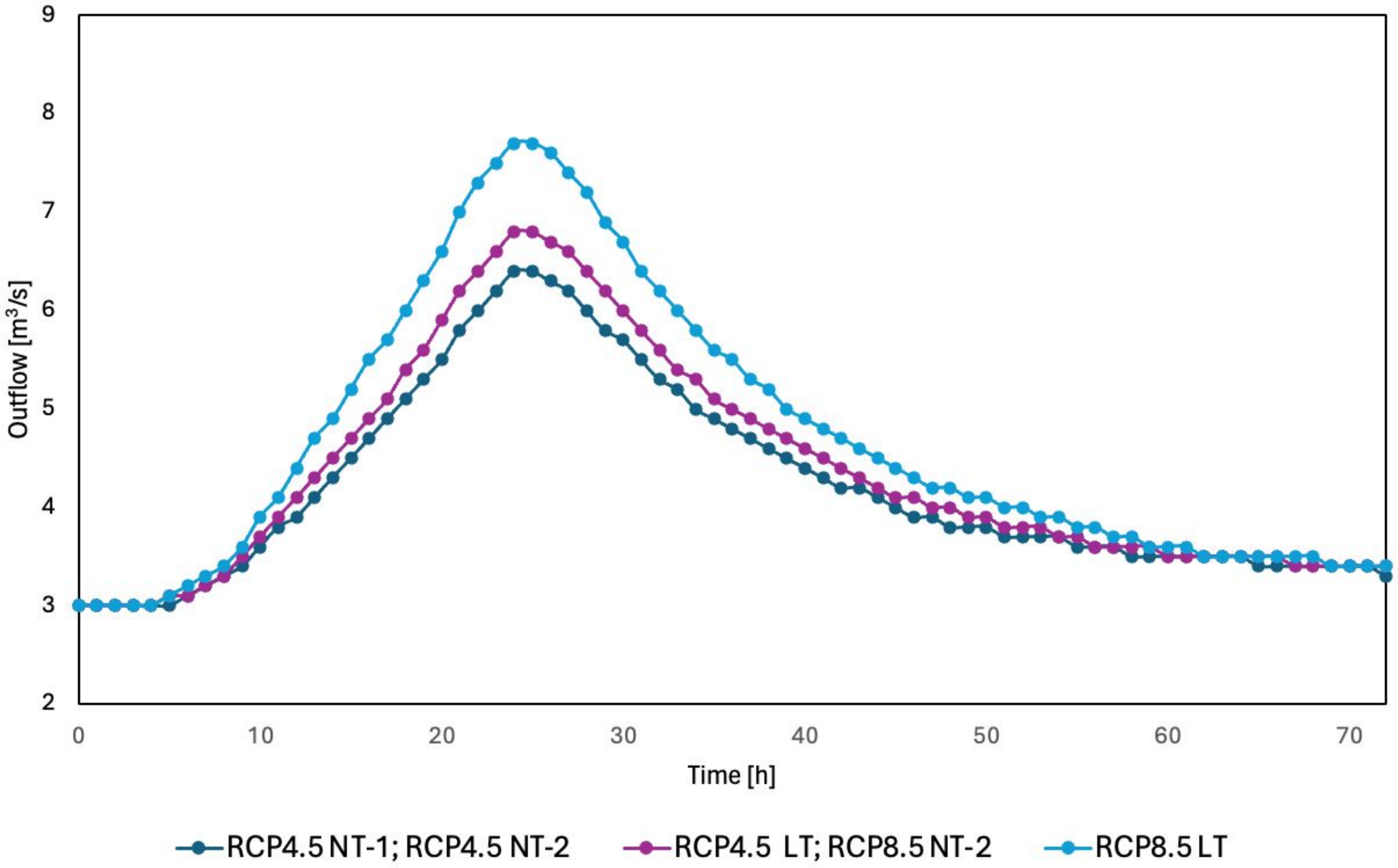
Implementation of RCP4.5 and RCP8.5 scenarios - May 2016 event

- ➔ Scenario assumes bigger precipitation
- ➔ Peak flow and volume increase according to the scenario and the period of time considered

Table 04 Results from implementation of different RCP scenarios to May 2016 event.

May 2016	RCP4.5			RC8.5	
	NT-1	NT-2	LT	NT-2	LT
Peak Flow (m3/s)	6.4	6.4	6.8	6.8	7.7
Total Volume (1000 m3)	1096	1096	1134	1134	1217



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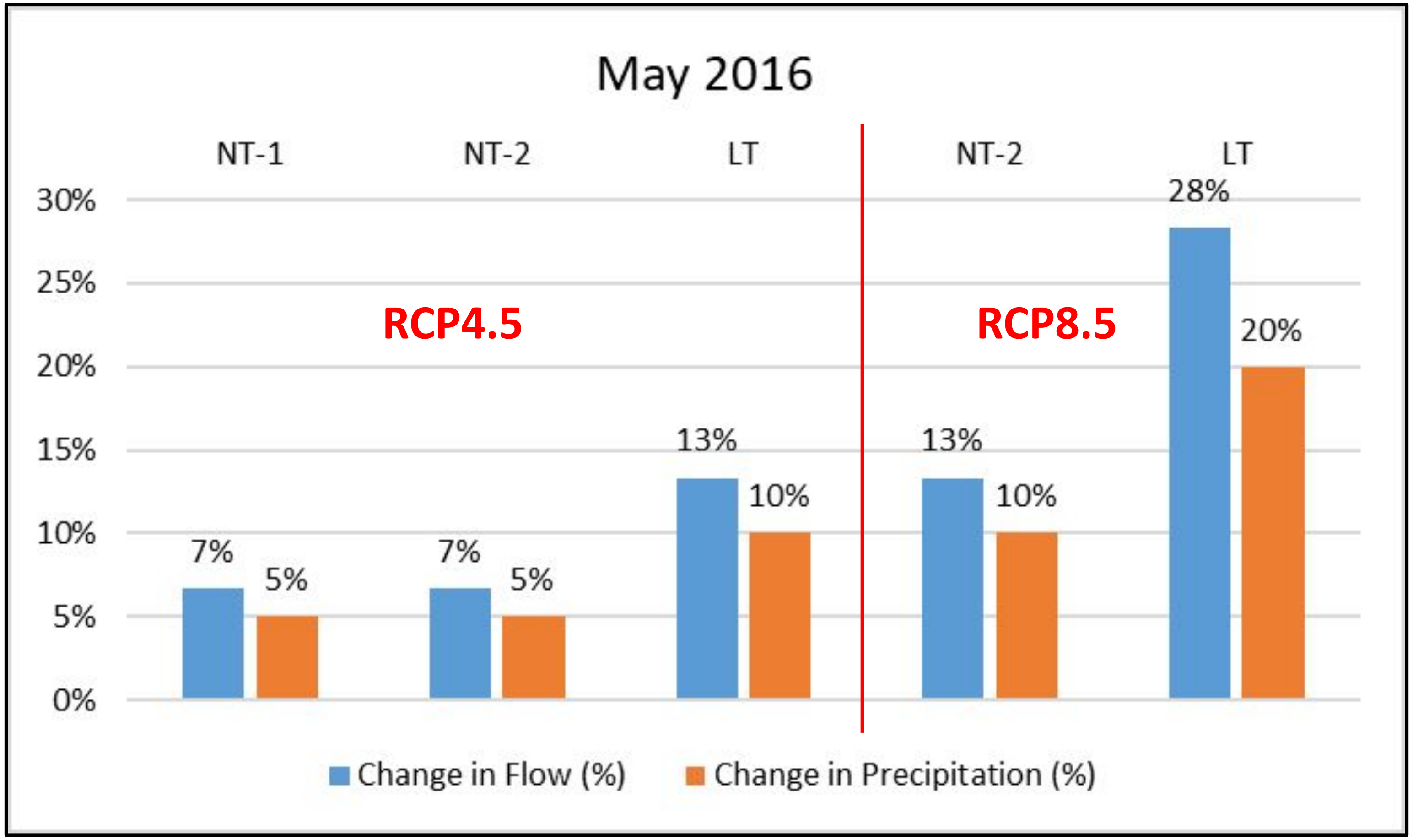
Implementation of RCP4.5 and RCP8.5 scenarios - May 2016 event



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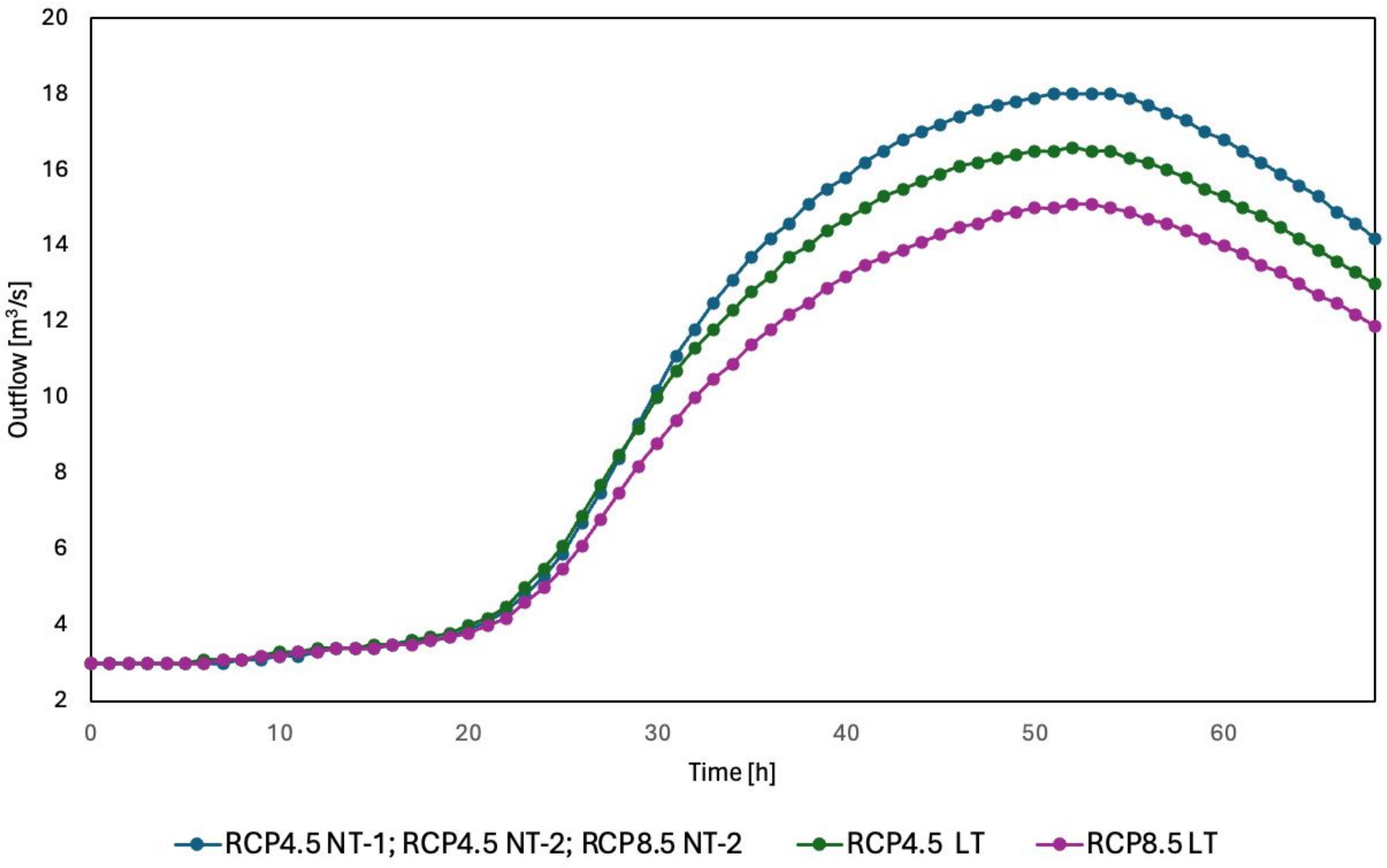
Implementation of RCP4.5 and RCP8.5 scenarios - July 2016 event

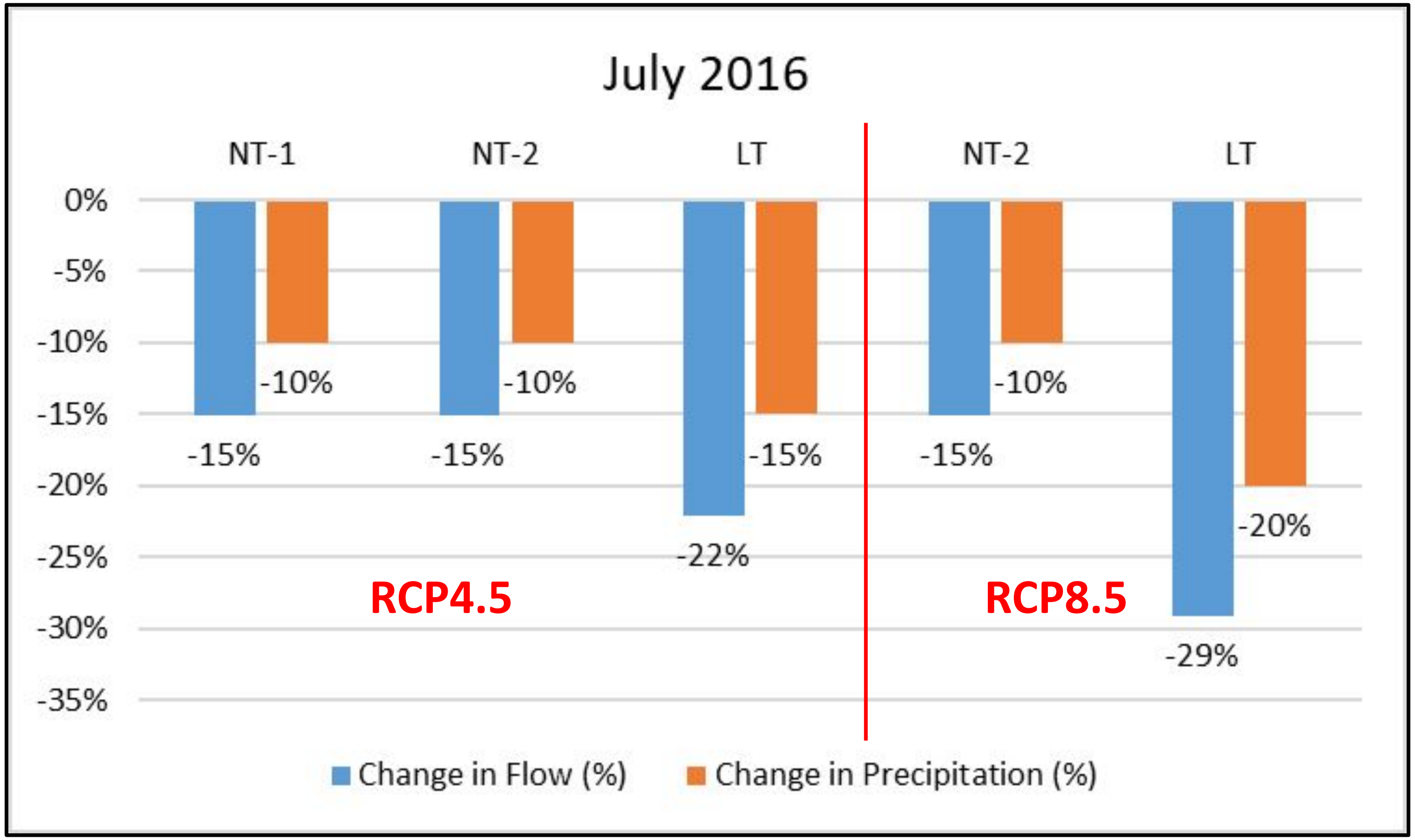
- ➔ Scenario assumes lower precipitation
- ➔ Same peak flow and volume for both scenarios considering a near term scale
- ➔ Significant reduction in flow over the long term scale

Table 03 Results from implementation of different RCP scenarios to July 2016 event.

July 2016	RCP4.5			RC8.5	
	NT-1	NT-2	LT	NT-2	LT
Peak Flow (m3/s)	18.1	18.1	16.6	18.1	15.1
Total Volume (1000 m3)	2704	2704	2484	2704	2267



Implementation of RCP4.5 and RCP8.5 scenarios - July 2016 event

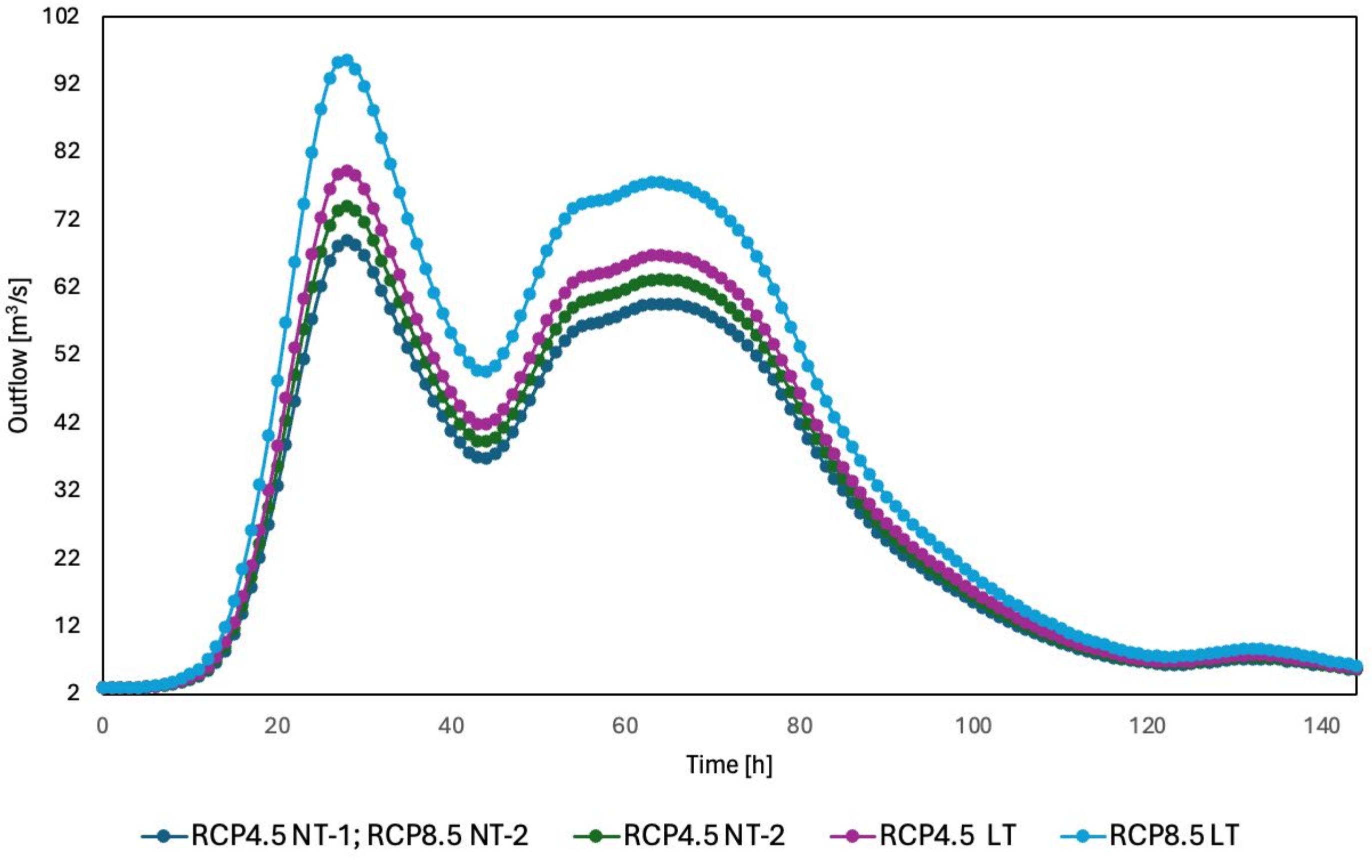


Implementation of RCP4.5 and RCP8.5 scenarios - October 2016 event

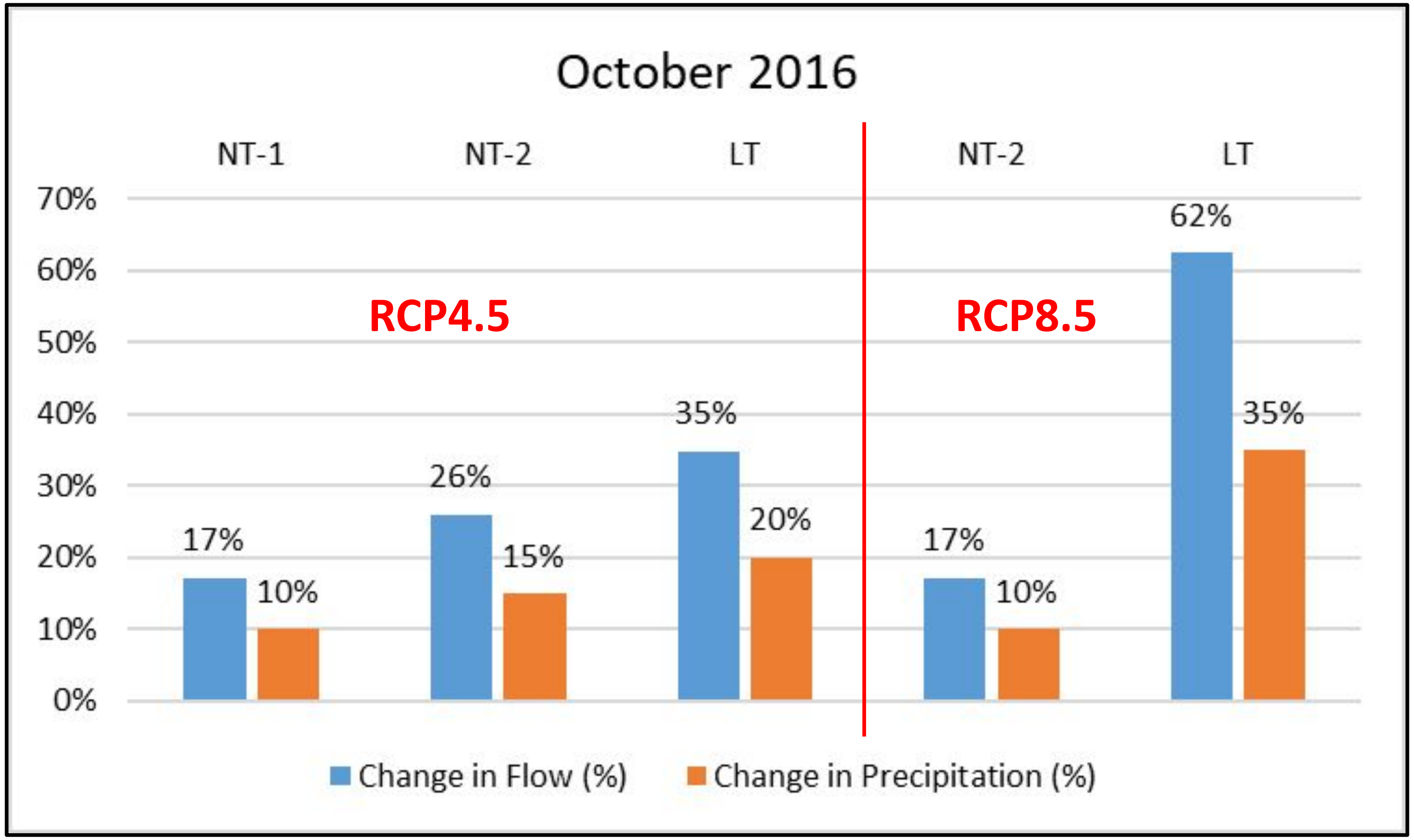
- ➔ Scenario assumes bigger precipitation
- ➔ Precipitation is fluctuating in autumn season
- ➔ Slightly increase in less than 30 hours

Table 05 Results from implementation of different RCP scenarios to October 2016 event.

October 2016	RCP4.5			RC8.5	
	NT-1	NT-2	LT	NT-2	LT
Peak Flow (m3/s)	69	74.2	79.4	69	95.7
Total Volume (1000 m3)	15221	16168	17118	15222	20055



Implementation of RCP4.5 and RCP8.5 scenarios - October 2016 event



Conclusions

- Relation Between Change of Rainfall & Discharge is **Non Linear** in Climatic Events. Higher Rainfall Event Having More Significant Changes
    - **Analysis of More Observed Events - Better Calibrated Model for Better Understanding,**

- In **Summer** Period, the Change of Rainfall in **Negative** - Increased Solar Radiation, Moisture Condition - Less Precipitation, Possibility of Droughts,
    - **Long Term Simulation (e.g. Hydrological Year),**

- **Uneven Distribution** of Rainfall Over the Year, High Intensity Rainfall
    - **Analysis of Historical Rainfall for Understanding the Pattern,**

Conclusions

- Uncertainty Associated -
    - **Land Use** Change in Future,
    - **Resolution** of the Climatic Data (GCM),
    - **Micro Climate Area** in Catchment, Rain Gauge Not Representative
    - **Semi Distributed** Model, Not Representing Physical System Completely,
    - **Socio-Economic** Factors,
    - **Interference** in the Catchment,
    - **Snow** Cover
        - **Impact of Landuse & Climatic - Forecasting Potential Landuse Change,**
        - **Use of Regional Scale Climate Model - Better Accuracy**
        - **Placement of Observation Stations in the Catchment,**
        - **Simulation of Model for Other Scenarios (e.g. SSP)**
        - **Development of Hydraulic Model for Flood Assessment.**

THANK YOU!