UNESCO Chair on Water-Related Disaster Risk Reduction and its activities 2016-19

United Nations
Educational, Scientific and
Cultural Organization

UNESCO Chair on
Water-related Disaster Risk Reduction
University of Ljubljana, Ljubljana, Slovenia

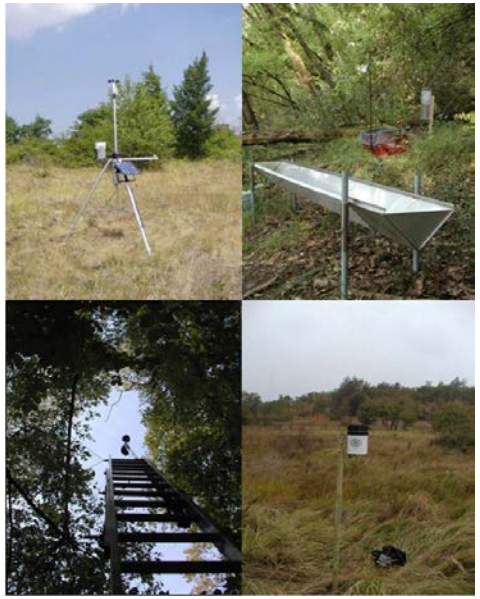
Univerza v Ljubljani
Fakulteta za gradbeništvo
in geodezijo

University of Ljubljana

- Comprehensive university: 23 faculties (schools) / 3 academies
- 35,000 students, 4,500 staff, close to 500 study programmes, 22 PhD
- ARWU World: #401-500, QS World: #651-700 (#326 in Natural Sciences)
- Members of European leagues of (research) universities:
  - ✓ The GUILD of European Research-Intensive Universities: https://www.the-guild.eu/members/
  - ✓ Central European Leuven Strategic Alliance (CELSA): http://celsalliance.eu/
  - ✓ UTRECHT Network: http://www.utrecht-network.org/
  - ✓ EUTOPIA - a new alliance of six European universities: https://www.uni-lj.si/news/news/20190228150237731/

WCDRR Activities I

UL FGG Chair of Hydrology and Hydraulic Engineering was supporting UNESCO IHP activities for decades – applied hydrological studies: flood hazards & risks, statistical hydrology, and contributed especially by field work in experimental river basins: hydrometeorology (interception studies, rainfall erosivity, soil erosion), sediment transport (turbidity, suspended loads, granulometry,...), landslide hydrology, ...



Šraj et al. (2016): „Review of Hydrological Studies Contributing to the Advancement of Hydrological Sciences in Slovenia“, Acta hydrotechnica, 29/50, 47-71. (available: ftp://ksh.fgg.uni-lj.si/acta/a29ms.pdf)

WCDRR Activities II

- COST ES0901: European procedures for flood frequency estimation (2010-2015).
- Past multilateral cooperation in the Sava River and the Danube River basins.
- International Sava River Basin Commission (ISRBC) – Estimation of Sediment Balance for the Sava River (2014) & Establishment of the Sediment Monitoring System for the Sava River Basin (2015).
- Hydrological Study of the Mura River (2012) & Study on Climate Change Impact on Flood Hazard in the Sava River Basin (2015).

  Brilly et al. (2015): „Climate Change Impact on Flood Hazard in the Sava River Basin“, In: R. Milačič et al. (eds.): „The Sava River“, 27-52, Springer Verlag, doi: 10.1007/978-3-662-44034-6_2
- The project NACER (Settlements & Corine Entity Results - Naselja & Corine Entitetski Rezultat) for Hrvatske vode, Croatia (2017).

  Zabret et al. (2018): „Development of model for the estimation of direct flood damage including the movable property“. Journal of flood risk management, 11(S1), 527-540, doi: 10.1111/jfr3.12255
- Flood Event Analysis in May 2014 in Bosnia and Herzegovina for the Bosna River in the Context of Supplementary Aid of the Republic of Slovenia (2014).

  Kobold et al. (2015): „Development of the hydrological model for the Bosna River basin to simulate the flood event in May 2014 in Bosnia and Herzegovina“, Acta hydrotechnica, 28/49, 77-100, ftp://ksh.fgg.uni-lj.si/acta/a49mk.pdf.

  Kobold et al. (2015): „Hydrological analysis of catastrophic flood that struck Bosnia and Herzegovina in May 2014“, UJMA, 29, 252-263, http://www.sos112.si/slo/tdocs/ujma/2015/252_263.pdf.

  Vidmar et al. (2016): „The Bosna River floods in May 2014“, NHESS, 16(10), 2235-2246, doi: 10.5194/nhess-16-2235-2016.

WCDRR Activities III

- Research Programme „Water Science and Technology & Geotechnical Eng.“ (since 2004) financed by Slovenian Research Agency (ARRS).
- ARRS project in debris-flow triggering mechanisms and modelling (2017-20).
- ARRS project on modelling of hydrological responses of non-homogenous catchments (2016-18).
- ARRS project on resilience of Alpine environment from the natural hazards perspective (2014-2017).
- ARRS project on developing of a unified method for estimation of cost-benefit of structural and non-structural measures for flood risk reduction (2018-19).
- Cooperation with UNITWIN Landslide and Water-related Disaster Risk Management at Kyoto University through the International Programme on Landslides (IPL).
- IPL World Centre of Excellence in Landslide Risk Reduction (WCoE: 2008-11, 2011-14, 2014-17, 2017-20) is focusing on landslide mechanisms in flysch formations.
- Cooperation with several UNESCO chairs in natural (hydrological) sciences. Newly: WENDI Chair on Water, Energy and Disaster Management for Sustainable Development at University of Kyoto, Japan (since 2018).

WCDRR Activities IV

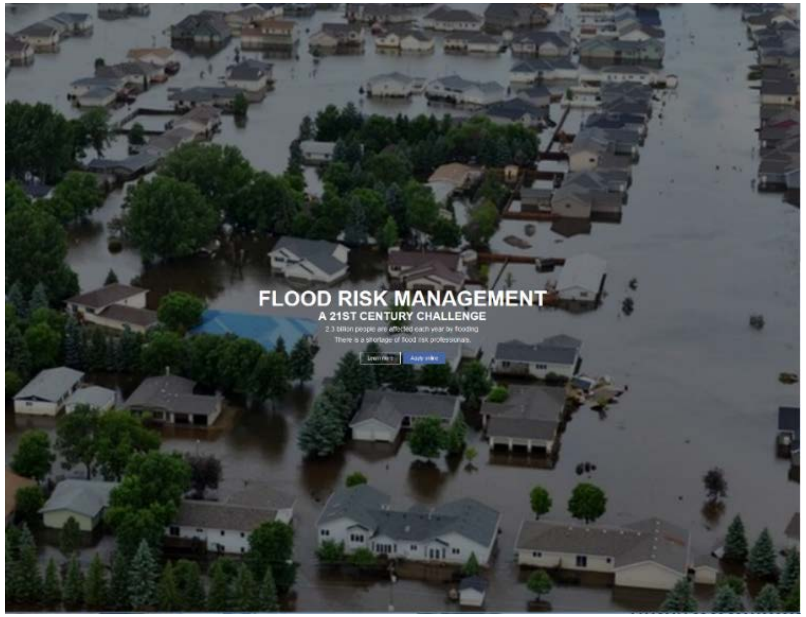
http://www.floodriskmaster.org/

This 2-year Master Study Programme (in 2011-2017 over 100 MSc, four from China; new for 2019-2024) follows the holistic approach and is explicitly designed to cover a wide range of topics – from drivers and natural processes to different models, decisions and socio-economic consequences and institutional environment, and is therefore an important advance in water education for Europe.

FLOODRisk Master

Global Change • Hydroinformatics • Planning

Partners:
TU Dresden, Germany
IHE Delft, the Netherlands
TU Catalonia, Barcelona, Spain
University of Ljubljana, Slovenia



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WCDRR Activities V

4th World Landslide Forum (May 29 - June 2, 2017, Ljubljana)

4thWLF 2017
4th World Landslide Forum
LJUBLJANA SLOVENIA EU

www.wlf4.org

World Construction Forum (April 8 – 11, 2019, Ljubljana)

www.wcf2019.org

Regional Symposiums on Landslides in the Adriatic-Balkan Region:

3rd ReSyLAB (October 11 – 13, 2017, Ljubljana, Slovenia)
4th ReSyLAB (October 23 – 25, 2019, Sarajevo, Bosnia & Hercegovina)

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WCDRR Activities VI

Cooperation of the Danubian countries in the area of hydrology started in 1961, hosting the first conference on hydrological forecast in Budapest.

The conference took place even before the International Hydrological Decade was proclaimed (1965-1975), a 10-year program that provided an important stimulus to international collaboration in hydrology, and before the International Hydrological Programme of UNESCO was established.

Since 1975, cooperation of 11 countries has been conducted within the framework of the International Hydrological Programme (IHP) of UNESCO.

Since 2017 Slovene IHP NC is responsible to coordinate The Cooperation.

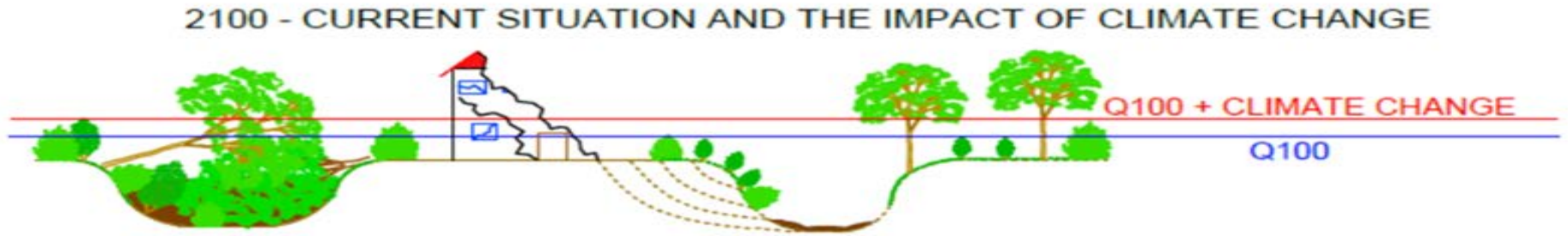
XXVIIIth Conference of the Danube Countries 6-8 November 2019 – Ukraine (Kyev)

WCDRR Activities VII

Action MR4W - More Room For Water:

- for water in the environment
- for water for remediation
- for water in urban areas
- for water storage
- for groundwater
- for torrents
- for rivers

or Bussines As Usual?



Collaboration with scientific associations

- Experimental and Representative Basins (ERB).
- SLOVENIAN ASSOCIATION of GEODESY and GEOPHYSICS, connected to IUGG, EGU, AGU and IAHS.
- Consortium of Universities for the Advancement of Hydrologic Science, Inc. – CUAHSI.
- Water Supply and Sanitation Technology Platform – WssTP.
- International Association for Hydro-Environment Engineering and Research – IAHR.
- UNESCO IHP National Commission/Committee? connected to UNESCO IHP cooperation in the Danube River Basin.
- European Network of Freshwater Research Organisations – EurAqua.
- SLOvenian COmission on Large Dams – SLOCOLD connected to ICOLD.
- Slovenian association for irrigation and drainage – SDNO connected to ICID.
- International Consortium on Landslides – ICL.
- International Research Society INTERPRAEVENT.

WCDRR Targets I

https://sustainabledevelopment.un.org/sdgs

WRDRR Chair is targeting below shown 5 SDGs.

Therefore, we are networking with other UNESCO Chairs in related fields – technical & natural sciences: U Brescia (Italy), U Florence (Italy), U Kyoto (Japan).

In 2018, at IHP meeting in Paris, we launched the More-Room-for-Water (MR4W) Initiative that is in line with the world-wide efforts to reach five of the Sustainable Development Goals till 2030 and by the Building Back Better (BBB) approach.

The idea is to give (back) more space for natural processes – through spatial planning procedures, and by nature-based solutions in order to increase society resilience against water hazards and to contribute to sustainable development.

WRDRR Targets II

Table 2 | Country performance with respect to social thresholds

Social indicator	N	Threshold	Countries above threshold (%)
Life satisfaction	134	6.5 on 0–10 Cantril ladder scale	25
Healthy life expectancy	134	65 years	40
Nutrition	144	2,700 kilocalories per person per day	59
Sanitation	141	95% of people have access to improved sanitation facilities	37
Income	106	95% of people earn above US$1.90 a day	68
Access to energy	151	95% of people have electricity access	59
Education	117	95% enrolment in secondary school	37
Social support	133	90% of people have friends or family they can depend on	26
Democratic quality	134	0.80 (approximate US/UK value)	18
Equality	133	70 on 0–100 scale (Gini index of 0.30)	16
Employment	151	94% employed (6% unemployment)	38

Table 1 | Country performance with respect to per capita biophysical boundaries

Biophysical indicator	N	Planetary boundary	Per capita boundary	Countries within boundary (%)
CO_2 emissions	145	2 °C warming	1.61 t CO_2 yr^{-1}	34
Phosphorus	144	6.2 Tg P yr^{-1}	0.89 kg P yr^{-1}	44
Nitrogen	144	62 Tg N yr^{-1}	8.9 kg N yr^{-1}	45
Blue water	141	4,000 km^3 yr^{-1}	574 m^3 yr^{-1}	84
eHANPP	150	18.2 Gt C yr^{-1}	2.62 t C yr^{-1}	44
Ecological footprint	149		1.72 gha yr^{-1}	43
Material footprint	144		7.2 t yr^{-1}	44

N is the number of countries.

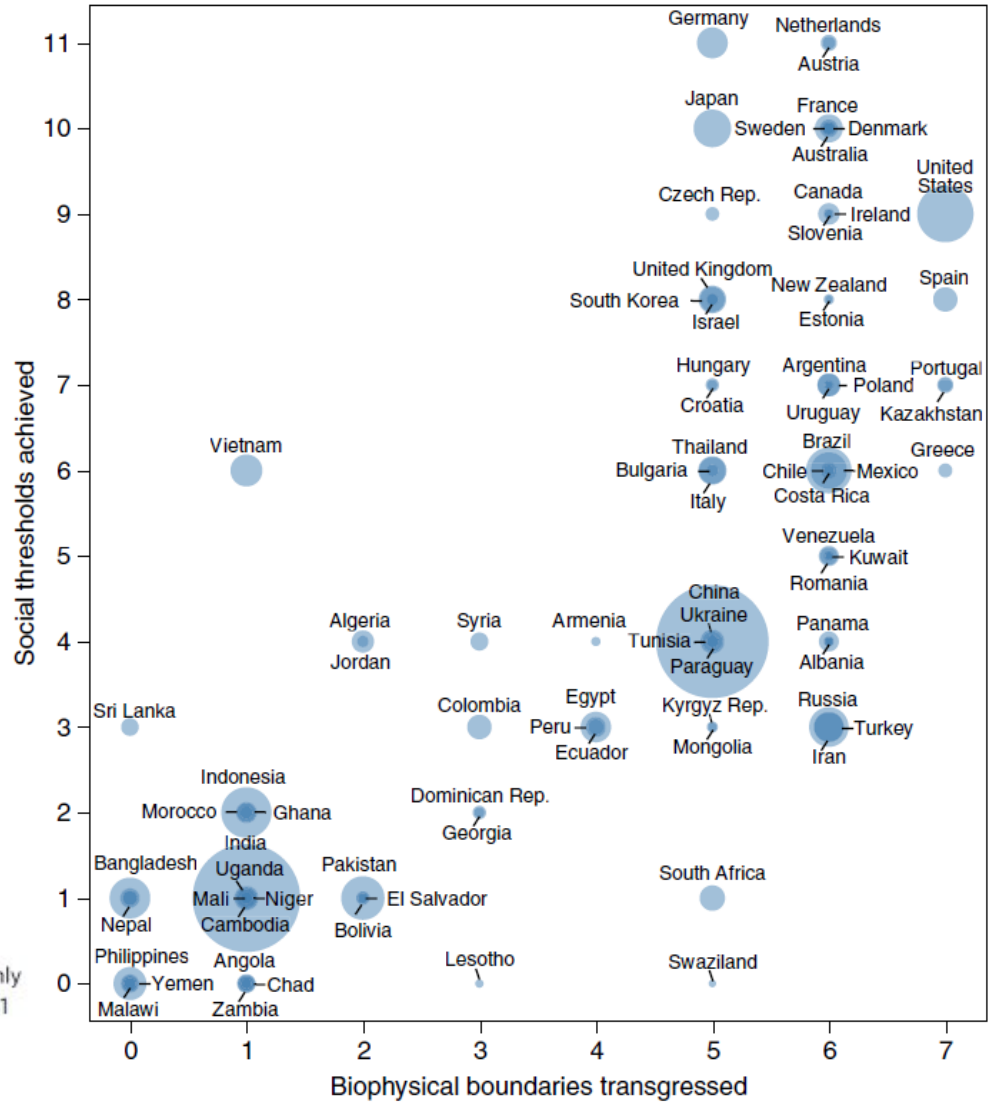
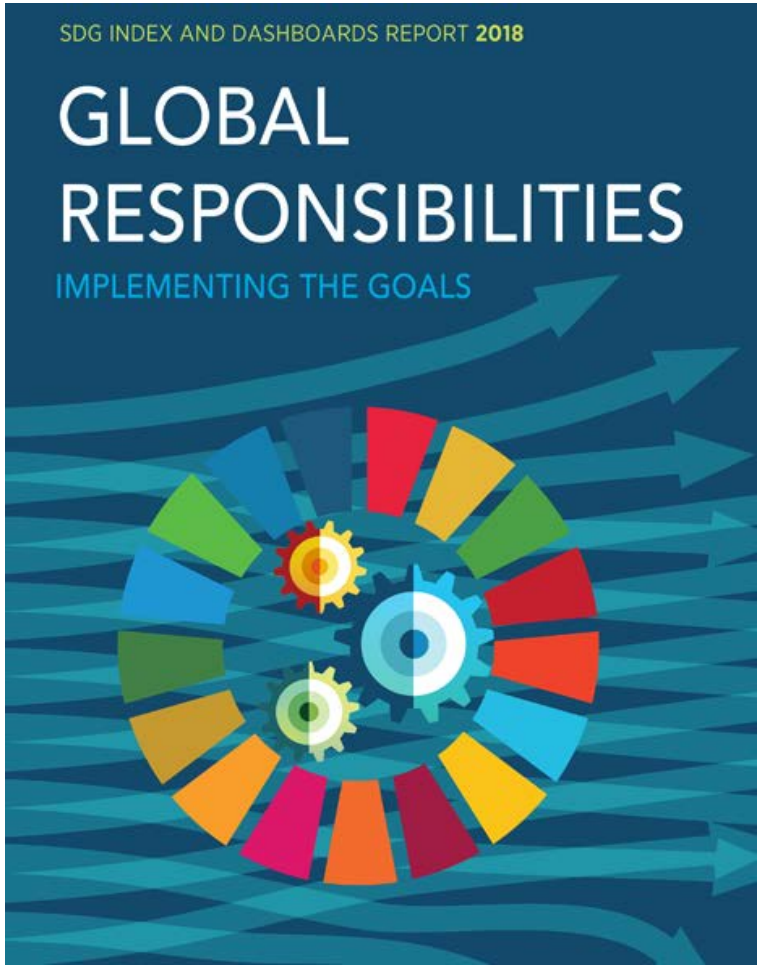


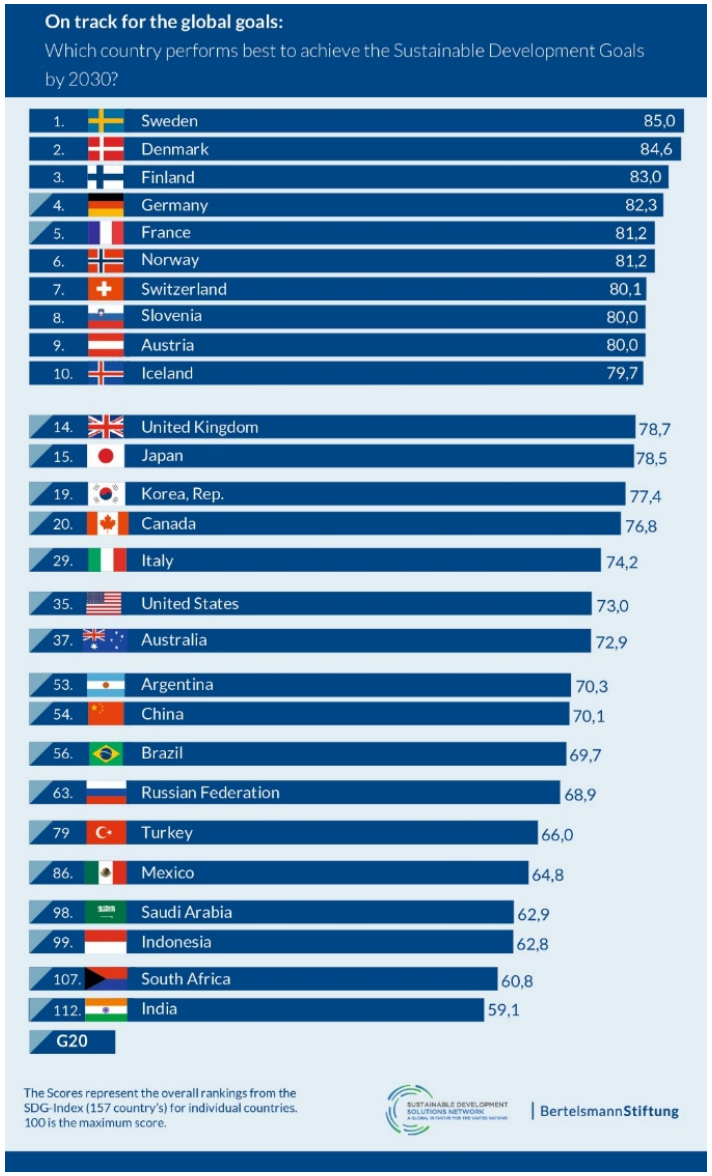
Fig. 2 | Number of social thresholds achieved versus number of biophysical boundaries transgressed for different countries (scaled by population). Ideally, countries would be located in the top-left corner. Only countries with data for all 7 biophysical indicators and at least 10 of the 11 social indicators are shown (*N*=109).

O'Neill et al.: A good life for all within planetary boundaries. Nature Sustainability 1, 88-95, 2018.

WRDRR Targets II

SDG Dashboard Report 2018





WRDRR Targets II

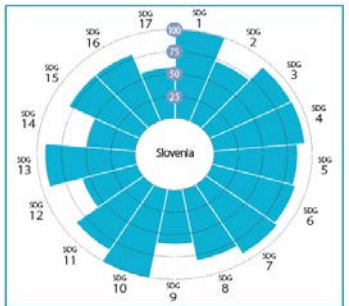
SDG Index

SLOVENIA
OECD Countries

OVERALL PERFORMANCE

Index score: 80.0

Regional average score: 76.9



AVERAGE PERFORMANCE BY SDG

SDG Global rank

8 (OF 156)

CURRENT ASSESSMENT – SDG DASHBOARD

SDG TRENDS

Notes: The full title of Goal 2 "Zero Hunger" is "End hunger, achieve food security and improved nutrition and promote sustainable agriculture".
The full title of each SDG is available here: https://sustainabledevelopment.un.org/topics/sustainabledevelopmentgoals

SLOVENIA
Performance by Indicator

	Value	Rating	Trend
SDG1 – End Poverty			
Poverty headcount ratio at $1.90/day (% population)	0.2		
Projected poverty headcount ratio at $1.90/day in 2030 (% population)	0.2		
Poverty rate after taxes and transfers, poverty line 50% (% population)	9.2		
SDG2 – Zero Hunger			
Prevalence of undernourishment (% population)	2.5		
Prevalence of stunting (low height-for-age) in children under 5 years of age (%)	2.6		
Prevalence of wasting in children under 5 years of age (%)	0.7		
Prevalence of obesity, BMI ≥ 30 (% adult population)	20.2		
Cereal yield (t/ha)	6.5		
Sustainable Nitrogen Management Index	0.8		
SDG3 – Good Health and Well-Being			
Maternal mortality rate (per 100,000 live births)	9.0		
Neonatal mortality rate (per 1,000 live births)	1.3		
Mortality rate, under-5 (per 1,000 live births)	2.3		
Incidence of tuberculosis (per 100,000 population)	6.5		
HIV prevalence (per 1,000)	0.0		
Age-standardised death rate due to cardiovascular disease, cancer, diabetes, and chronic respiratory disease in populations age 30–70 years (per 100,000 population)	13.2		
Age-standardised death rate attributable to household air pollution and ambient air pollution (per 100,000 population)	20.4		
Traffic deaths rate (per 100,000 population)	6.5		
Healthy Life Expectancy at birth (years)	80.8		
Adolescent fertility rate (births per 1,000 women ages 15-19)	4.3		
Births attended by skilled health personnel (%)	99.8		
Surviving infants who received 2 WHO-recommended vaccines (%)	92.0		
Universal Health Coverage Tracer Index (0-100)	80.5		
Subjective Wellbeing (average ladder score, 0-10)	6.2		
Gap in life expectancy at birth among regions (years)	2.2		
Gap in self-reported health by income (0-100)	20.8		
Daily smokers (% population age 15+)	18.9		
SDG4 – Quality Education			
Net primary enrolment rate (%)	97.8		
Mean years of schooling	12.1		
Literacy rate of 15-24 year olds, both sexes (%)	NA		
Population age 25-64 with tertiary education (%)	30.7		
PISA score (0-600)	509.3		
Variation in science performance explained by students' socio-economic status (%)	13.5		
Students performing below level 2 in science (%)	15.0		
Resilient students (%)	34.6		
SDG5 – Gender Equality			
Unmet demand for contraception, estimated (% women married or in union, ages 15-49)	10.0		
Female to male mean years of schooling, population age 25 + (%)	97.5		
Female to male labour force participation rate (%)	85.0		
Seats held by women in national parliaments (%)	36.7		
Gender wage gap (total, % male median wage)	5.0		
SDG6 – Clean Water and Sanitation			
High-income countries: population using safely managed water services (%)	98.0		
Other countries: population using at least basic drinking water services (%)	NA		
High-income countries population using safely managed sanitation services (%)	75.7		
Other countries: population using at least basic sanitation services (%)	NA		
Freshwater withdrawal as % total renewable water resources	6.1		
Imported groundwater depletion (m^3/year/capita)	9.1		
SDG7 – Affordable and Clean Energy			
Access to electricity (% population)	100.0		
Access to clean fuels & technology for cooking (% population)	98.2		
CO_2 emissions from fuel combustion / electricity output ($MtCO_2$/TWh)	0.9		
Share of renewable energy in total final energy consumption (%)	20.9		
SDG8 – Decent Work and Economic Growth			
Adjusted Growth (%)	-1.2		
Slavery score (0-100)	80.0		
Adults (15 years +) with an account at a bank or other financial institution or with a mobile-money-service provider (%)	97.5		
Employment-to-Population ratio (%)	69.3		
Youth not in employment, education or training (NEET) (%)	11.6		
SDG9 – Industry, Innovation and Infrastructure			
Proportion of the population using the internet (%)	75.5		
Mobile broadband subscriptions (per 100 inhabitants)	62.3		
Quality of overall infrastructure (1= extremely underdeveloped; 7= extensive and efficient by international standards)	4.6		
Logistics performance index: Quality of trade and transport-related infrastructure (1=low to 5=high)	3.2		
The Times Higher Education Universities Ranking, Average score of top 3 universities (0-100)	26.1		
Number of scientific and technical journal articles (per 1,000 population)	1.6		
Research and development expenditure (% GDP)	2.2		
Research and development researchers (per 1,000 employed)	8.4		
Triadic patent families filed (per million population)	4.9		
Gap in internet access by income (%)	60.4		
Women in science and engineering (%)	31.1		
SDG10 – Reduced Inequalities			
Gini Coefficient adjusted for top income (1-100)	27.5		
Palma ratio	0.8		
Elderly Poverty Rate (%)	13.5		
SDG11 – Sustainable Cities and Communities			
Annual mean concentration of particulate matter of less than 2.5 microns of diameter (PM2.5) in urban areas (µg/m^3)	20.3		
Improved water source, piped (% urban population with access)	99.3		
Satisfaction with public transport (%)	67.0		
Rent overburden rate (%)	5.9		
SDG12 – Responsible Consumption and Production			
E-waste generated (kg/capita)	15.0		
Anthropogenic wastewater that receives treatment (%)	34.7		
Production-based SO_2 emissions (kg/capita)	8.1		
Net imported SO_2 emissions (kg/capita)	17.4		
Reactive nitrogen production footprint (kg/capita)	34.7		
Net imported emissions of reactive nitrogen (kg/capita)	125.0		
Non-Recycled Municipal Solid Waste (MSW in kg/person/day)	0.7		
SDG13 – Climate Action			
Energy-related CO_2 emissions per capita (tCO_2/capita)	6.2		
Imported CO_2 emissions, technology-adjusted (tCO_2/capita)	-1.4		
Climate Change Vulnerability Monitor (best 0-1 worst)	0.0		
CO_2 emissions embodied in fossil fuel exports (kg/capita)	450.5		
Effective Carbon Rate from all non-road energy, excluding emissions from biomass (€/tCO_2)	23.3		
SDG14 – Life Below Water			
Mean area that is protected in marine sites important to biodiversity (%)	99.9		
Ocean Health Index Goal-Biodiversity (0-100)	95.4		
Ocean Health Index Goal-Clean Waters (0-100)	28.4		
Ocean Health Index Goal-Fisheries (0-100)	75.3		
Fish Stocks overexploited or collapsed by EEZ (%)	NA		
Fish caught by trawling (%)	89.7		
SDG15 – Life on Land			
Mean area that is protected in terrestrial sites important to biodiversity (%)	85.6		
Mean area that is protected in freshwater sites important to biodiversity (%)	93.1		
Red List Index of species survival (0-1)	0.9		
Annual change in forest area (%)	2.2		
Imported biodiversity threats (threats per million population)	14.0		
SDG16 – Peace, Justice and Strong Institutions			
Homicides (per 100,000 population)	1.2		
Prison population (per 100,000 population)	67.7		
Population who feel safe walking alone at night in city or area where they live (%)	88.0		
Government Efficiency (1-7)	3.0		
Property Rights (1-7)	4.5		
Birth registrations with civil authority, children under 5 years of age (%)	100.0		
Corruption Perception Index (0-100)	61.0		
Children 5–14 years old involved in child labour (%)	0.0		
Transfers of major conventional weapons (exports) (constant 1990 US$ million per 100,000 population)	0.0		
SDG17 – Partnerships for the Goals			
Government Health and Education spending (% GDP)	14.8		
High-income and all OECD DAC countries: International concessional public finance, including official development assistance (% GNI)	0.2		
Other countries: Tax revenue (% GDP)	NA		
Tax Haven Score (best 0-5 worst)	0.0		
Financial Secrecy Score (best 0-100 worst)	41.8		

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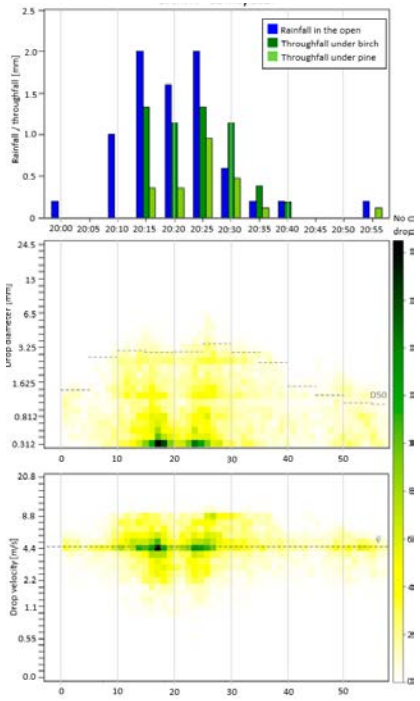
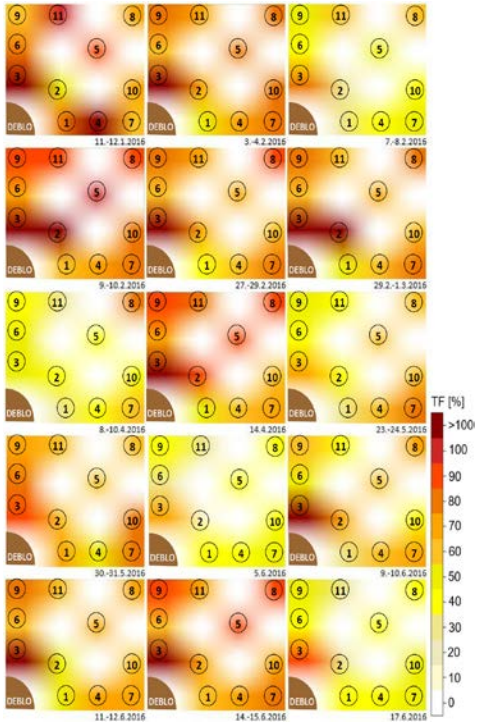
Rainfall interception experiment

ANALYSES

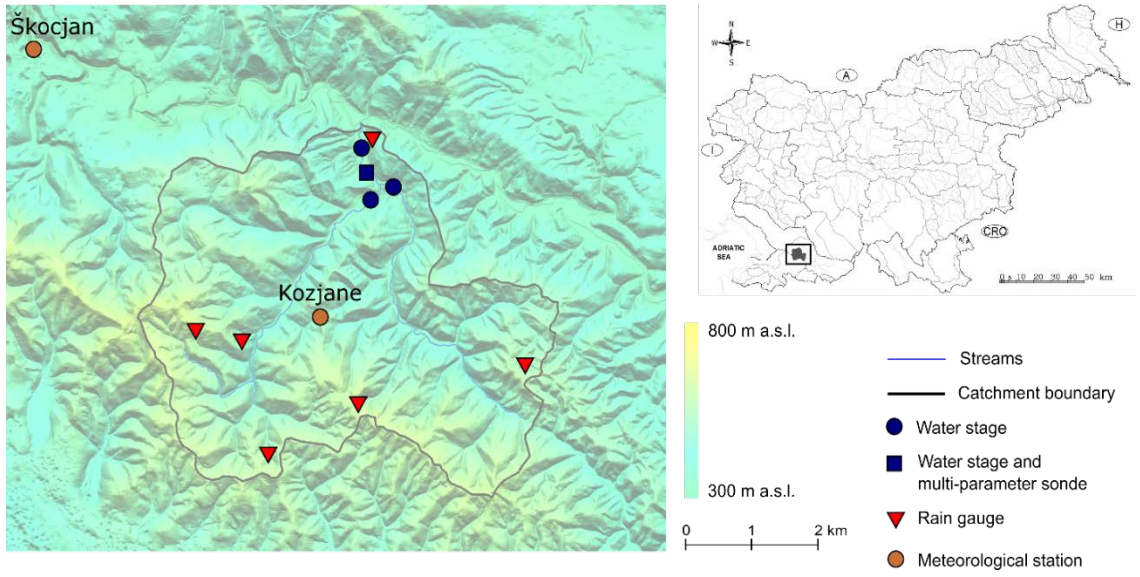


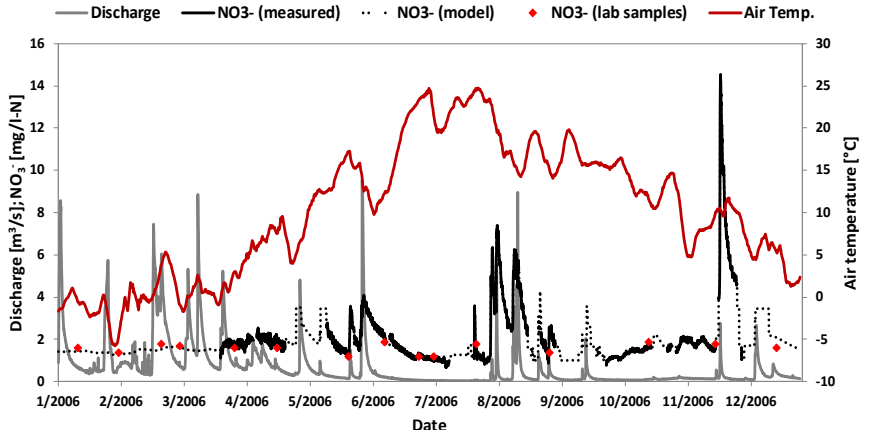


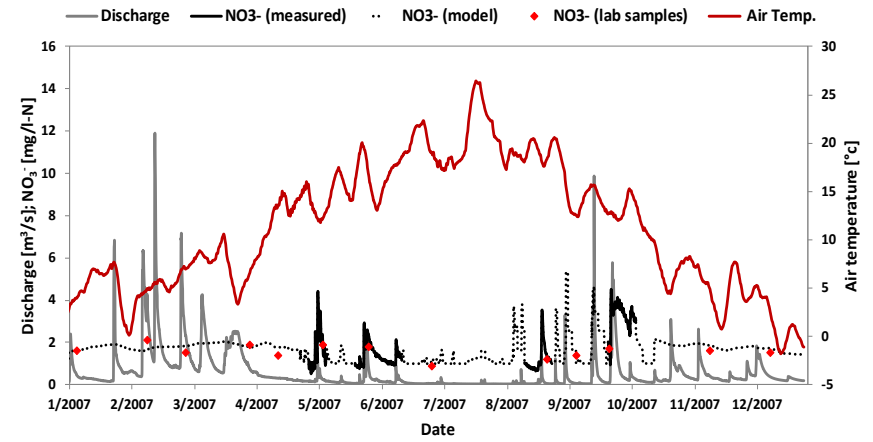
Zabret et al. 2017. Influence of Raindrop Size Distribution on Throughfall Dynamics under Pine and Birch Trees at the Rainfall Event Level. Atmosphere, 8, 240K.
Zabret et al. 2018. Influence of meteorological variables on rainfall partitioning for deciduous and coniferous tree species in urban area. J. Hydr., 558, 29–41.
Bezak et al. 2018. Application of Copula Functions for Rainfall Interception Modelling. Water, 10, 995.

Experimental catchments

Monitoring interactions between hydrological and biogeochemical cycles:



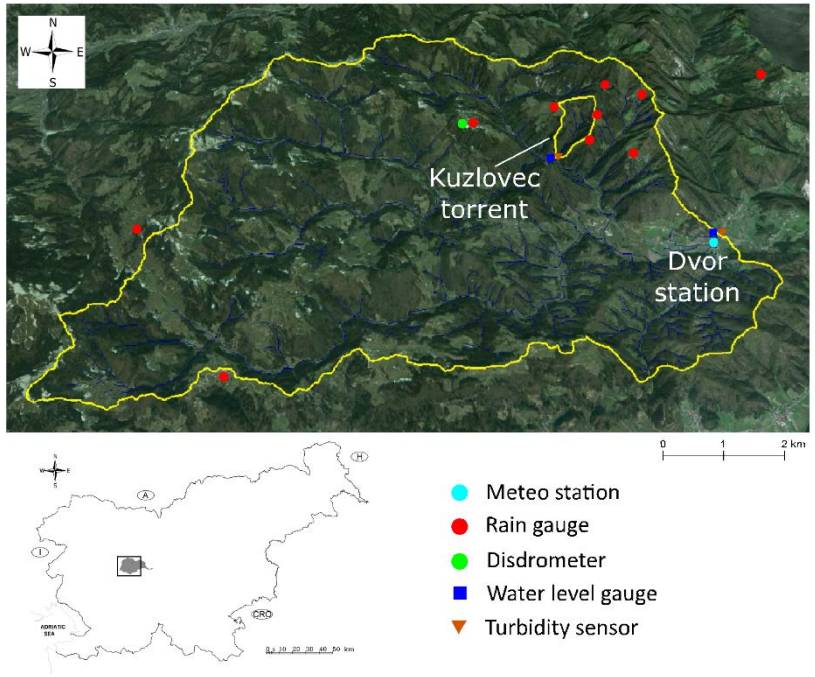


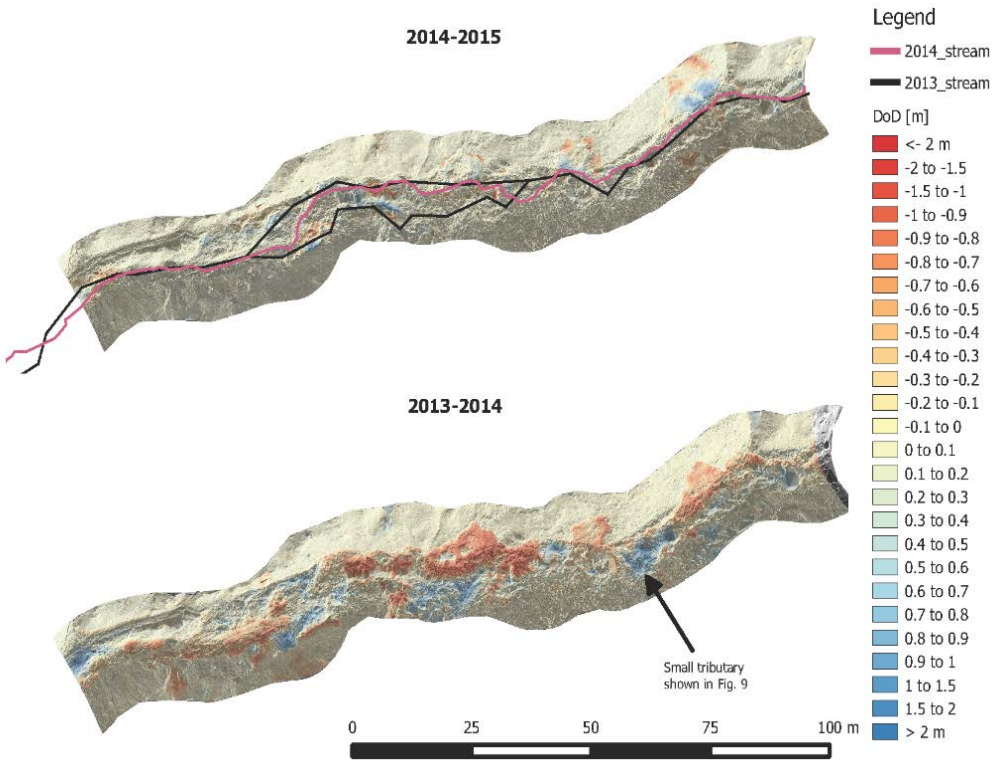


Rusjan & Vidmar 2017. The role of seasonal and hydrological conditions in regulating dissolved inorganic nitrogen budgets in a forested catchment in SW Slovenia. Sci. Total Environ., 575.

Experimental catchments

Monitoring of erosion processes:

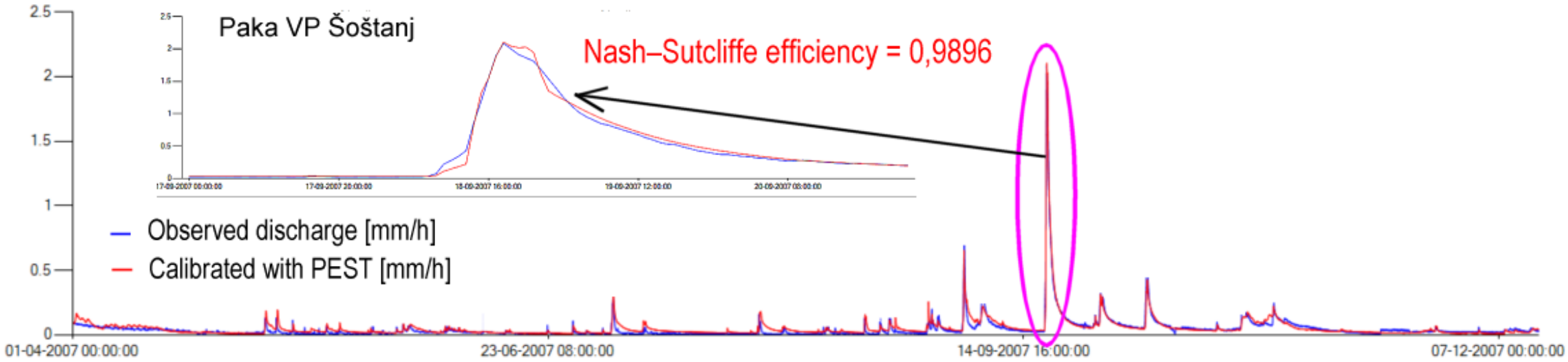




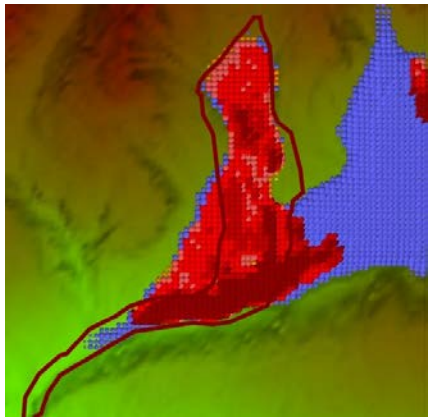
Bezak et al. 2017. Geomorphic response detection and quantification in a steep forested torrent. Geomorphology, 291.

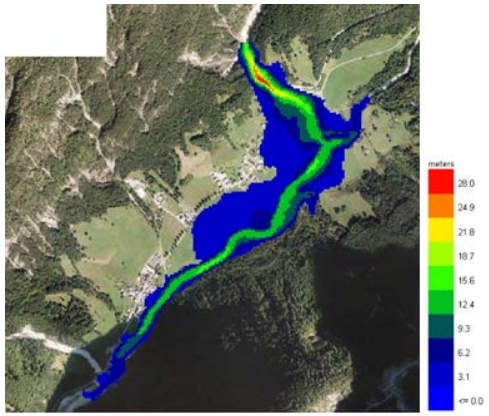
Hydrological Modeling using PEST

- PEST - Model-Independent Parameter Estimation and Uncertainty Analysis Tool is state-of-the art to calibrate complex non-linear environmental and other computer models to assist: Hydropower operations, Dam safety, Climate change, Flood warnings, Water supply.
- PEST with use of Singular Value Decomposition and Tikhonov Regularization give us almost perfect fit.
- We succeeded to calibrate and simulate many flash-flood waves in real time very accurately.



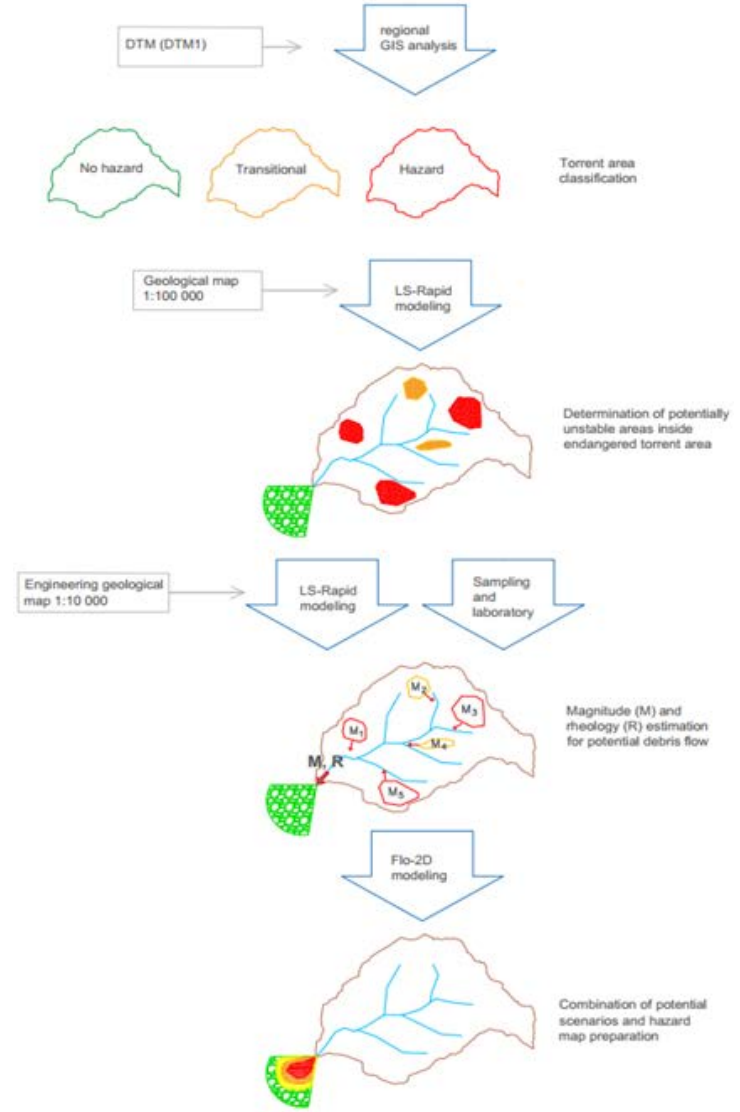
Debris-Flow Hazard Assessment





$C_v = 0.60$, $\tau = 2000$ Pa, $\eta = 156$ Pa.s

PHASE	PROCESS	DATA	TOOLS
Preliminary torrent area classification	Geomorphological analysis od DTM data	DTM	GIS tools
	Watershed definition		GIS tools
	Determination of classification parameters		other tools (Excell)
	Parameter estimation		other tools (Excell)
	Torrent area classification		other tools (Excell)
Potentially unstable areas determination inside chosen torrent area	Modeling data preparation (topography, geological units)	DTM, geological map	GIS tools, tools for data preparation (Excell)
	Triggering model preparation	DTM, geological map	LS-Rapid
	Modeling parameter determination	Geological map	GIS tools, tools for data preparation (Excell)
	Simulation and results analysis		LS-Rapid
	Determination of unstable areas where further investigations must be carried out		LS-Rapid
Potential debris flow magnitude estimation	Modeling data preparation for chosen area (topography, geological units)	DTM, geological map	
	Triggering model preparation	DTM, geological map	LS-Rapid
	Modeling parameter determination	Geological map	GIS tools, geotehnical lab, tools for data preparation (Excell)
	Simulation and results analysis		LS-Rapid
	Landslide volume estimation - debris flow magnitude estimation		LS-Rapid, tools for data preparation (Excell)
Debris flow modelling	Basic model preparation (computational	DTM	Flo-2D (interface)
	Key input data preparation	LS Rapid results, geotehnical lab results	LS-Rapid, geotechnical lab
	Simulation and results analysis		Flo-2D
Debris flow hazard estimation and hazard map preparation		Flo -2D results, Legislation	Various tools (GIS, CAD...)



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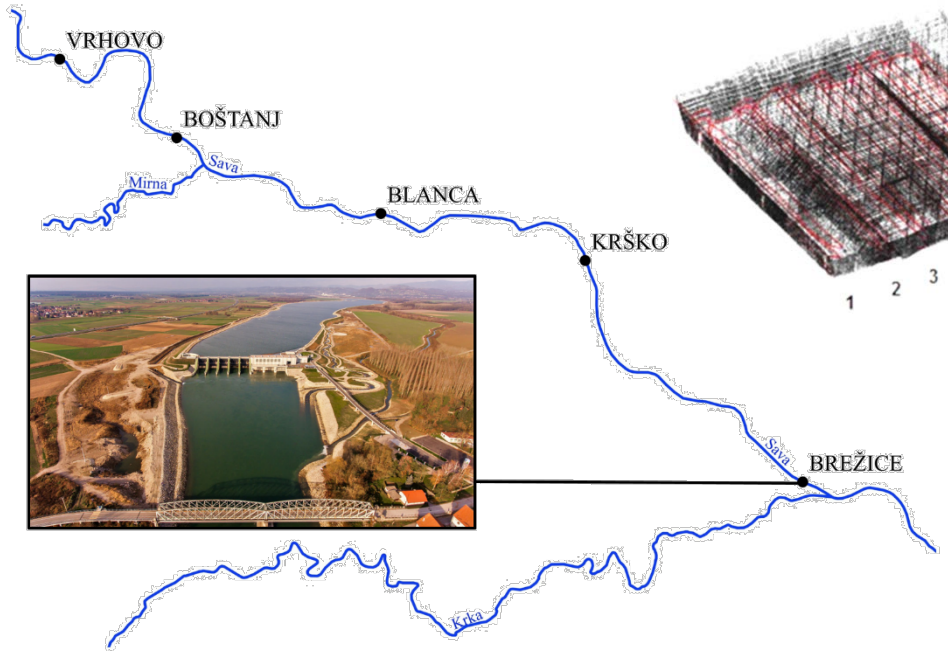
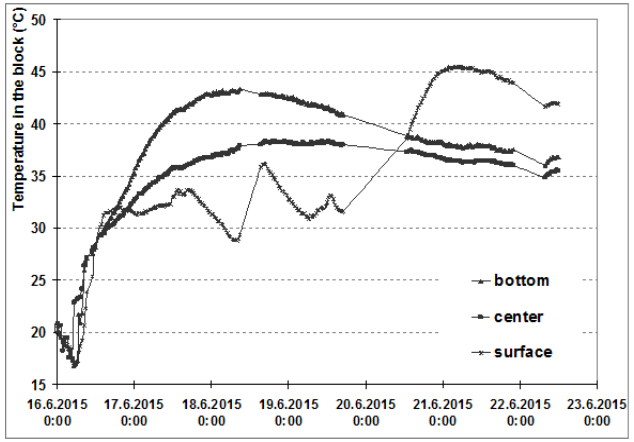
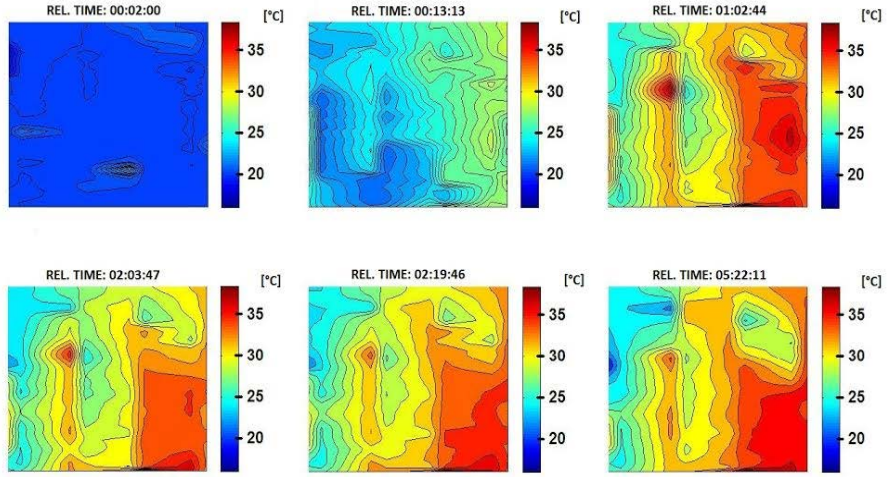
Temperature in the early stage of the concrete



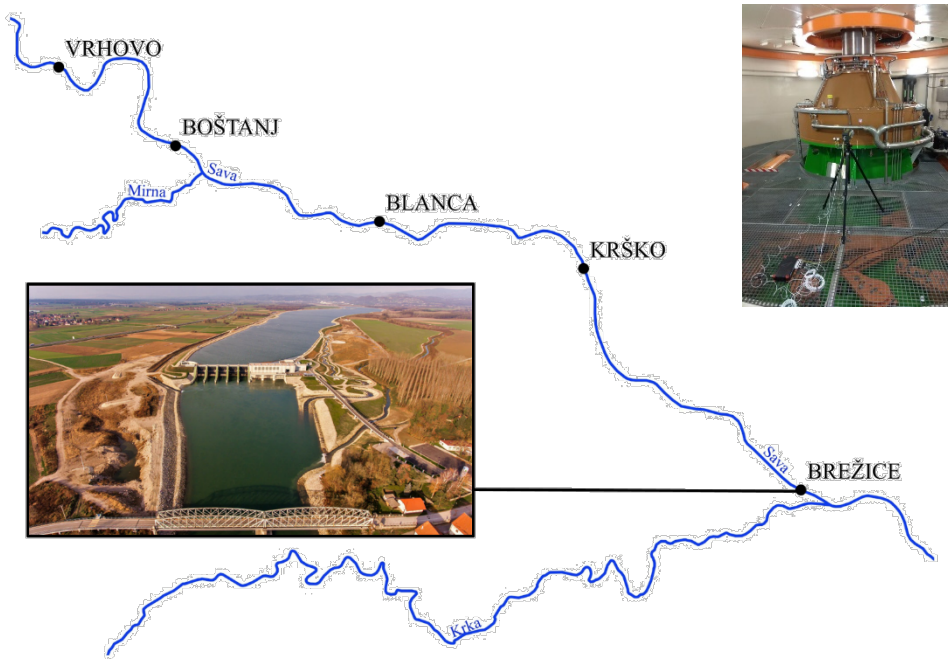


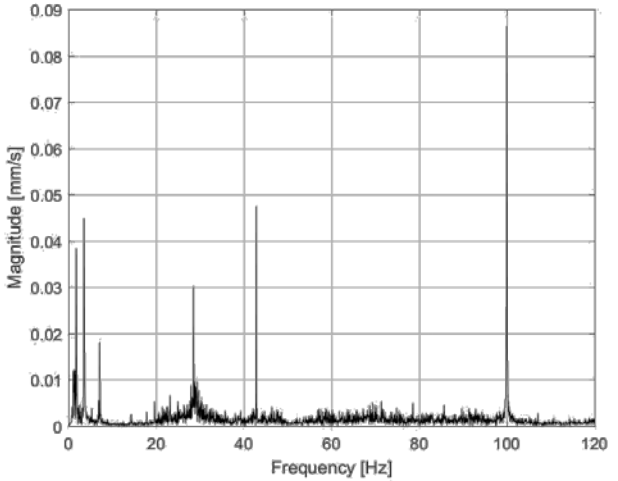


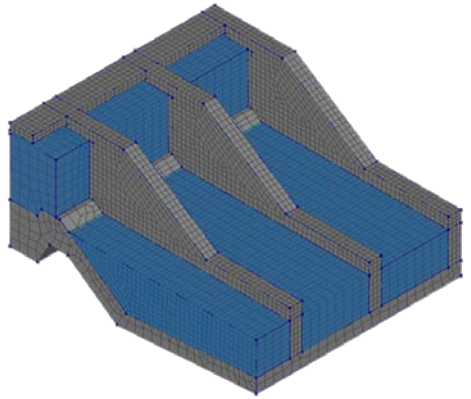
Experiment: The use of optical fibers for temperature measurements in an early-age mass concrete directly after puring of concrete.

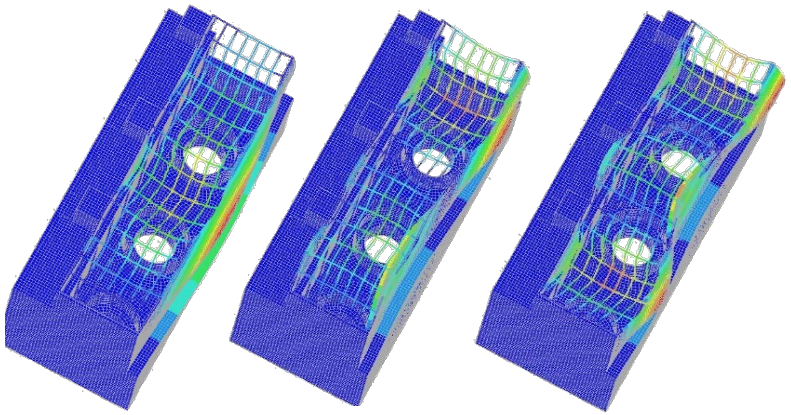
Analysis of results of temperature field distribution - 3D presentation.

Temperature in the early stage of the concrete









Experiment: The use of optical fibrers for temperature measurements of early-age concrete during construction.

Analysis of modal properties and operational loads.

Interreg project - Dareffort

Interreg
EUROPEAN UNION
Danube Transnational Programme
DAREFFORT

- Danube River Basin Enhanced Flood Forecasting Cooperation (DAREFFORT)
- June 1, 2018 – May 31, 2021
- 12 partners and 12 ASPs from 12 countries
- UL is a leader of WP3 – Evaluation of forecasting
- The main aim is to give a comprehensive overview about the complex national flood and ice forecasting systems and to eliminate the shortcomings of the existing forecasting practices.

Project web page: http://www.interreg-danube.eu/approved-projects/dareffort

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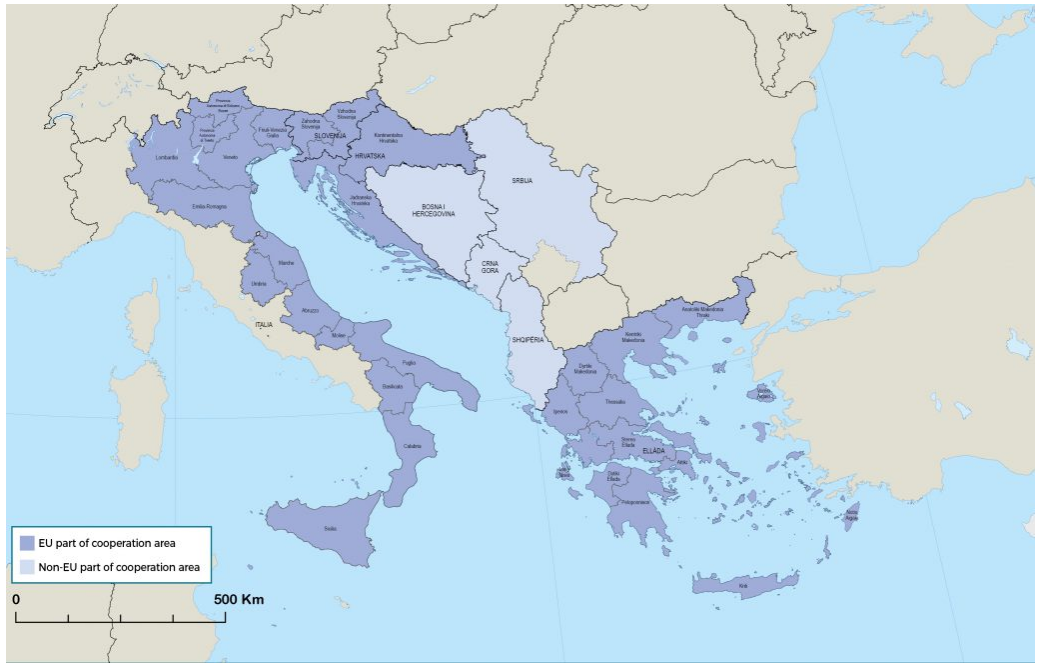
Interreg project - Tourest

Interreg ADRION ADRIATIC-IONIAN
EUROPEAN UNION
European Regional Development Fund - Instrument for Pre-Accession II Fund

TOUREST

- Tourism water management for sustainable Adrion coastal areas.
- Duration: 1. 1. 2018 – 31. 12. 2019
- 8 partners and 2 ASPs from 8 countries.
- UL is a leader of WP3 – Validating the effectiveness of innovative benchmarking and monitoring solutions to support sustainable tourism water management.
- The main goal of the project is to provide the means to manage environmental risks linked to tourism activities in the Adrion territories by supporting the sustainable tourism water management and stimulating the vibrant involvement of public authorities and the tourism sector.



Project web page: https://tourest.adrioninterreg.eu/

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COST action: Land4Flood

- **Project title: Natural Flood Retention on Private Land.**
- **Leader of WG1 that focuses on environmental conditions.**
- **The common characteristic of green infrastructure measures that can be used to reduce flood risk is that they often claim more land than traditional methods (grey infrastructure).**

- Which **synergies** can be identified between different land uses and the provision of flood storage and ecosystem services?
- How can the **knowledge base** about advantages and potentials of NWRM, large scale flood retention and resilient cities be strengthened and their importance communicated to different actors at the local, regional and catchment levels?
- How can **land owners** be **encouraged** to adapt land uses and land management strategies which allow for increased water retention capacity?
- How can **public** and **private stakeholders** in urban and rural areas engage with each other to reduce flood damage through a comprehensive management plan based on the implementation of retention and resilience measures throughout the catchment?

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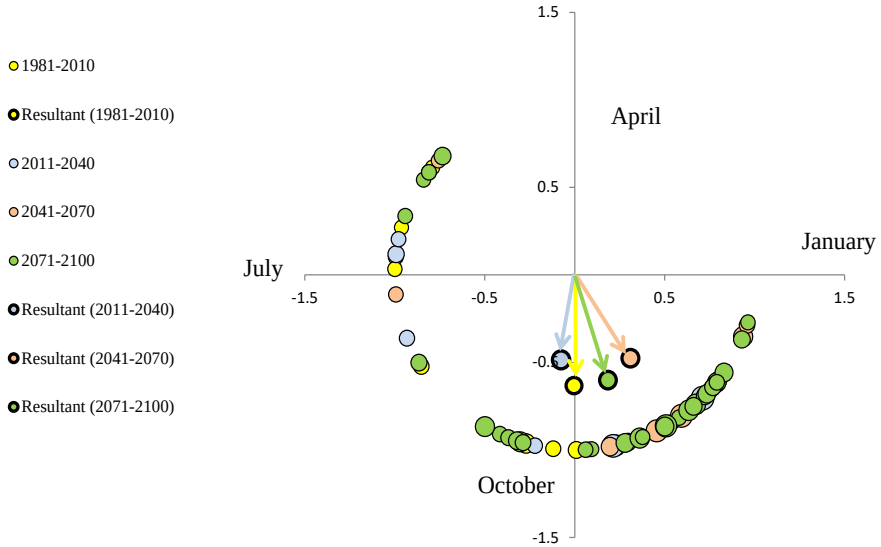
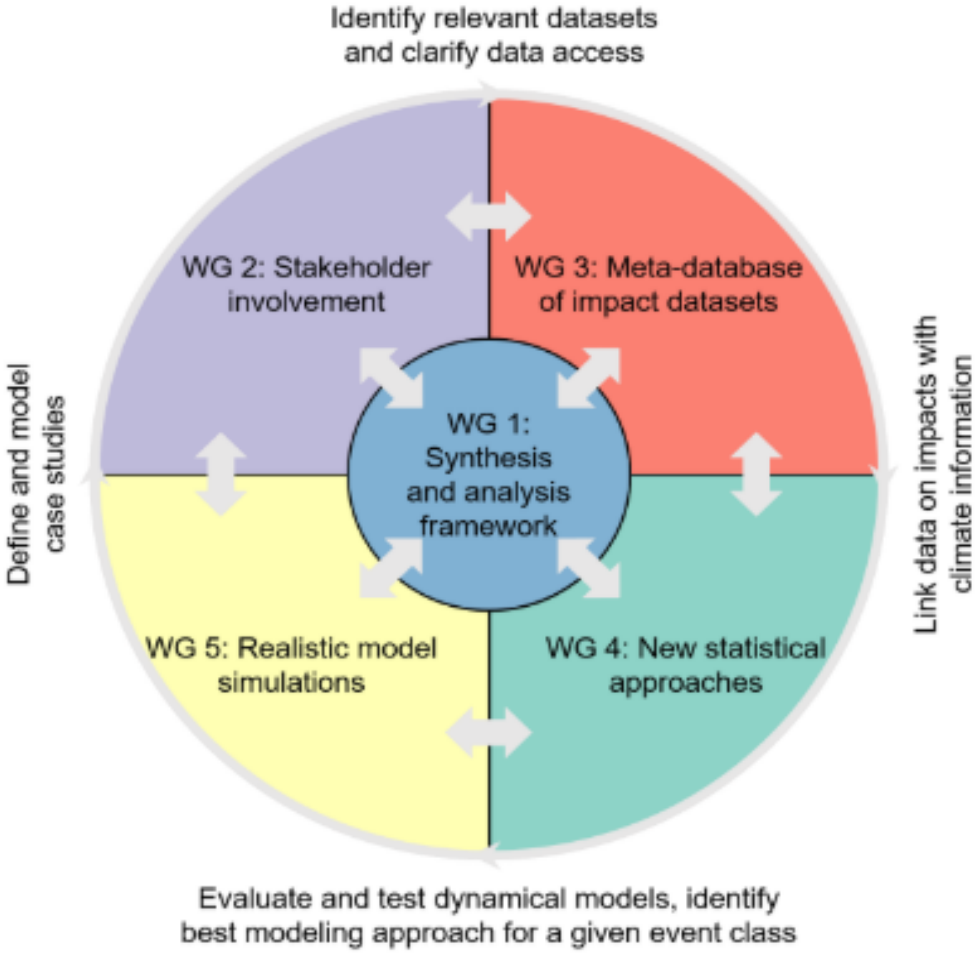
COST action: DAMOCLES

- **Project title: Understanding and modelling climate and weather events.**
- **We just hosted a short-term scientific mission (STSM) report where we focused on the climate change impact on the so-called rain on snow floods.**





cost EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

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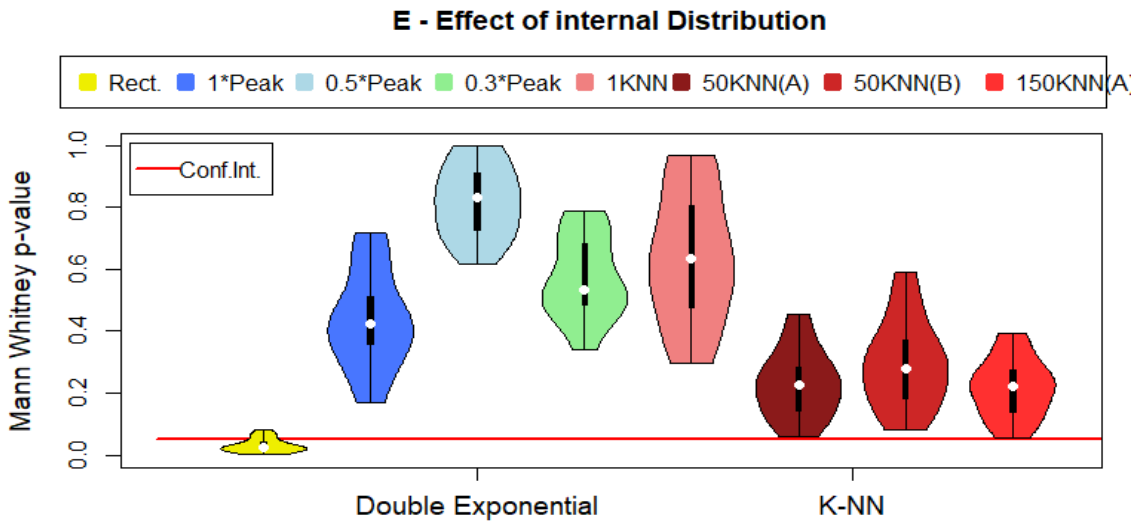
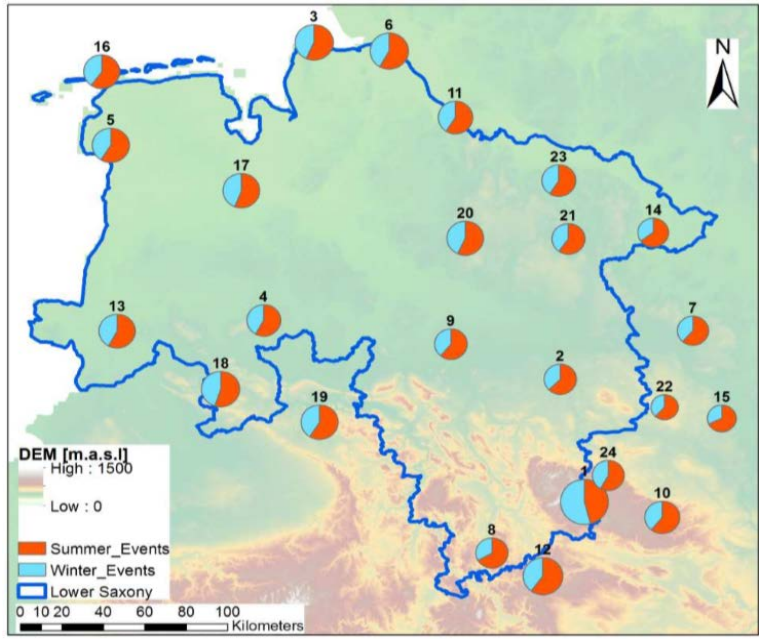
Bilateral project Germany-Slovenia

- **Project title: Stochastic rainfall models for rainfall erosivity evaluation.**
- **Leibniz Universitat Hannover, Institute of Hydrology and Water Resources Management.**
- **We are currently working on the comparison of three precipitation models (Cascade Disaggregation model, Alternating Renewal model and KNN Disaggregation model) in terms of their ability to simulate correct rainfall erosivity pattern.**





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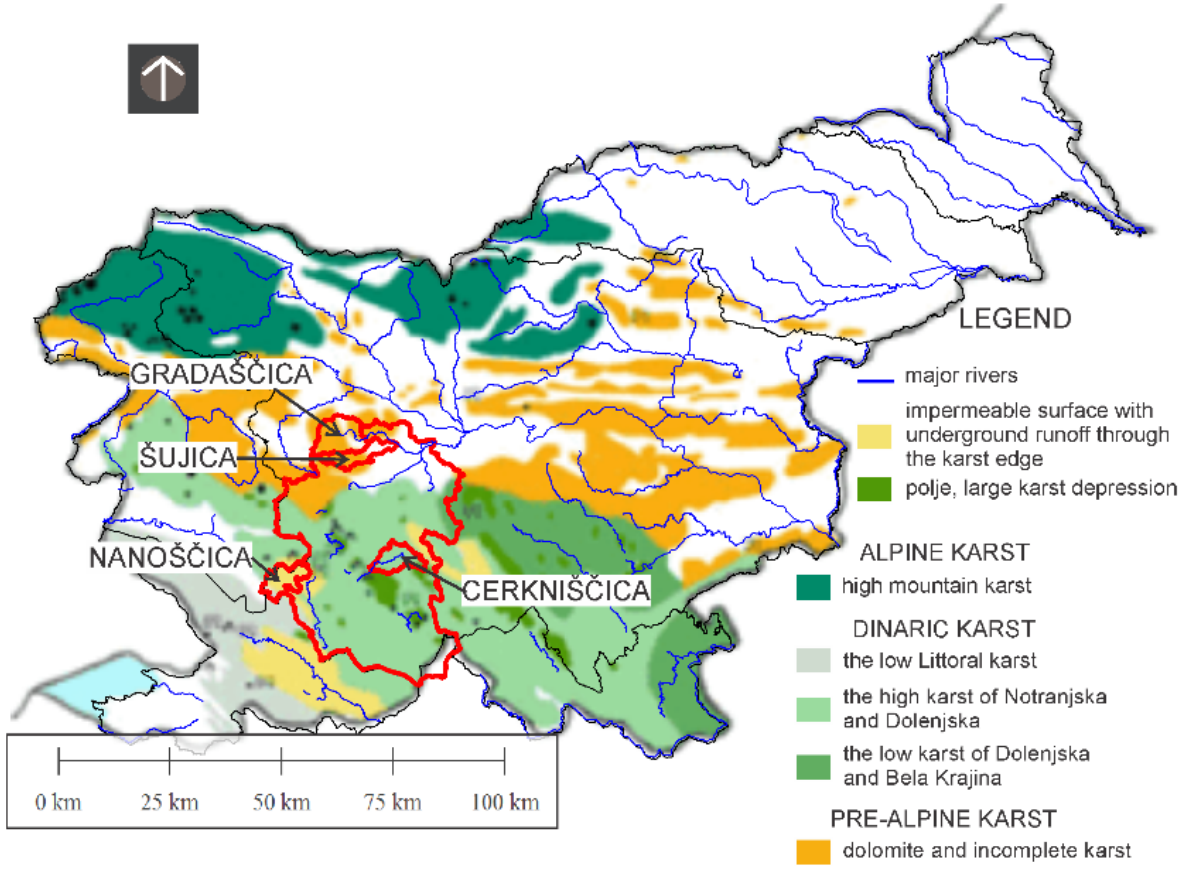
Bilateral project China-Slovenia

- **Project title: Evaluation of intelligent learning techniques for prediction of hydrological data: useful case.**
- **Chongqing Technology and Business Univ., National Research Base of Intelligent Manufacturing Service.**
- **Joint paper: „Hydrological modelling of karst catchment using lumped conceptual and data mining models“ that is currently under review in the Journal of Hydrology.**



Thank You:

Discussion – Questions ?