UNESCO Chair on Water-related Disaster Risk Reduction (WRDRR)

Matjaž Mikoš, Nejc Bezak, Mitja Brilly, Mateja Klun, Andrej Kryžanowski, Simon Rusjan, Klaudija Sapač, Jošt Sodnik, Mojca Šraj, Andrej Vidmar

Faculty of Civil and Geodetic Engineering, University of Ljubljana

Presentation Overview

United Nations
Educational, Scientific and
Cultural Organization

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

- How it started? Was it like a Big Bang?
- Water in 21st Century – problems, challenges, needs, tools.
- Slovenia and UN Agenda 2030 Sustainable Development Goals.
- Chair's international collaboration – a list.
- Chair's recent research activities – overview of field activities & projects.
- 2019 Ljubljana Declaration Statement.
- More on the web: www.unesco-floods.eu

How it started?

- UL FGG Chair of Hydrology and Hydraulic Engineering was supporting UNESCO International Hydrological Programme (IHP) activities for decades.
- Fields of expertise were in applied hydrological studies:
  - flood hazards & risks
  - statistical hydrology …
- We contributed by field work in our own experimental river basins:
  - hydrometeorology (interception studies, rainfall erosivity, soil erosion)
  - hydrological and biogeochemical cycles
  - 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)

Water in 21st Century

Problems

- Water is at the heart of the three recent world milestone agreements:
  - the UN 2030 Agenda for Sustainable Development,
  - the Sendai Framework for Disaster Risk Reduction 2015-2030, and
  - the 2015 Paris Agreement.

https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf

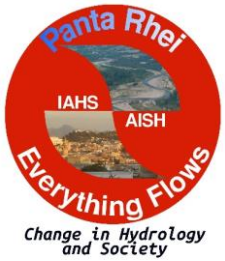
Challenges & Needs

- The UN 2030 Agenda introduced 17 Sustainable Development Goals (SDGs) – among targets:
  - by 2030, reduce by half the loss of human life and property from water-related disasters, by improving the resilience of nations.
- The UN General Assembly proclaims the period 2018-2028 the International Decade for Action "Water for Sustainable Development", to further improve cooperation, partnership and capacity development in response to the ambitious 2030 Agenda.
- There is an urgent need to a better understanding of the hydrological cycle, of all of its components as well as its changes and variability under fast climate change in the next decades.

Water in 21st Century

Tools

- Launched in 1992, the UNITWIN/UNESCO Chairs Programme promotes international inter-university cooperation and networking to enhance institutional capacities through knowledge sharing and collaborative work.
- The IAHS Scientific Decade 2013-2022 “Panta Rhei” is a fundamental contribution to new science of integrated hydrological and societal processes.



- Today, 170 of the University Chairs included in the UNESCO/UNITWIN Chairs programme with well over 700 chairs worldwide are related to Natural Sciences.
- The 2018 Geneva Milestone, a blueprint to strengthen UNESCO Chairs’ contribution to transformative change towards the implementation of the 2030 Agenda for sustainable development asks for the focus on:
  - The 2030 Agenda
  - Xdisciplinarity
  - Science-Policy-Society
  - Postering collaboration
  - Increasing visibility and knowledge

https://iahs.info/uploads/Panta%20Rhei/Panta-Rhei-science-plan-ver4.pdf

http://www.unesco.org/new/en/natural-sciences/about-us/how-we-work/unesco-chairs/
http://unesdoc.unesco.org/images/0025/002565/256554E.pdf

Slovenia - SDG Index & Dashboard Report 2018

SLOVENIA
OECD Countries

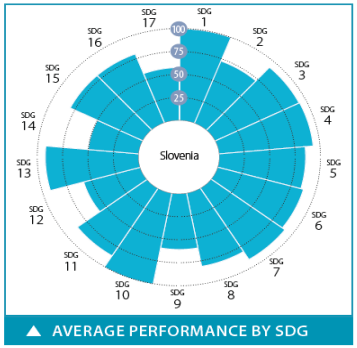
OVERALL PERFORMANCE

Index score: 80.0

Regional average score: 76.9

SDG Global rank

8 (OF 156)



AVERAGE PERFORMANCE BY SDG

CURRENT ASSESSMENT – SDG DASHBOARD

SDG TRENDS

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		

Which country performs best to achieve SDGs by 2030? 156 countries in the report: http://sdgindex.org/reports/2018/

PART 4. COUNTRY PROFILES

Slovenia - Country Performance

11 social indicators (life satisfaction, healthy life expentancy, nutrition, sanitation, income, access to energy, education, social support, democratic quality, equality, employment) vs. 7 biophysical indicators (Table 1).

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.

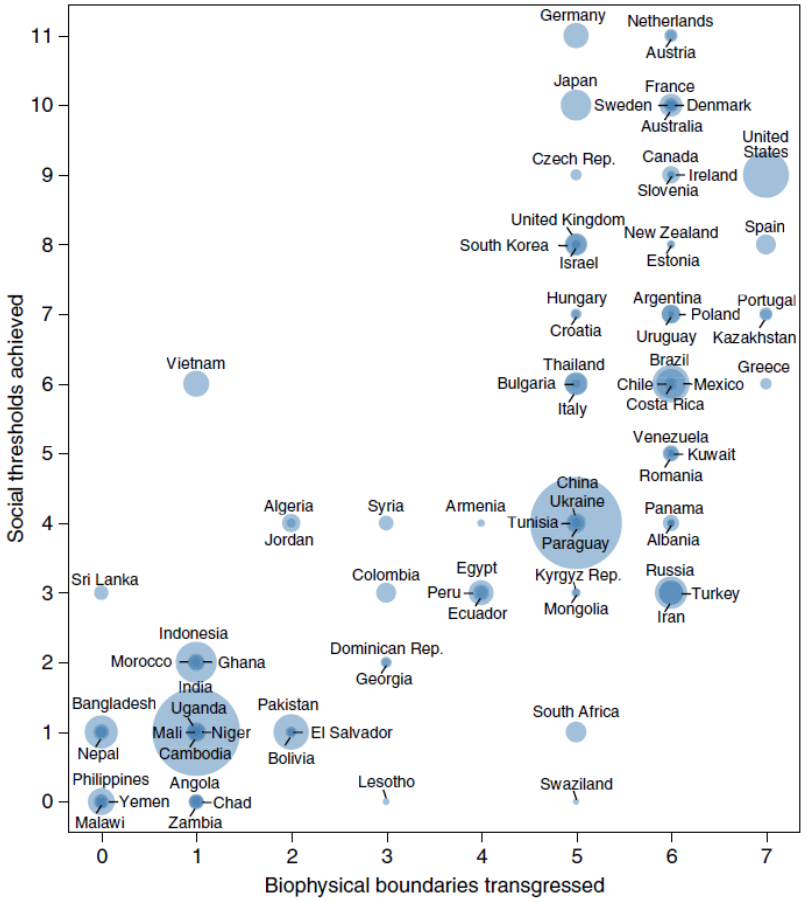


Fig. 2 | Number of social thresholds achieved versus number of biophysical boundaries transgressed for different countries (scaled by population). Ideally, countries would be located in the top-left corner. Only countries with data for all 7 biophysical indicators and at least 10 of the 11 social indicators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

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

UNESCO Chair on WRDRR Contributions to SDG

UNESCO Chair on WRDRR as the only UNESCO Chair at the University of Ljubljana and one of 3 chairs in Slovenia, is targeting the following five Sustainable Development Goals:

WRDRR collaboration with UNESCO

- UNESCO/KU/ICL UNITWIN Cooperation Programme „Landslide and Water-related Disaster Risk Management for Society and the Environment“, Kyoto University, Japan (since 2010) – the main activities is the International Programme on Landslides (IPL) managed by the IPL Global Promotion Committee including ICL, UNESCO, UNISDR and other stakeholders.
- The International Programme on Landslides (IPL) includes activities:
  - IPL projects: IPL-225 „Recognition of potentially hazardous torrential fans using geomorphometric methods and simulating fan formation“.
  - 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.
  - Triannual World Landslide Forum (WLF4 in Ljubljana 2017).
- UNESCO Chair on prevention and sustainable management of geo-hydrological hazards, University of Florence, Italy.
- UNESCO Chair for Integrated River Basin Management, Universität für Bodenkultur, Vienna, Austria.
- UNESCO WENDI Chair on Water, Energy and Disaster Management for Sustainable Development, University of Kyoto, Japan.
- UNESCO Chair on Cultural Digital Heritage, Cyprus University of Technology, Cyprus.
- UNITWIN/UNESCO Chair INWEB – International Network of Water-Environment Centres for the Balkans, Aristotle University of Thessaloniki, Greece.

WRDRR International collaboration

- Euro-Mediterranean Network of Experimental and Representative Basins – ERB (http://erb-network.simdif.com/).
- Slovenian Association of Geodesy and Geophysics – SUGG (http://fgg-web.fgg.uni-lj.si/SUGG/) & International Union of Geodesy and Geophysics - IUGG (http://www.iugg.org/), International Association of Hydrological Sciences - IAHS (https://iahs.info/), European Geosciences Union - EGU (https://www.egu.eu/), American Geophysical Union – AGU (https://sites.agu.org/).
- Universities Allied for Water Research – CUAHSI (https://www.cuahsi.org/).
- European Water Supply and Sanitation Technology Platform – WssTP (http://wsstp.eu/).
- International Association for Hydro-Environment Engineering and Research –IAHR (https://www.iahr.org/).
- UNESCO IHP National Committee & UNESCO IHP cooperation in the Danube River Basin.
- European Network of Freshwater Research Organisations – EurAqua (https://www.euraqua.org/).
- SLOvenian COmission on Large Dams – SLOCOLD & International Commission on Large Dams - ICOLD (https://www.icold-cigb.org/).
- Slovenian association for irrigation and drainage – SDNO & International Comission on Irrigation and Drainage - ICID (http://www.icid.org/).
- International Consortium on Landslides – ICL (http://icl.iplhq.org/).
- International Research Society INTERPRAEVENT (http://www.interpraevent.at/).

WRDRR Dissemination Activities

4th World Landslide Forum

„Advancing Culture of Living With Landslides“

4thWLF 2017
4th World Landslide Forum
LJUBLJANA SLOVENIA EU

Regional Symposium on Landslides in the Adriatic-Balkan Region:

3rd ReSyLAB (October 11 – 13, 2017, Ljubljana, Slovenia)

4th ReSyLAB (October 23 – 25, 2019, Sarajevo, Bosnia & Hercegovina)

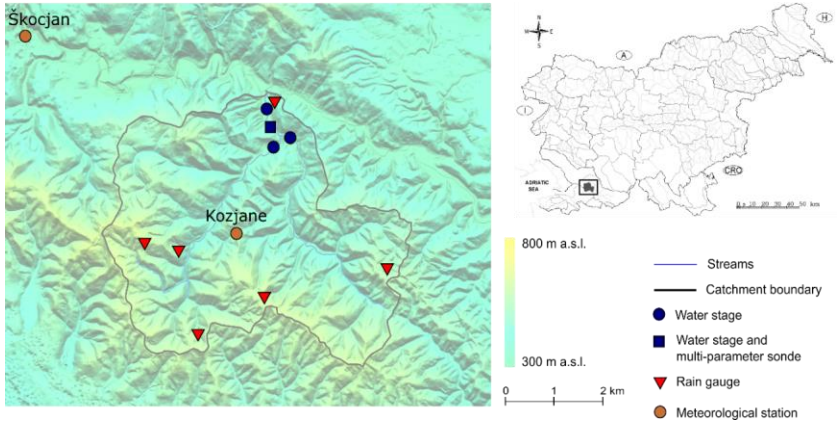
- A 2-year MSc Programme (2019-2024, over 150 applicants for the 1st year; in 2011-2017 over 100 MSc) follows the holistic approach and is explicitly designed to cover a wide range of topics – from drivers and natural processes to different models, decisions and socio-economic consequences and institutional environment, and is therefore an important advance in water education for Europe.
- Partners: TU Dresden (Germany), IHE Delft (the Netherlands), TU Catalonia, Barcelona (Spain) & University of Ljubljana.

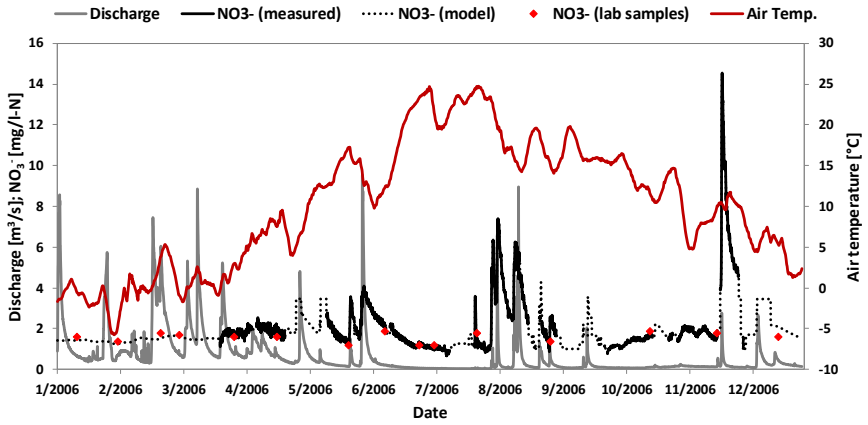
FLOODRisk Master
Global Change • Hydroinformatics • Planning

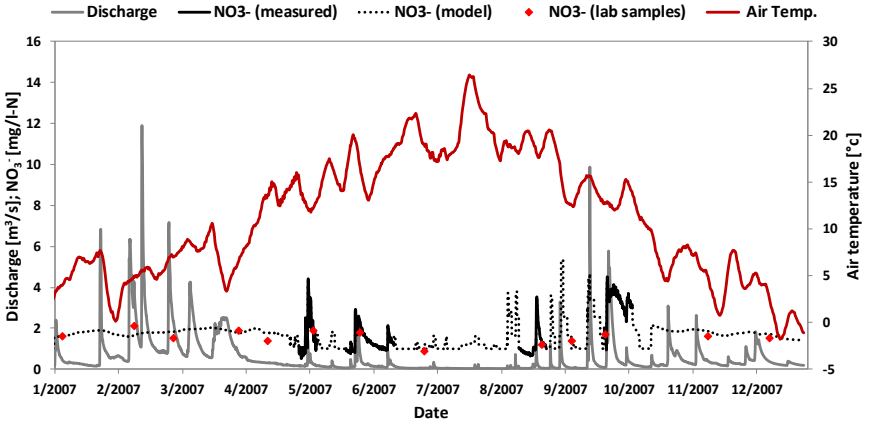
Further info: http://www.floodriskmaster.org/

Experimental catchments 1

- Monitoring interactions between hydrological and biogeochemical cycles.
- The Notranjska Reka experimental catchment.

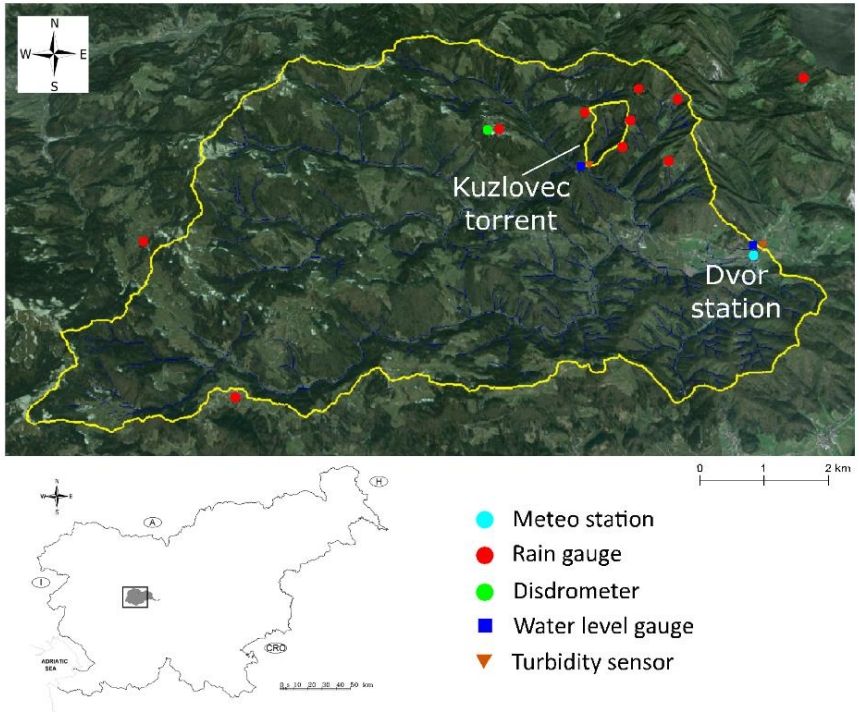


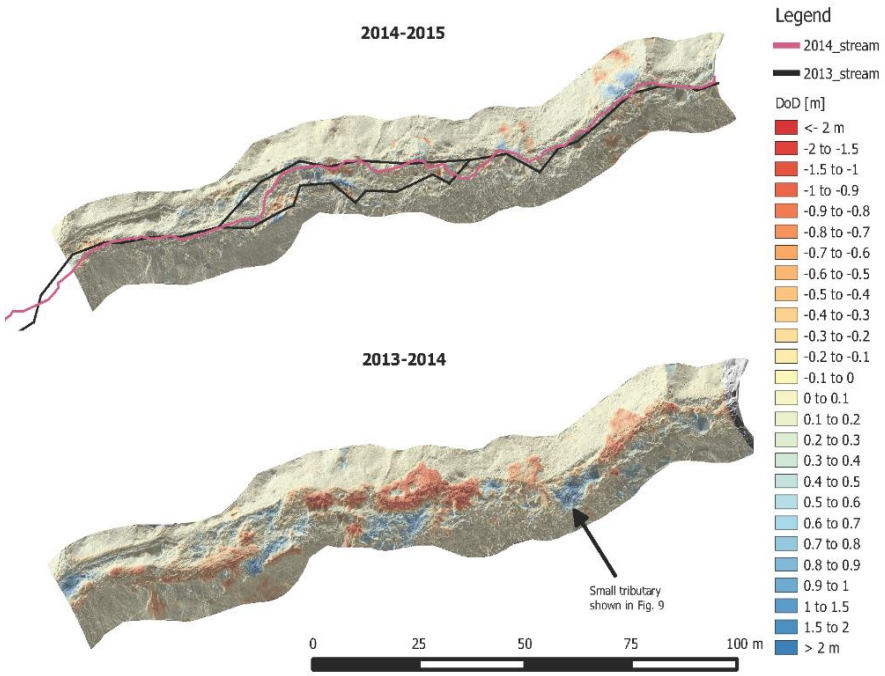




Experimental catchments 2

- Monitoring of erosion processes in a small forested torrential catchment using advanced field techniques and equipment.
- The Torrent Kuzlovec experimental catchment.

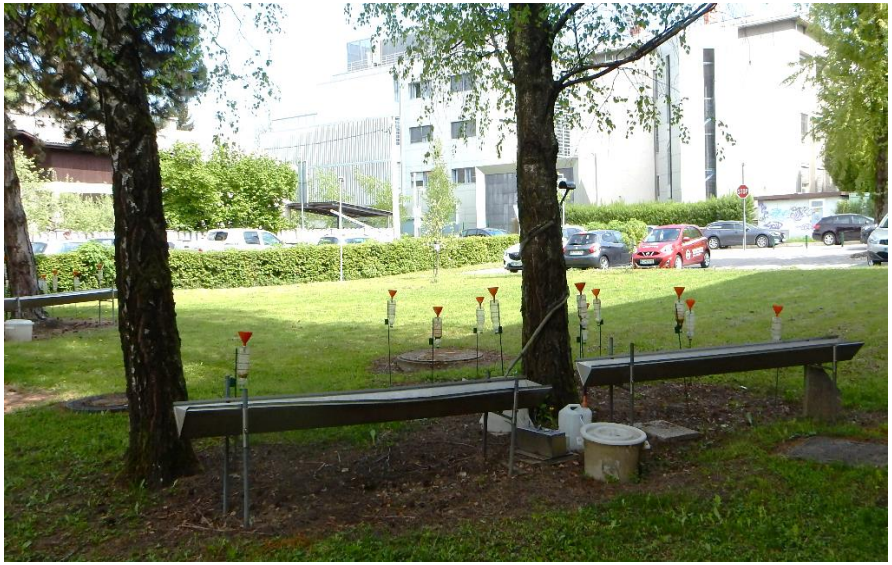


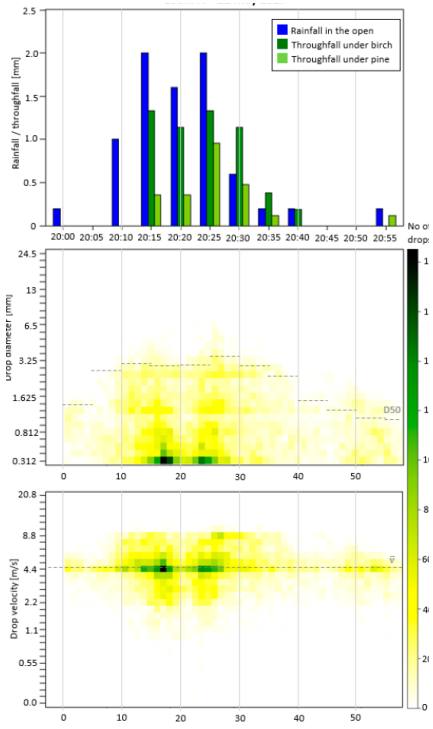


Bezak et al. 2017. Geomorphic response detection and quantification in a steep forested torrent. *Geomorphology*, 291.

Experimental catchments 3

- Rainfall interception experiments in an urban area – hydrometeorology.
- The Hajdrihova ulica experimental plot.
- Field measurements and analyses.

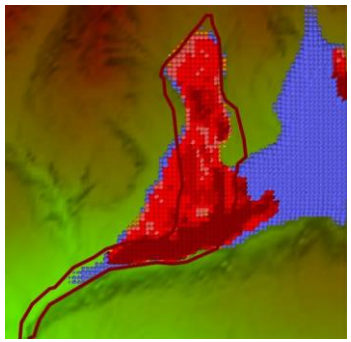


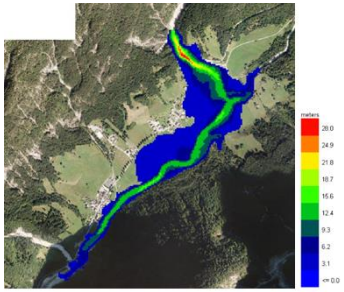


Zabret et al. 2017. Influence of Raindrop Size Distribution on Throughfall Dynamics under Pine and Birch Trees at the Rainfall Event Level. *Atmosphere*, 8.
Zabret et al. 2018. Influence of meteorological variables on rainfall partitioning for deciduous and coniferous tree species in urban area. *Journal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

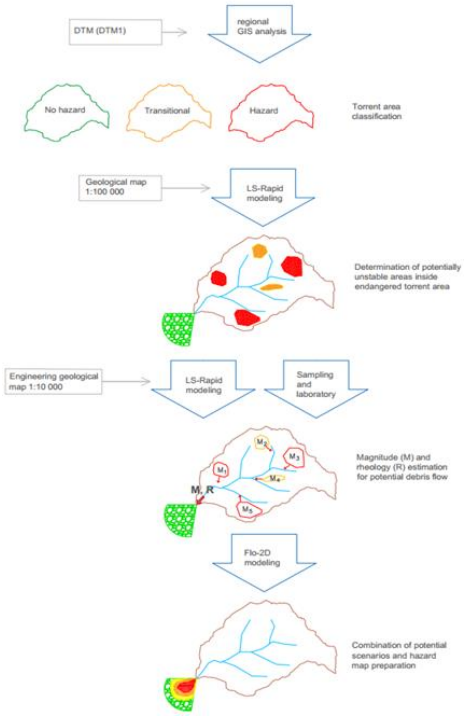
Experimental catchments 4

- Debris-flow Hazard Assessment.
- The 2000 Stože Landslide & Debris Flow as the case study.
- Mathematical modelling.





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

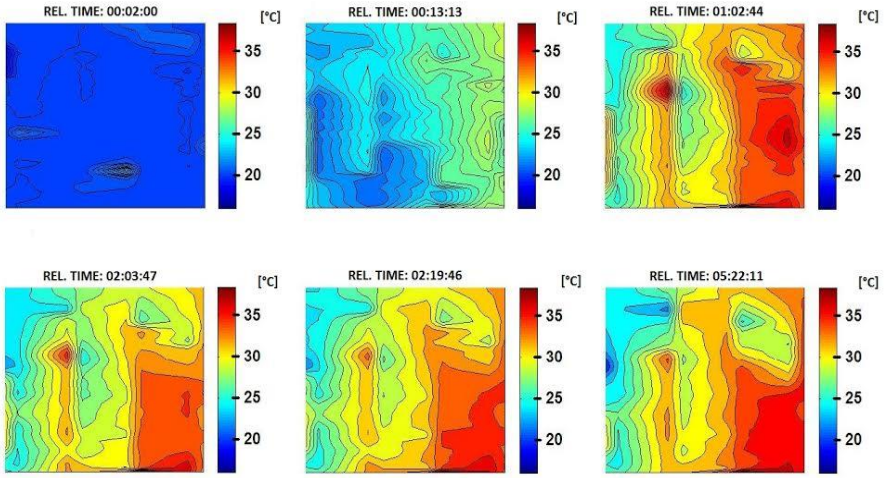


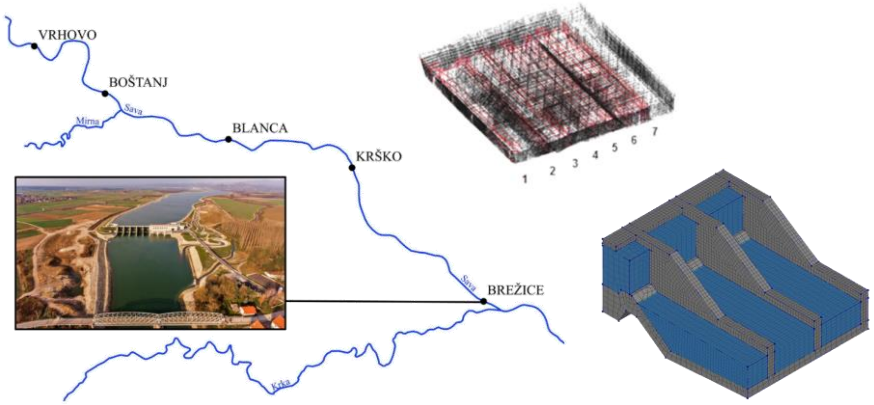
PHASE	PROCESS	DATA	TOOLS
Preliminary torrent area classification	Geomorphological analysis od DTM data	DTM	GIS tools
	Watershed definition		GIS tools
	Determination of classification parameters		other tools (Excell)
	Parameter estimation		other tools (Excell)
	Torrent area classification		other tools (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...)

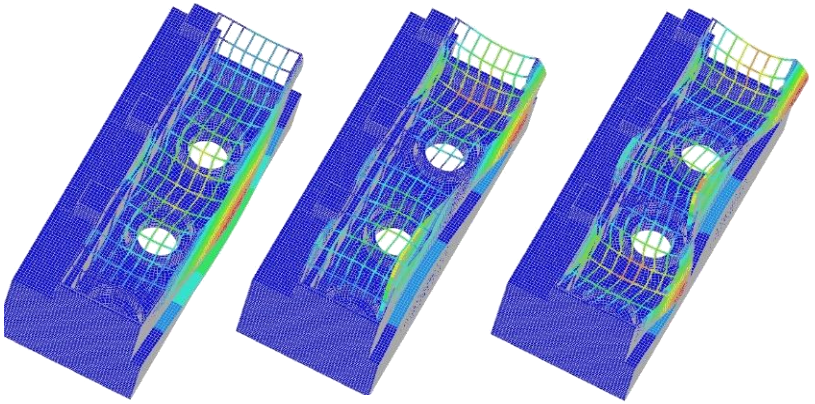
Sodnik & Mikoš 2018. Zemeljski plazovi pri ocenjevanju nevarnosti zaradi delovanja drobirskih tokov = Landslides at debris flow hazard assessment. Gradbeni vestnik, 67(6), 120-131. http://www.zveza-dgits.si/12708/pdf

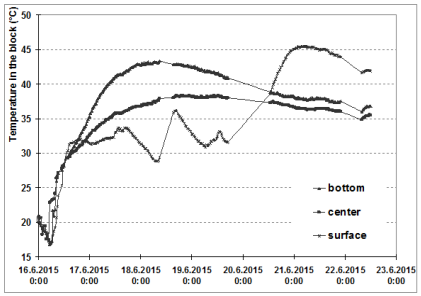
Experimental catchments 5

- Temperature in the concrete early stages using optical fibers.
- The HPP Brežice as the test field.
- Analyses of the dam modal properties under operational loads.





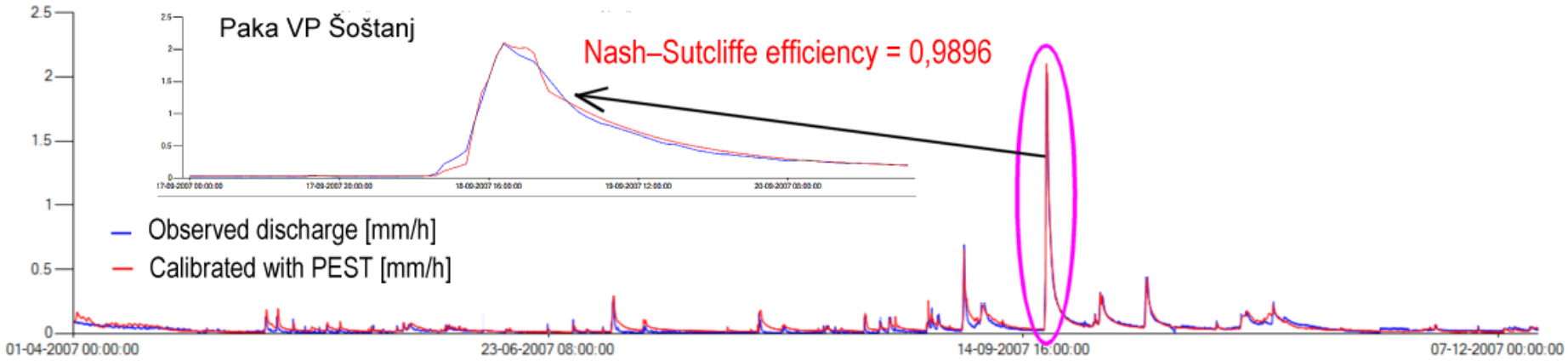




Klun et al. 2017. Structural measurements of dynamic response of hydraulic structures. In: *Proceedings 85th ICOLD Annual Meeting Int. Symposium*, 1-7.
Klun et al. 2018. Structural vibration measurement in dam monitoring. *Scientific journal of civil engineering*, 7(1), 21-27.

Hydrological Modelling using HBV-light and PEST

- We used a user-friendly catchment-runoff-model software HBV-light for hydrologic modelling.
- The PEST is a Model-Independent Parameter Estimation and Uncertainty Analysis Tool - a state-of-the art tool to calibrate complex non-linear computer models in water management (i.e. floods, dam operation, climate change etc.).
- PEST with the 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 in the Savinja River Basin and for 2014 Bosna River Floods.

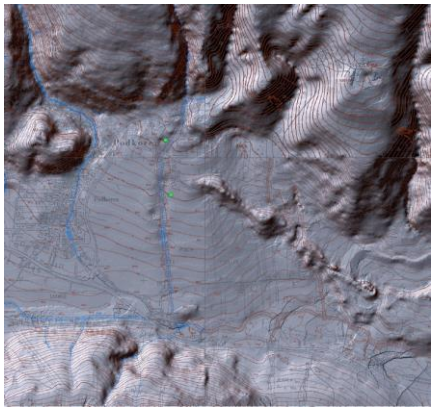


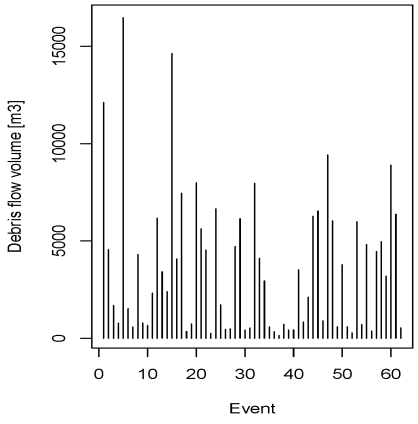
Vidmar et al. 2016. The Bosna River Floods in 2015. *NHESS*, 16, 2235-2246, https://doi.org/10.5194/nhess-16-2235-2016.

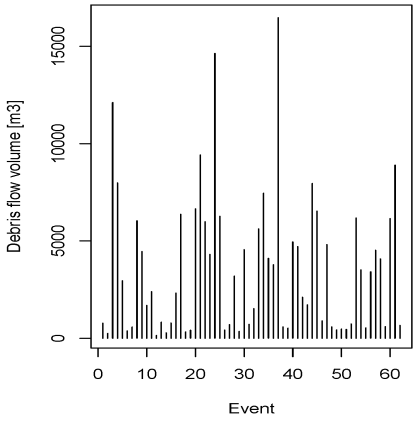
Brilly et al. 2018. Historical, Hydrological and Hydraulics Studies for Sustainable Flood Management, Achievements and Challenges of Integrated River Basin Management, Dejan Komatina, IntechOpen, https://www.intechopen.com/chapter/pdf-download/59715

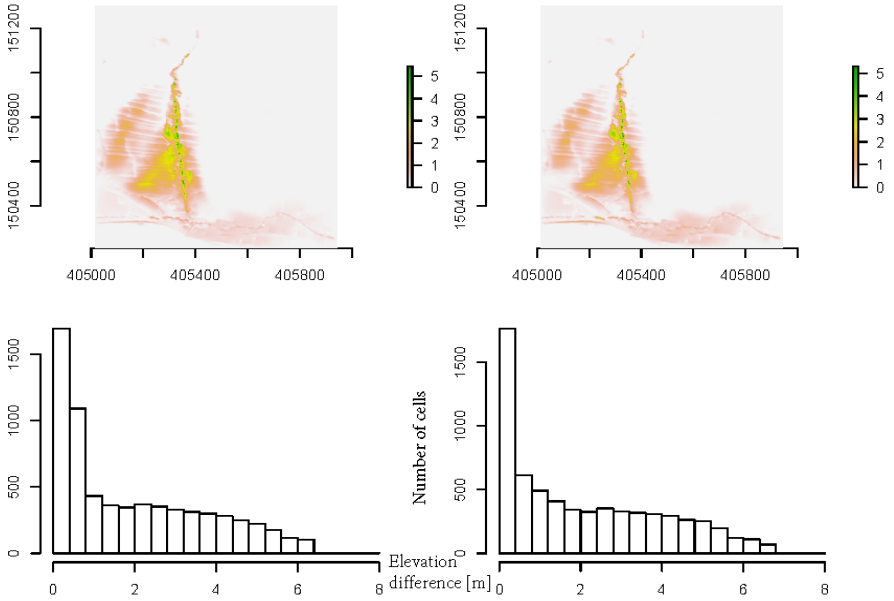
IPL-225 Project & ARRS J7-8273

- Recognition of potentially hazardous torrential fans using geomorphometric methods and simulating fan formation.
- 1. 5. 2017 – 30. 4. 2020.
- The main aim is to (semi)automatically recognize debris-flow prone torrential fans in the Alpine envronment.
- We used the Suhelj Torrent in NW Slovenia as the test area for a fan formation using a random sequence of debris flows and a mathematical model RAMMS::DEBRIS FLOW.





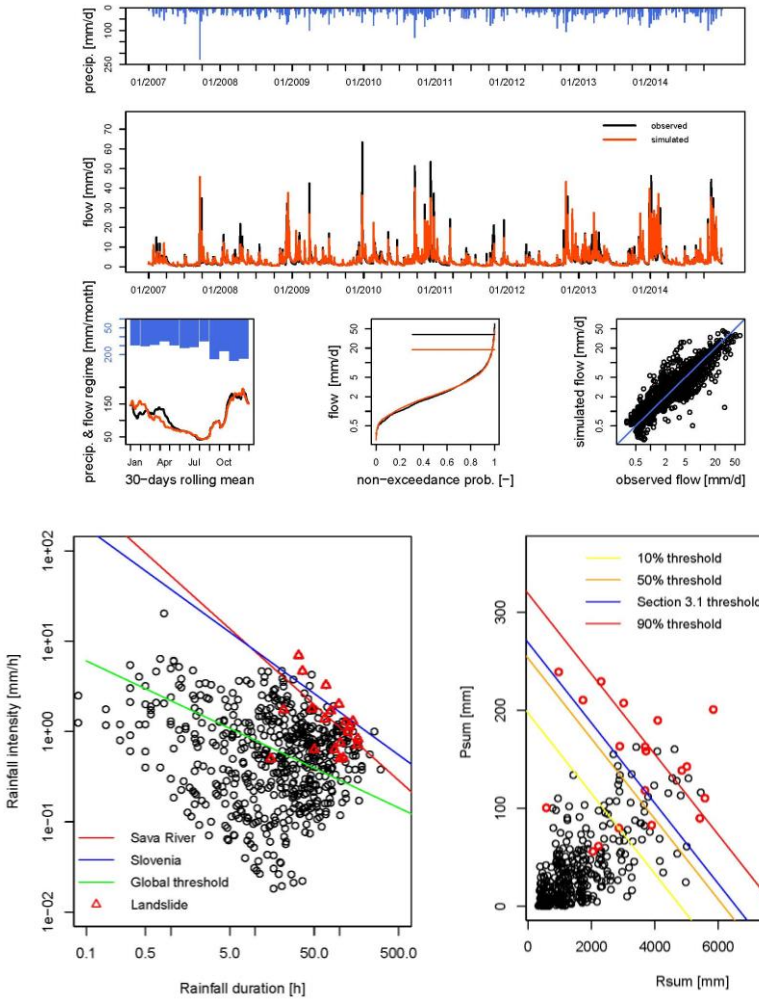




Bezak et al. 2019. Impact of a Random Sequence of Debris Flows on Torrential Fan Formation. *Geosciences*, 9(2), 64. https://www.mdpi.com/2076-3263/9/2/64/pdf

IPL-226 Project & ARRS J1-8153

- Studying landslide movements from source areas to zone of deposition using a deterministic approach.
- 1. 5. 2017 – 30. 4. 2020.
- We developed a methodology for predicting rainfall-induced shallow landslides based on a lumped conceptual hydrological model.
- The model was tested in the Selška Sora basin.
- Based on two hydro-meteorological variables a threshold was defined that could be used for prediction of rainfall-induced landslides as a part of an early warning system.
- The production storage level during the rainfall event Psum and the rainfall sum Rsum during the event were used for landslide prediction.
- Using copula functions we developed the probabilistic thresholds for triggering of shallow landslides.



Bezak et al. 2019. Application of hydrological modelling for temporal prediction of rainfall-induced shallow landslides. *Landslides*, https://link.springer.com/content/pdf/10.1007%2Fs10346-019-01169-9.pdf

Interreg Project DAREFFORT

- Danube River Basin Enhanced Flood Forecasting Cooperation (DAREFFORT).
- 1. 6. 2018 – 31. 5. 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.

Interreg
EUROPEAN UNION
Danube Transnational Programme
DAREFFORT

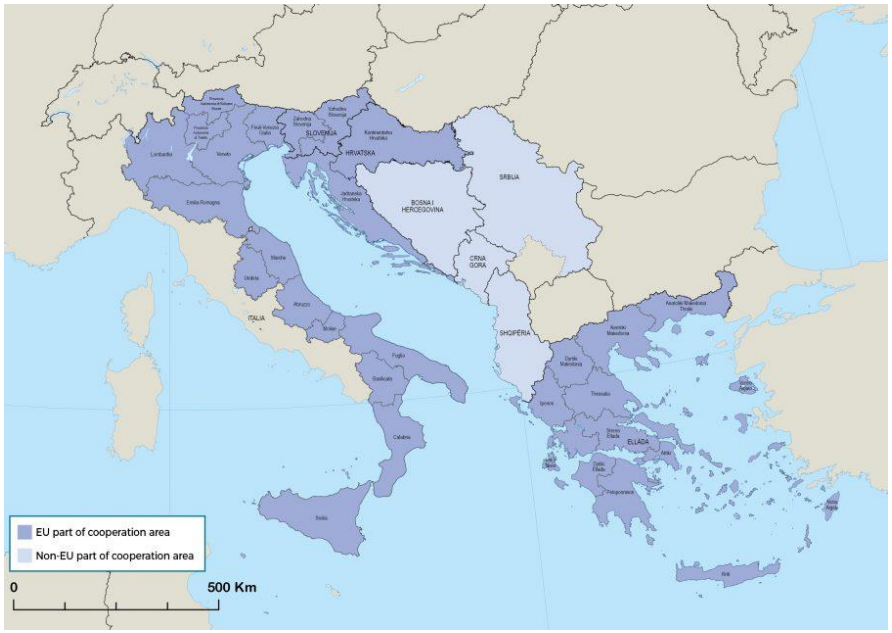
Project web page: http://www.interreg-danube.eu/approved-projects/dareffort

Interreg Project TOUREST

- Tourism water management for sustainable Adrion coastal areas.
- 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.

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

TOUREST



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

COST Action Land4Flood

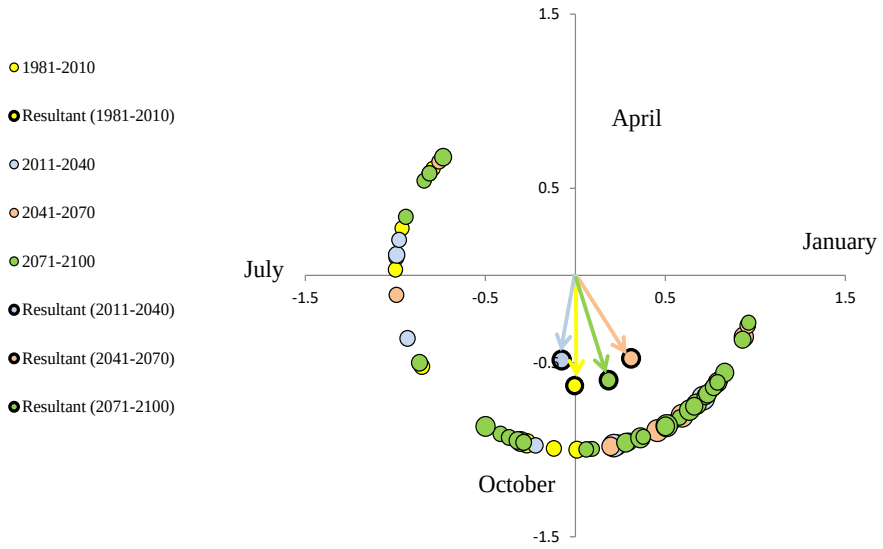
- Natural Flood Retention on Private Land.
- 14 . 9. 2017 – 13 . 9. 2021.
- UL is leader of WG1 that focuses on environmental conditions.
- The common characteristic of green infrastructure measures (used to reduce flood risk) is that they often claim more land than traditional methods (grey infrastructure).

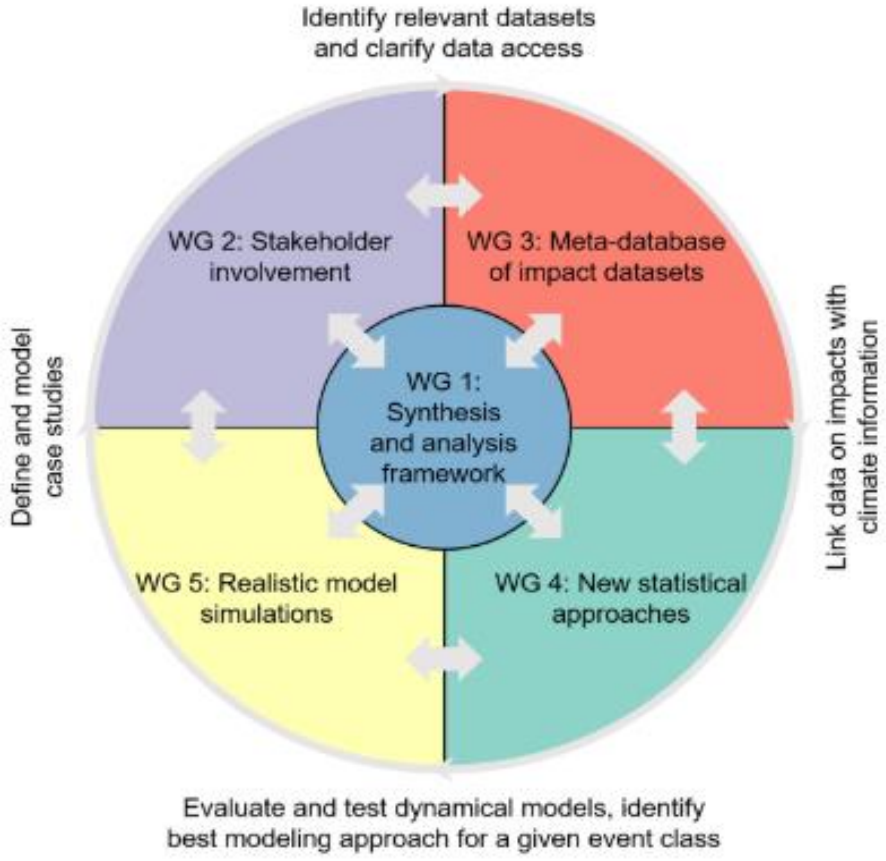
- Which synergies can be indentified between different land uses and the provision of flood storage and ecosystem services?
- How can the knowledge base about advantages and potentials of Natural Water Resources Management, large scale flood retention and resilient cities be strenghten and their importance communicated to different actors at local, regional and catchment level?
- How can land owners be encouraged to adapt land uses and land management strategies whic alow 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?

Project web page: https://www.land4flood.eu/

COST Action 17109 DAMOCLES

- Understanding and modelling compound climate and weather events.
- 14. 9. 2018 – 13. 9. 2022.
- Hazards (i.e. floods, droughts, …) usually result from a combination of interacting physical processes that occur across multiple spatial and temporal scales.
- Action deals with compound events.



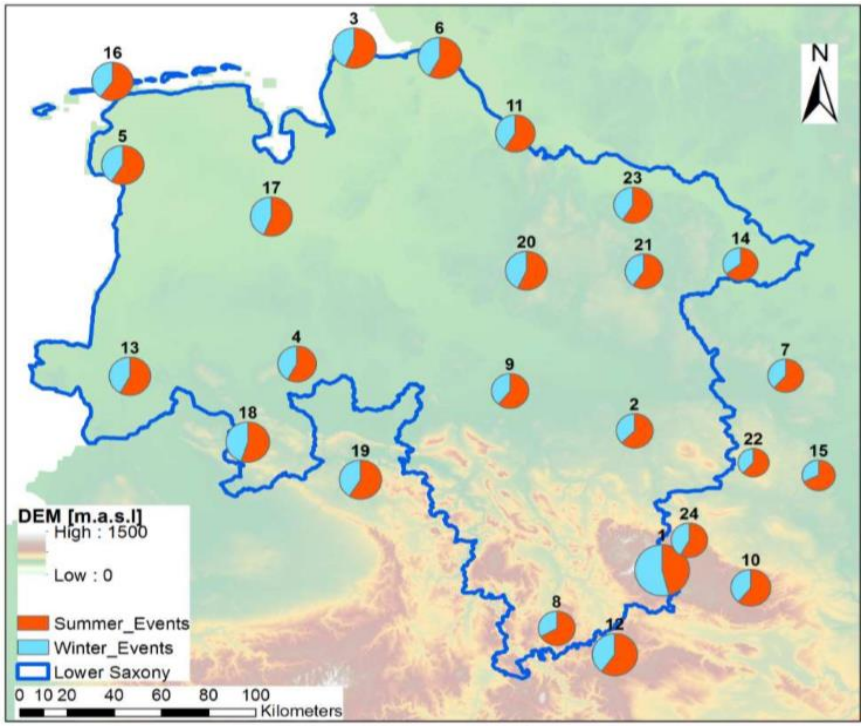


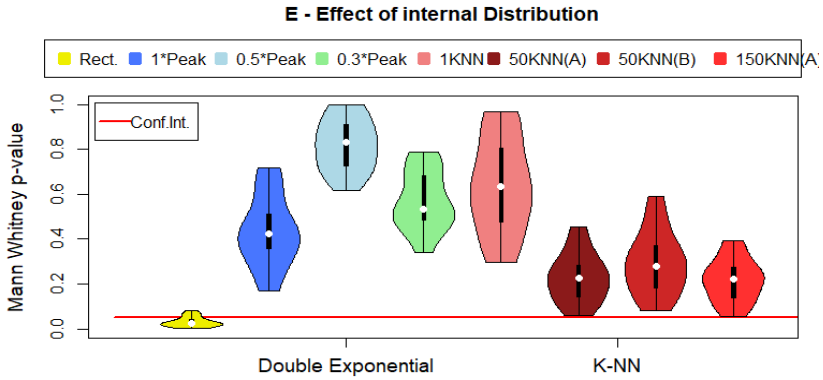
Project web page: https://www.cost.eu/actions/CA17109/

Bilateral project Slovenia - Germany

- Stochastic rainfall models for rainfall erosivity evaluation.
- 1. 1. 2018 – 31. 12. 2019.
- Leibniz Universität 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
  - KNN Disaggregation model

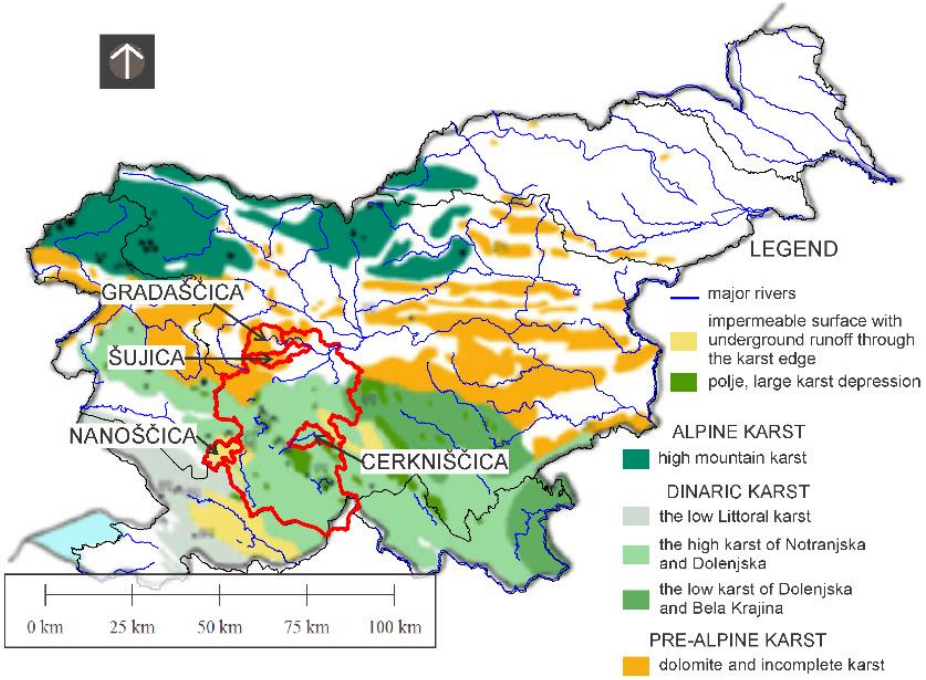
  in terms of their ability to simulate correct rainfall erosivity pattern.





Bilateral project Slovenia - China

- Evaluation of intelligent learning techniques for prediction of hydrological data: useful case.
- 1. 1. 2018 – 31. 12. 2020.
- Chongqing Technology and Business University, 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 *Journal of Hydrology*.



Project human resources ☺

World Construction Forum 2019

Buildings and Infrastructure Resilience

Ljubljana, Slovenia, April 8 – 11, 2019

M. Mikoš

Ljubljana Declaration Statement

UNESCO UNITWIN Networks and UNESCO Chairs as a part of the internationalization of higher education can effectively contribute to a higher impact of civil engineering disciplines to the joint worldwide efforts to fulfill the UN 2030 Agenda on Sustainable Development and its 17 Sustainable Development Goals.