

UNESCO CHAIR/UNITWIN NETWORK FINAL REPORT FORM

Title of the Chair/Network:	UNESCO Chair on Water-related Disaster Risk Reduction
Host Institution:	University of Ljubljana
Date of establishment of Chair/Network: (mm, yyyy)	05/2016 date of agreement 12/2016 date of inauguration
Period of activity under report: (mm, yyyy - mm, yyyy)	05/2016–05/2020
Report established by: (name, position)	Prof. Dr. Matjaž Mikoš, Chair holder

To be returned by electronic mail to both: unitwin@unesco.org and
i.nichanian@unesco.org Or by mail to UNESCO, Division for Policies and Lifelong Learning
Systems

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1. Executive Summary:

Major outcomes, results and impact of the Chair, including on national policies, in relation to its objectives as stated in Article 2 of the Chair Agreement (between the Institution and UNESCO)

The main challenge of the Chair was to promote an integrated system of research, training, information and documentation on water management in the field of water-related disaster risk reduction. The following specific objectives were met in the 2016–2020 period (for further details, please read this Final Report):

1. Research was conducted in WRDRR involving PhD and post-doctoral students at the PhD study programmes Built Environment and Environment Protection at the University of Ljubljana; as part of the international interdisciplinary Master's Study Programme Flood Risk Management (Erasmus Mundus, coordinated by IHE Delft) with many applicants from all over the world (including Africa, Americas, and Asia); with contribution to the national Research Programme P2-1080 Water Science and Technology, and Geotechnical Engineering (2014–2016, 2017–2021); by carrying-out bilateral research projects (Germany, China) and many national research and targeted projects.
2. Research results were disseminated through authoring numerous publications (mainly open-access and/or freely available at the Chair's webpage: www.unesco-floods.eu), as well as through co-editing conference proceedings (World Construction Forum, World Landslide Forum, both with more than 500 participants from ~50 countries), contributing to and co-editing SCI journal *Landslides: Journal of the International Consortium on Landslides*, and issuing SCOPUS journal *Acta hydrotechnica*, as well as serving as members of editorial boards of other international journals; maintaining the Chair's website, promoting study programmes in WRDRR, giving interviews in various media, and by preparing and giving lectures at the undergraduate and postgraduate levels, such as during two university doctoral summer schools; and by hosting exchange first- and second-cycle Erasmus students.
3. Platforms for cooperation with several interested parties and the public were developed, related to the effective use of WRDRR tools and practices, by setting-up and maintaining experimental river basins; by contributing to the Interactive Teaching Tools on Landslide-Risk Reduction published by Springer, contributing to the UNESCO VISUS methodology on School Safety Assessment; by developing national KR PAN methodology for assessing flood damage; by signing Kyoto Landslide Commitment 2020 supporting Sendai Framework for DRR 2015–2030; contributing to the International Programme on Landslides (IPL) led by ICL (iplhq.org) and other activities under ICL (thematic & regional networks).
4. Close cooperation with UNESCO IHP Programme, heading the National Committee on IHP, working for the IHP Bureau and Council in Paris, and within the Danube River Basin (and its part, the Sava River Basin), by various activities, such as taking care of the historical archives concerning scientific collaboration within the Danube River Basin, as well as with over 10 UNESCO Water Chairs and Centres, and especially as member of the UNITWIN-UNESCO/KU/ICL Landslide and Water-related Disaster Risk Management for Society and the Environment Cooperation Programme).

<p>2) Activities: <i>Overview of activities undertaken by the Chair during the reporting period</i></p>	
<p>a) Education/Training/Research <i>(key education programmes and training delivered and research undertaken by the Chair during the reporting period, target group and geographical coverage)</i></p>	
<p>i) Education (leading to certificate)</p>	<p>The Chair actively participated in the multidisciplinary ERASMUS+ master study program in Flood Risk Management (together with IHE, TU Dresden, Tech Barcelona) (international coverage).</p> <p>The Chair actively participated in Joint Masters Programme in Flood Risk Management, supported by EU Erasmus Mundus funds and leading by IHE Delft (international coverage).</p> <p><u>Supervision of Doctoral Candidates (national coverage):</u></p> <ul style="list-style-type: none"> - Nejc Bezak, 2012-2016, Fluvial transport of suspended sediments related to other hydrologic processes - Jošt Sodnik, 2014-2017, Debris flow hazard assessment on torrential fans - Tina Peternel, 2017, Dynamics of the slope mass movements in the Potoška planina with analyses of results of remote sensing and terrestrial surveys techniques and in-situ measurements - Zsuzsanna Engi, 2016, Flood hazard modeling on river outfall stretches, based on silting up processes - Gašper Rak, 2017, Water surface topology of supercritical confluence flow - Katarina Zabret, 2014-2018, Influence of meteorological and vegetation parameters on rainfall interception : doctoral thesis - Mateja Klun, 2015-2020, Analysis of Concrete Gravity Dam Conditions using State-of-the-art Experimental and Numerical Methods - Klaudija Sapač, 2015-, - Andrej Vidmar, 2015-, - Tamara Kuzmanić, 2019- <p><u>Supervision of other PhD students (international coverage):</u></p> <ul style="list-style-type: none"> - Yaser Ghafoori, Afghanistan, 2016- <p><u>Supervision of MSc and BSc Candidates (national coverage)</u></p> <ul style="list-style-type: none"> - 88 BSc and MSc candidates finished their studies under the supervision of the Chair's members between 2016 and 2020. <p><u>Supervision of the Flood Risk Management MSc candidates (international coverage):</u></p> <ul style="list-style-type: none"> - Martin Morlot, France, 2019, Characterization of the floods in the Danube river basin through flood frequency and seasonality analysis <p>Members of the Chair actively participated in the 2020 Field School on Geoenvironmental Disaster Reduction from February 10 to 16, 2020, organized by the UNESCO Chair on Geoenvironmental Disaster Reduction at Shimane University, Matsue, Japan by a male assistant professor and a female PhD student.</p> <p>The Chair is involved in preparing the Programme of InterFloodCourse headed by National University of Public Service, Baja Hungary, in cooperation with University of Belgrade, Faculty of Civil Engineering and supported by EU Strategy for the Danube Region.</p>
<p>ii) Training (short term)</p>	<p>The Chair at University of Ljubljana organized Environmental Protection summer school (June 27–July 17, 2016, Ljubljana) for doctoral students. 17 participants from 11 countries, 59% female over 24, attended the summer school.</p> <p>The Chair at University of Ljubljana organized Natural Disasters summer school (May 21–June 10, 2017, Ljubljana) for doctoral students. 28 participants worldwide, 46% female over 24, attended the summer school.</p>

	<p>PhD students involved in the Chair's activities are regularly attending national and international trainings and courses, such as summer and field schools. In 2017, Klaudija Sapač actively participated at the Catchment Science summer school in Birmingham, United Kingdom, and in 2020 Tamara Kuzmanić attended the Field School on Geoenvironmental Disaster Reduction from 10 to 16 February 2020, organized by the UNESCO Chair on Geoenvironmental Disaster Reduction at Shimane University.</p> <p>The Chair member, Assist. Prof. Andrej Kryžanowski, took a 3 month (6 March 2017-10 June 2017) sabbatical leave at Slovak University of Technology in Bratislava, Bratislava, Slovakia.</p> <p>The Chair member, Andrej Vidmar, actively attended the course Groundwater Model Calibration using PEST in Milano in 2018. The topic of the course is closely related to his PhD thesis, which will be defended in a few months.</p>
<p>iii) Research</p>	<p><u>International research projects:</u></p> <ul style="list-style-type: none"> - Bilateral cooperation with Chongqing Technology and Business University, China under the framework of a bilateral research project "Evaluation of intelligent learning techniques for prediction of hydrological data: useful case studies in China and Slovenia" (2018-2020). - Bilateral cooperation with Leibniz University, Hannover, Germany, under the framework of a bilateral research project "Stochastic precipitation models for the assessment of rainfall erosivity" (2018-2019). - ERASMUS+ project KA2-HE-14/15 Environmental Protection and Natural Disasters (2015-2017). - DAREFFORT Danube River Basin Enhanced Flood Forecasting Cooperation: INTERREG Danube Transnational Programme (2018-2021) - TOUREST: Tourism water management for sustainable: ADRION coastal areas (2018-2020) - CA15113: SMIRES – Science and Management of Intermittent Rivers and Ephemeral Streams, COST project, (2016–2020) - CA16209: LAND4FLOOD – Natural Flood Retention on Private Land, Cost project, (2017–2021) - CA17109: DAMOCLES – Understanding and modeling compound climate and weather events, Cost project (2018–2022) <p><u>National research projects:</u></p> <ul style="list-style-type: none"> - V2-1733: Development of a unified method for estimation of benefits of constructional and non-constructional measures for flood risk reduction (2018-2019) - J2-7322: Modelling hydrologic response of nonhomogeneous catchments (2016-2018) - J7-8273: Recognition of potentially hazardous torrential fans using geomorphometric methods and simulating fan formation (2017-2020) <p><u>Other research activities:</u></p> <ul style="list-style-type: none"> - Field measurements and applied research in experimental river basins in Slovenia, supported by diverse technologies and measuring equipment. - 2nd Meeting of UNESCO VISUS experts (October 29–30, 2019) in Ljubljana on "School safety upgrading strategies in multi-hazard prone areas", where the Ljubljana Declaration was accepted. <p><u>Invited lectures (international coverage):</u></p> <ul style="list-style-type: none"> - Matjaž Mikoš at the UNESCO Chair WENDI at Kyoto University, Japan July-August 2018 - Matjaž Mikoš at 7th ASEM Sustainable Development Dialogue, September 2018, Budapest, Hungary - Nejc Bezak at Doctoral Summer School, February 2020, Shimane University, Japan

b) Conferences/Meetings

(key conferences and meetings organized by the Chair or to which its Chairholder contributed)

i) Key conferences and workshops hosted by the Chair

- Organization of 4th World Landslide Forum (May 29–June 2, 2017, Ljubljana) with 600 participants from 50 countries, approx. 20% female beneficiaries over 24.
- World Construction Forum (April 8–11, 2019, Ljubljana) co-organized by the Slovenian Chamber of Engineers and the World Federation of Engineering Organizations (WFEO) with over 600 participants from 50 countries and 5 continents, approx. 25% female beneficiaries over 24.
- 2nd Meeting of UNESCO VISUS experts (October 29–30, 2019) in Ljubljana on “School safety upgrading strategies in multi-hazard prone areas”, where the Ljubljana Declaration was accepted.

ii) Other conferences/organizational activities undertaken by the Chairholder

- 14th of INTERPRAEVENT Congress 2020 in Bergen, Norway, September 2020 (postponed to May 2021 www.interpraevent2020.no)

iii) A selection of conference presentations by the Chairholder and other colleagues

List of conferences with active participation (international coverage):

2016:

- INTERPRAEVENT Congress, Luzern, Switzerland
 - o Water management as a part of civil engineering sector in Slovenia
 - o Monitoring of the main scarp of the Potoška planina landslide (Karavanke Mountain, NW Slovenia) using terrestrial laser scanning (TLS)
- 84th ICOLD Annual Meeting, Johannesburg, South African Republic
 - o Application of response surface method in the analysis of hydraulic structures
- Conference of the Euromediterranean Network of Experimental and Representative Basins (Bucharest, Romania)
 - o Monitoring the rainfall-runoff and erosion processes during extreme rainfall events in a forested headwater catchment
- European Geosciences Union, General Assembly 2016, Vienna, Austria
 - o Ljubljanica connects - restoration of the Ljubljanica river corridor and improvement of the river's flow regime
 - o The monitoring of eco-hydrological parameters with the "LIFE Ljubljanica connects" project
 - o Radio-controlled boat for measuring water velocities and bathymetry
 - o Temporal and spatial characteristics of rainfall events : a Slovenian case study
 - o Calibration of hydrological model with programme PEST
 - o Influence of rainfall microstructure on rainfall interception
- Fish Passage conference, Massachusetts, USA
 - o Stereo vision camera system for monitoring fish migration
- 3. Forum Flusswellen v Nürnberg, Germany
 - o Modelling of a hydraulic standing wave for water sports
- 7th Danube Academies Conference, Ljubljana, Slovenia
 - o Sediments in the Sava River Basin
- 1st Conference of Interdisciplinary Research on Real Estate, Ljubljana, Slovenia
 - o Analysis of the impact of flood events on the real estate market in two case studies - Ljubljana, Slovenia, and Boulder, Colorado, USA

2017:

- 85th ICOLD Annual Meeting, Prague, Czech Republic
 - o Structural measurements of dynamic response of hydraulic structures
- XXVII Conference of the Danubian Countries on Hydrological Forecasting and Hydrological Bases of Water Management, Golden Sands, Bulgaria
 - o Backwater effect in the Savinja River catchment on the flood safety and hydrological data
- Hydrological structure of the catchment during the floods
 - o Calibration of hydrological model with programme pest
- MACOLD 4th Congress on Dams, Struga, North Macedonia
 - o Structural vibration measurement in dam monitoring
- XVII Dam Monitoring International Conference, Stryszawa, Poland
 - o Introducing new technologies in dam monitoring : advance methods for better quality of structures and efficient dam safety
- The First Baku International Water Week, Baku, Azerbaijan

- European Geosciences Union, General Assembly 2017, Vienna, Austria
 - o Development and application of blended learning at the level of doctoral studies
 - o Hydrological structure of the catchment during the floods
 - o Estimation of snow line elevation changes from MODIS snow cover data
 - o Application of stable isotope analyses as support for determination of hydrological response of nonhomogeneous catchment of the Ljubljana River
 - o Investigating the physical basis of river memory and application to flood frequency prediction
 - o How is rainfall interception in urban area affected by meteorological parameters?
 - o Hydro-meteorological risk reduction and climate change adaptation in the Sava river basin
 - o Influence of temporal rainfall distribution on surface runoff modelling
- 1st International Conference on Mobilizing UNESCO Chairs in Natural Sciences for policy action towards 2030, Geneva, Switzerland
- 3rd Adriatic-Balkan Regional Symposium on Landslides, Ljubljana, Slovenia
- 2nd International Electronic Conference on Atmospheric Sciences, Basel, Switzerland
 - o Evaluation of drop size distribution impact on rainfall interception by trees
- Symposium Knowledge Based Dam Engineering, 85th Annual Meeting of International Commission on Large Dams, Prague, Czech Republic
 - o Structural measurements of dynamic response of hydraulic structures
- 2018:**
- 8th International Water Resources Management Conference of International Association of Hydrological Sciences (IAHS), Beijing, China
- 8th Water Forum, Brasilia, Brazil
- 86th ICOLD Annual Meeting, Vienna, Austria
- European Geosciences Union, General Assembly 2018, Vienna, Austria
 - o Hydrological investigation of the nonhomogeneous karstic catchment using stable isotopes
 - o Strengths, weaknesses and lessons learned from the blended learning methodology application at two interdisciplinary doctoral summer schools
 - o The development of event throughfall under birch and pine trees regarding the raindrop size distribution
 - o Influence of meteorological and vegetation variables on rainfall partitioning for two distinct tree species (*Pinus nigra* and *Betula pendula*)
 - o Throughfall spatial distribution under single birch and pine tree canopies
- World's Large Rivers Initiative (WLRI), Vienna, Austria
- Euromediterranean Network of Experimental and Representative Basins (ERB), Darmstadt, Germany
 - o Identification of rainfall-runoff processes formation with high-frequency monitoring of water chemistry
- International Conference on Natural Hazards and Risks in a Changing World, Potsdam, Germany
- IPL Symposium on Landslides, Kyoto, Japan
 - o Recognition of potentially hazardous torrential fans using geomorphometric methods and simulating fan formation
- INTERPRAEVENT International Symposium 2018 in the Pacific Rim, Toyama, Japan
 - o Estimating Landslide Volumes Using LS-rapid Model -The 2000 Stože Landslide in NW Slovenia)
- 2019:**
- European Geosciences Union, General Assembly 2019, Vienna, Austria
 - o Development of unified method and application for estimation of benefits of constructional and nonconstructional measures for flood risk reduction
 - o Investigation of the effects of hydrometeorological and vegetation conditions on nitrate flushing from a small forested catchment with high-frequency in-stream monitoring
 - o A decision-making framework for the design of check dam systems in erosion-prone areas
 - o Status quo of the Danube basin countries' flood and ice forecasting systems and methodologies
 - o Influence of rainfall interception by urban trees on runoff reduction
- World Construction Forum 2019, Ljubljana, Slovenia
 - o The design rainfall issue: impact on the results of the hydraulic modelling
 - o More room for water
 - o International doctoral summer school natural disasters : opportunity for improvement of understanding of natural disasters and their prevention
 - o Buildings and infrastructure resilience
- 87th ICOLD Annual Meeting, Ottawa, Canada
 - o Application of laser doppler vibrometry in dam health monitoring
- XXVIII Conference of the Danubian Countries on Hydrological Forecasting and Hydrological Bases of Water Management, Kyiv, Ukraine
 - o Development of the GIS-based KR PAN application for calculating expected annual flood damage
 - o Overlook on the Danube river basin hydrological forecast
 - o Analysis of low-flow conditions in a heterogeneous karst catchment as a basis for future planning of water resource management
 - o Backwater effect in the Savinja River catchment on the flood safety and hydrological data

- Venice Climate Meeting on the future of South-East Europe and the Mediterranean in the context of Climate Change: a UNESCO perspective, Venice, Italy
- 4th Adriatic-Balkan Regional Symposium on Landslides, Sarajevo, Bosnia and Hercegovina
- International Conference Live with Water, Podstreda, Slovenia
 - o Practical workshops with water for primary and secondary school students
 - o Journey of a water drop - water cycle through a board game

2020:

Online conferences and meetings due to the COVID-19 situation:

- European Geosciences Union, General Assembly 2019
 - o Event-based analysis of nitrate flushing from forested catchment using high-frequency in-stream monitoring data
 - o Modeling and evaluation of the effect of afforestation on the runoff generation within the Glinščica catchment (Slovenia)
 - o A global bibliometric perspective on soil erosion modelling
 - o Review of flood and ice forecasting systems and methodologies in the Danube River countries

c) Interuniversity Exchanges/Partnerships

(principal exchanges/partnerships between the Chair and other institution,s including UNESCO Chairs/UNITWIN Networks)

Link and cooperation in the UNITWIN/UNESCO/KU/ICL Landslide Risk Mitigation for Society and Environment Cooperation Programme, Kyoto University, Japan.

Activities in the International Consortium on Landslides (ICL) – cooperation with other 19 World Centres of Excellence in Landslide Risk Reduction being an active ICL member, supporting the ICL journal Landslides published by Springer Nature, contributing scientific and technical papers to triennial World Landslide Forums, regional cooperation within the ICL regional Adriatic-Balkan Network (Croatia, Bosnia & Hercegovina, Serbia, Albania).

University of Brescia, Italy – cooperation in PhD “Civil and Environmental Engineering, International cooperation and Mathematics”.

University of Udine, Italy – cooperation within the framework UNESCO VISUS technical-triage methodology (Visual Inspections for the definition of Safety Upgrading Strategies).

IHE Delft – cooperation together with TU Dresden and TU Barcelona within the framework of the international & multidisciplinary 2-year ERASMUS+ Master in Flood Risk Management that is partially executed in Ljubljana at University of Ljubljana with the direct involvement of UNESCO Chair in WRDRR.

Bilateral cooperation with Chongqing Technology and Business University, China under the framework of a bilateral research project “Evaluation of intelligent learning techniques for prediction of hydrological data: useful case studies in China and Slovenia« (2018-2020).

Bilateral cooperation with Leibniz University, Hannover, Germany, under the framework of a bilateral research project “Stochastic precipitation models for the assessment of rainfall erosivity” (2018-2019).

Collaboration with UNESCO Chairs:

- UNESCO Chair on Open Technologies for Open Educational Resources and Open Learning, Institute Jožef Stefan, Slovenia.
- International Consortium on Landslides (ICL), Kyoto, Japan.
- The Adriatic-Balkan Network of the ICL.
- World Centre of Excellence in Landslide Risk Reduction of the ICL, Faculty of Civil and Geodetic Engineering, University of Ljubljana, Slovenia.
- UNITWIN/UNESCO/KU/ICL Landslide Risk Mitigation for Society and Environment Cooperation Programme, Kyoto University, Japan.
- UNESCO Chair on prevention and sustainable management of geo-hydrological hazards, University of Florence, Italy.
- UNESCO Chair on Integrated River Research and Management, University of Natural Resources and Life Sciences Vienna, Austria.
- UNESCO Chair/International Network of Water-Environment Centres for the Balkans on ‘Sustainable Management on Water and Conflict Resolution’, Greece.
- W4ESD – UNESCO Chair on Water for Ecological Sustainable Development, University of Belgrade, Serbia.
- UNESCO Chair on Intersectoral Safety for Disaster Risk Reduction and Resilience SPRINT-Lab, University of Udine, Italy.

- UNESCO Chair on Geoenvironmental Disaster Reduction, Shimane University, Matsue, Japan.
- UNESCO Chair on Geoenvironmental Disaster Reduction, Shimane University, Matsue, Japan. UNESCO category II center IHE Delft Institute for Water Education, the Netherlands.
- UNESCO category II center International Research and Training Centre on Urban Drainage (IRTCUD), Belgrade, Serbia.

d) Publications/Multimedia Materials

(major publications and teaching/learning materials)

Please tick relevant fields of output and indicate volume of output:

	[tick]	[no.]
Books		
Books (edited)		8
Books (chapters)		11
Monographs Research		
Reports		15
Journal Articles (refereed)		89
Conference Proceedings		57
Occasional Papers		
Teaching/Learning Materials		12
Multimedia Materials (CD-Rom)		
Multimedia Materials (Video)		58
Multimedia Materials (Other)		

Give details of major publications and materials including full citations.

i) Theses

PhD theses:

- Nejc Bezak, 2016, Fluvial transport of suspended sediments related to other hydrologic processes
- Jošt Sodnik, 2017, Debris flow hazard assessment on torrential fans
- Tina Peternel, 2017, Dynamics of the slope mass movements in the Potoška planina with analyses of results of remote sensing and terrestrial surveys techniques and in-situ measurements
- Zsuzsanna Engi, 2016, Flood hazard modeling on river outfall stretches, based on silting up processes
- Gašper Rak, 2017, Water surface topology of supercritical confluence flow
- Katarina Zabret, 2018, Influence of meteorological and vegetation parameters on rainfall interception
- Mateja Klun, 2020, Analysis of Concrete Gravity Dam Conditions using State-of-the-art Experimental and Numerical Methods

MSc theses:

- Špela Žnidaršič, 2016, Determination of the optimum Adiabatic Curve for Mass Concrete at the Brežice HPP
- Yaser Ghafoori, 2016, Design and static analysis of arch dam using software SAP2000
- Gregor Robič, 2016, Hydrological Analysis of Floods for the Ljubljana River Basin
- Janez Zakrajšek, 2016, The exploitation of the energy potential of watercourses with emphasis on nature conservation
- Jure Šimic, 2016, Analysis of the process of spatial planning of hydropower plants on the Middle Sava River with an example of optimizing project management by using the Primavera software
- Natalija Likar Koselj, 2016, Locating hydropower developments on the case of Slovenia and Scotland
- Maja Štajdohar, 2016, Effects of sustainable measures on a runoff hydrograph in an urbanized drainage area
- Barbara Novak, 2017, Effect of precipitation microstructure and leaf area index on the interception of precipitation
- Lenart Ugovšek, 2017, Positioning and analysis of the dry retention areas operation on the river Dreta
- Gregor Grbec, 2017, Operational optimization of the Ceršak SHPP on Mura River
- Tilen Koranter, 2017, Design of measures for ensuring passability for aquatic organisms on Sava Bohinjka River at Soteska HPP Dam
- Petra Šinkovec, 2017, Creation of detailed hydraulic model of Ljubljana river at the Špica section
- Urban Jakop, 2017, Hydrological analysis of floods for the Savinja river watershed
- Gašper Polak, 2017, Optimization of Reservoir Storages on the Savinja River
- Urška Mižigoj, 2017, Flood protection system proposal for the Potočnica stream to improve the safety of the

village of Stara Vas near Krško

- Urban Jakop, 2017 Hydrological analysis of floods for the Savinja river watershed
- Aleš Oblak, 2017, Comparison of methods for the evaluation of liquefaction potential from in-situ tests
- Manca Petek, 2017, Rainfall erosivity analysis in Slovenia
- Pavel Janko, 2018, Variant analysis of the hydro potential use on the border Mura river
- Neven Verdnik, 2018, Designing of dry detention area along the Mura River in Gabrje, the municipality of Lendava
- Mateja Ribnikar, 2018, Use of Brook90 model for estimation of water balance in urban forests
- Sara Mikec, 2018, Passibility of Kaplan turbine for downstream fish passage
- Mateja Trnovec, 2018, Discussion of the flood problem of the Suha torrent in Preddvor with the flood regulations proposal
- Lenka Zalokar, 2018, Choice of a drought index for the announcement of hydrological drought of surface waters in Slovenia
- Duje Čajo, 2018, Proposal for protective measures against falling stones and rockfalls for the western part of the city of Omiš, Croatia
- Katarina Lavtar, 2019, Evaluation of lumped hydrological models performance for the Sava River basin
- Urban Repič, 2019, Measurements of temperatures in concretes with use of optical cables
- Jan Cunja, 2019, Temporal and spatial analysis of the largest hydrological droughts in Slovenia
- Klemen Zimic, 2019, Analysis of sediment transport in the section of the HPP Doblar reservoir
- Žiga Ščukovt, 2020, Comparison of drought indicators with measurements of water balance in soil

ii) Publications

Journal Articles (refereed):

In the report period 89 refereed scientific journal articles were published. Therefore, for each year of the report period, only the most cited publications are listed.

2016:

- Bezak, N., Šraj, M., Mikoš, M. 2016. Analyses of suspended sediment loads in Slovenian rivers. Hydrological sciences journal 61, 6: 1094-1108. doi: [10.1080/02626667.2015.1006230](https://doi.org/10.1080/02626667.2015.1006230)
- Bezak, N., Šraj, M., Mikoš, M. 2016. Copula-based IDF curves and empirical rainfall thresholds for flash floods and rainfall-induced landslides. Journal of Hydrology 541: 272:284. doi: [10.1016/j.jhydrol.2016.02.058](https://doi.org/10.1016/j.jhydrol.2016.02.058)
- Šraj, M., Viglione, A., Parajka, J., Blöschl, G. 2016. The influence of non-stationarity in extreme hydrological events on flood frequency estimation. Journal of hydrology and hydromechanics 64, 4: 426-437. doi: [10.1515/johh-2016-0032](https://doi.org/10.1515/johh-2016-0032)
- Bezak, N., Brilly, M., Šraj, M. 2016. Flood frequency analyses, statistical trends and seasonality analyses of discharge data: a case study of the Litija station on the Sava River. Journal of flood risk management 9, 2: 154-168. doi: [10.1111/jfr3.12118](https://doi.org/10.1111/jfr3.12118)
- Dolšak, D., Bezak, N., Šraj, M. 2016. Temporal characteristics of rainfall events under three climate types in Slovenia. Journal of hydrology 541: 1395-1405. doi: [10.1016/j.jhydrol.2016.08.047](https://doi.org/10.1016/j.jhydrol.2016.08.047)

2017:

- Blöschl et al. (co-author Mojca Šraj), 2017. Changing climate shifts timing of European floods. Science 357: 588-590. doi: [10.1126/science.aan2506](https://doi.org/10.1126/science.aan2506).
- Bezak, N., Rusjan, S., Fijavž Kramar, M., Mikoš, M., Šraj, M. 2017. Estimation of suspended sediment loads using copula functions. Water 9, 8: 1-23. doi: [10.3390/w9080628](https://doi.org/10.3390/w9080628)
- Bezak, N., Grigillo, D., Urbančič, T., Mikoš, M., Petrovič, D., Rusjan, S. 2017. Geomorphic response detection and quantification in a steep forested torrent. Geomorphology 291: 33-44. doi: [10.1016/j.geomorph.2016.06.034](https://doi.org/10.1016/j.geomorph.2016.06.034)
- Sapač, K., Humar, N., Brilly, N., Kryžanowski, A. 2017. More room for landslides. Advancing culture of living with landslides 1: 563-569. doi: [10.1007/978-3-319-59469-9_51](https://doi.org/10.1007/978-3-319-59469-9_51)

2018:

- Zabret, K., Rakovec, J., Šraj, M. 2018. Influence of meteorological variables on rainfall partitioning for deciduous and coniferous tree species in urban area. Journal of hydrology 558: 29-41. doi: [10.1016/j.jhydrol.2018.01.025](https://doi.org/10.1016/j.jhydrol.2018.01.025)
- Bezak, N., Zabret, K., Šraj, M. Application of Copula Functions for Rainfall Interception Modelling. Water 10, 8: 995. doi: [10.3390/w10080995](https://doi.org/10.3390/w10080995)
- Bezak, N., Šraj, M., Rusjan, S., Mikoš, M. 2018. Impact of the Rainfall Duration and Temporal Rainfall Distribution Defined Using the Huff Curves on the Hydraulic Flood Modelling Results. Geosciences 8, 2: UNSP 69. doi: [10.3390/geosciences8020069](https://doi.org/10.3390/geosciences8020069)
- Maček, U., Bezak, N., Šraj, M. Reference evapotranspiration changes in Slovenia, Europe. Agricultural and forest meteorology 260: 183-192. doi: [10.1016/j.agrformet.2018.06.014](https://doi.org/10.1016/j.agrformet.2018.06.014)
- Petek, M., Mikoš, M., Bezak, N. 2018. Rainfall erosivity in Slovenia: Sensitivity estimation and trend detection. Environmental research 167: 528-535. doi: [10.1016/j.envres.2018.08.020](https://doi.org/10.1016/j.envres.2018.08.020)

2019:

- Blöschl et al. (co-author Mojca Šraj), 2019. Changing climate both increases and decreases European river

floods. *Nature* 573: 108-111. doi: [10.1038/s41586-019-1495-6](https://doi.org/10.1038/s41586-019-1495-6)

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Multimedia materials (video):

One of the main objectives of the Erasmus+ project titled Environmental Protection and Natural Disasters was to produce e-learning material, i.e. recorded lectures that cover both interdisciplinary areas of environmental protection and natural disasters. All together 48 lectures were recorded that are freely available at: <http://www.let-group.com/summerschool.html>. Lectures were given by 29 world-renowned experts and scientists covering before mentioned interdisciplinary areas at the two doctoral summer schools, organized in the scope of the project.

In the scope of the World Construction Forum 2019, all presentations were recorded and are freely available at: <https://www.wcf2019.org/forum-lectures/index.html>. Approximately 10 presentations are directly related to the topics of the Chair's activities and can be therefore used as teaching material.

e) Cooperation with UNESCO Headquarters, Field Offices

Numerous ICL meetings are held in UNESCO Headquarters in Paris, such as annual Board of Representatives meetings including International Programme of Landslides (IPL) conferences on landslide risk reduction.

Very good cooperation was established during the first 4 years of Chair's activities with Mr Giuseppe Arduino, Chief of the Ecohydrology, Water Quality and Water Education Section in the Division of Water Sciences. This cooperation is twofold: on the one hand UNESCO Chair WRDRR is water-related chair, directly related to Mr Arduino division (two Chair's progress reports were submitted to him personally in 2018 and 2020), and on the other hand he is involved in International Consortium on Landslides (ICL) activities as UNESCO advisor to ICL.

In the activities of ICL in Paris also Mr Soichiro Yasukawa, Programme Specialist on Disaster Risk Reduction in the Division of Ecological and Earth Sciences, is involved. He was also our contact person for our involvement in two VISUS UNESCO methodology on school safety assessment.

The Chair supports national IHP activities and members of IHP are involved in national and international activities hosted by UNESCO HQ in Paris (IHP Bureau and Council meetings).

Moreover, the Chair was actively involved in the Venice Climate Meeting (November 6–8, 2019) on the future of South-East Europe and the Mediterranean in the context of Climate Change: a UNESCO perspective.

f) Other

(any other activities to report)

Members of the Chair were involved in activities of the Slovenian national platform on disaster risk reduction in the period 2014-2019.

Since 1991, members of the Chair are Chairman of the Slovenian National Committee Intergovernmental Hydrological Programme and as such members of the Slovenian National Commission of UNESCO.

A Chair's member is a member of the scientific-technical board of the international research society INTERPRAEVENT based in Klagenfurt, Austria.

3) Future plans and Development Prospects:

Outline of action plan for the next biennium and short/medium and long-term development prospects. Please do not hesitate to refer to difficulties that the Chair has experienced

In the future, the UNESCO Chair on Water-related Disaster Risk Reduction will:

- Be involved in IPL activities by executing IPL projects, by contributing to evaluation of IPL project proposals and World Centres of Excellence in Landslide Risk Reduction proposals, and by contributing to the Global Promotion Committee of the IPL.
- Be further working as an active member of ICL by contributing to the Kyoto Landslides Commitment 2020 (signed in September 2019 by UL FGG), contributing to the editorial work for SCI journal *Landslides* issued by ICL and Springer Nature, by co-organizing the 5th World Landslide Forum in November 2021, Kyoto, Japan, by co-organizing the 6th World Landslide Forum to be held in Florence, Italy in 2023, by proposing IPL projects, by further supporting thematic and regional ICL networks, especially the Balkan-Adriatic Network and its 5th Regional Symposium on Landslide Risk Reduction to be held in October 2021 in Rijeka, Croatia.
- If approved, in November 2020 proceed to work as the World Centre of Excellence on Landslide Risk Reduction for the next 3 years (2020-2023) - we were given this title for the first time in 2008 and were repeatedly awarded this title ever since during the following triennial World Landslide Forums.
- Proceed to implement the activities of the Erasmus Mundus international interdisciplinary Flood Risk Management master study (coordinated by IHE Delft).
- Research work within the framework of the national research programme P2-0180 Water Science and Technology, and Geotechnical Engineering that we plan to prolong for the period 2021-2027.
- Further support the activities of the Slovenian National Committee for IHP UNESCO (UNESCO Chairholder is also chairing the NC IHP UNESCO in Slovenia and is member of the Slovenian National Commission for UNESCO, while two more members of the UNESCO Chair are members of the Slovenian NC IHP UNESCO).
- Will support the work of IHP Bureau and IHP Council in Paris. We will support the IHP project World's Large Rivers Initiative (WLRI).
- Further work on development and intensify research activities in experimental river basins and enhance cooperation in the Euro-Mediterranean Network of Experimental and Representative Basins (ERB, <https://erb-network.simdif.com/>). We plan to attend the next ERB Conference in Elba, Italy, in September 2020 (postponed to 2021 due to COVID-19).
- Contribute to the draft of IXth Programme of IHP UNESCO, and continue to support activities of other UNESCO chairs within the existing network, especially through the ICL community in the field of landslide risk reduction, and through already established cooperation within the international hydrology community.
- Support the forthcoming 4th Congress on Waters in Slovenia to be held in 2021.
- Support water diplomacy efforts of the Slovenian Government and support the organization of the Slovenian Presidency of EU in 2021.
- Proceed with digitalization of existing materials (e.g. reports and proceedings from the Danubian countries) and with production of new materials in electronic form, freely available for the hydrology scientific community. Also supporting publishing of the SCOPUS journal *Acta hydrotechnica* is part of these efforts.
- Further support all kind of national and international University of Ljubljana educational efforts and activities in the field of hydrological sciences and integrated water management, as well as in flood risk management and community (society) capacity building and development through risk dialogue with diverse stakeholders.
- Cooperate on development and maintenance of the Glossary of Hydrology.
- Maintain and develop the existing experimental river basins (e.g. Gradaščica river catchment).

Moreover, Slovenia is coordinating the national committee for IHP UNESCO in the Danube River Basin and their research efforts, and a workshop is planned to be held in November 2020 in Ljubljana to host national committees of region II.

Appendix:

1) Human Resources		
<ul style="list-style-type: none"> - Matjaž Mikoš: Professor – Chair holder - Mitja Brilly: Professor – retired in 2020 (Hydrology) - Ana Petkovšek: Associate Professor – retired in 2020 (Engineering Geology) - Janko Logar: Associate Professor (Geotechnical Engineering) - Mojca Šraj: Associate Professor (Hydrology) - Andrej Kryžanowski: Assistant Professor (Hydraulic Engineering) - Marko Komac: Adjunct Professor (Geology) - Simon Rusjan: Assistant Professor (Hydraulic Engineering) - Dušan Petrovič: Assistant Professor (Geodetic Engineering) - Matej Maček: Teaching Assistant Dr. (Geotechnical Engineering) - Dejan Grigillo: Teaching Assistant Dr. (Geodetic Engineering) - Nejc Bezak: Teaching Assistant Professor (Hydrology) - Jošt Sodnik: Senior Lecturer (Hydraulic Engineering) - Mateja Klun: Teaching Assistant Dr. (Hydraulic engineering) - Klaudija Sapač: PhD Student (Hydrology) - Katarina Sirk: PhD Student (Geotechnical Engineering) - Tamara Kuzmanić: PhD Student (Hydrology) 		
2) Financial Resources		
<i>Please tick sources of financial contribution and specify the amount in U.S. dollars</i>	<input type="checkbox"/> [tick]	Amount (\$)
	Host Institution	94,000 USD
	Partner Institution	_____
	Government Body	_____
	Other Public Institution/Body (incl. Research Councils)	88,000 USD
	UNESCO	18,000 USD
	Other UN Agency	_____
	IGO	_____
	NGO	_____
	Industry	_____
	Other Private	_____

Give details of financial contributions, material resources and space.

A: Financial resources of UNESCO Chair

Additionally to the in-kind services in the height of 94,000 USD in 4 years, offered by the host institution (University of Ljubljana), the Chair's activities are directly financed by the Slovenian Research Agency in the height of 88,000 USD in 4 years for the Chair's research activities, and by the National UNESCO Commission in the height of 18,000 USD in 4 years through financing the activities of the National Committee for IHP that are supported by the Chair's diverse activities.

B1: Material resources and space of UNESCO Chairs

UNESCO Chair is hosted by the Faculty of Civil and Geodetic Engineering of the University of Ljubljana (UL FGG) – the Chair's premises are in the building of the UL FGG Department of Environmental Civil Engineering at Hajdrihova ulica 28 in Ljubljana, while the main UL FGG building is at Jamova c. 2, Ljubljana.

UNESCO Chair also uses experimental river basins around Slovenia for applied hydrology research, established by the Chair of Hydrology and Hydraulic Engineering at UL FGG and plenty of field equipment, as well as hydraulic and geotechnical (soil mechanics) laboratory available at UL FGG, and its computer facilities. Furthermore, remote sensing equipment such as TLS or UAV from the UL FGG Department of Geodesy is also available for the UNESCO Chair.

B2: Space provided to the UNESCO Chair

UNESCO Chair is hosted by the Faculty of Civil and Geodetic Engineering of the University of Ljubljana (UL FGG) – the Chair is headquartered in the building of the UL FGG Department of Environmental Civil Engineering at Hajdrihova ulica 28 in Ljubljana – the main UL FGG building is at Jamova c. 2, Ljubljana.

UNESCO Chair also uses experimental river basins around Slovenia for applied hydrology research, established by the Chair of Hydrology and Hydraulic Engineering at UL FGG and plenty of field equipment, as well as hydraulic, geotechnical (soil mechanics) laboratory and laboratory for aggregates available at the UL FGG, and its computer facilities.

Furthermore, remote sensing equipment such as TLS or UAV from the UL FGG Department of Geodesy is also available for the UNESCO Chair.

End of the Form